

EJA

European Journal
of
Anaesthesiology

Euroanaesthesia 2017
The European Anaesthesiology Congress

Abstracts Programme
Geneva, Switzerland, 3 - 5 June

Abstracts and Programme

EUROANAESTHESIA 2017

The European Anaesthesiology Congress

3 - 5 June 2017
Geneva, Switzerland

European Journal of Anaesthesiology

Editor-in-Chief

Martin R. Tramèr *Geneva, Switzerland*

Deputy Editors-in-Chief

Walid Habre *Geneva, Switzerland*

Bernhard Walder *Geneva, Switzerland*

Language and Technical Editors

Alan Aitkenhead *Nottingham, UK*

Gordon Lyons *Leeds, UK*

Neil Morton *Glasgow, UK*

Ian F. Russel *Hull, UK*

Associate Editors

Bernd W. Böttiger *Cologne, Germany*

Nicolas Bruder, *Marseille, France*

Michelle Chew *Halmstad, Sweden*

Pierre Diemunsch *Strasbourg, France*

Thomas Fuchs-Buder *Nancy, France*

Robert Greif *Berne, Switzerland*

Tom Hansen, *Odense, Denmark*

Peter Kranke *Würzburg, Germany*

Patricia M. Lavand'homme *Brussels, Belgium*

Philipp Lirk *Amsterdam, Netherlands*

Annelies Moerman, *Ghent, Belgium*

Rolf Rossaint *Aachen, Germany*

Charles-Marc Samama *Paris, France*

Francis Veyckemans *Lille, France*

Methods, Statistics, Epidemiology

Malachy Columb *Manchester, UK*

Nadia Elia *Geneva, Switzerland*

Book Reviews

Micheal H. Nathanson *Nottingham, UK*

Journal Manager

Bridget M. Benn *Geneva, Switzerland*

European Journal of Anaesthesiology is the official publication of the European Society of Anaesthesiology. The Journal publishes original scientific work. Preference is given to experimental work or clinical observations in man, and to laboratory work of clinical relevance.

Information for contributors

Papers should be submitted online at: www.editorialmanager.com/eja.

European Journal of Anaesthesiology (ISSN: 0265-0215) is published monthly by Wolters Kluwer Health, Inc. and distributed in the US by Mercury Airfreight International, Inc., 365 Blair Road, Avenel, NJ 07001. Periodicals postage paid at Rahway, NJ. POSTMASTER: send address changes to *European Journal of Anaesthesiology*, PO Box 1610, Hagerstown, MD 21740, USA.

All correspondence should be addressed to the Editorial Office: *European Journal of Anaesthesiology*, Lippincott Williams & Wilkins, Citi Building, 41st Floor, 25 Canada Square, London E14 5LQ, UK
Publisher Daniel Hyde
Production Editor Duncan Martin-Holloway

Copyright © 2017 by European Society of Anaesthesiology. All right reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without either the prior written permission of the Publisher or a licence permitting restricted copying issued by the Copyright Licensing Authority and in the USA by the Copyright Clearance Center.

Printed on chlorine-free, recyclable paper from sustainable forests meeting the requirements of ISO 9706, ISO 14001 and ISO 9001 in Singapore by Markono Print Media Pte Ltd. Typeset by Thomson Digital Ltd., Noida Special Economic Zone, Noida, India.

Advertising: For further information please visit www.wkadcenter.com or contact Avia Potashnik. Tel: +44 (0)20 3197 6722, email: avia.potashnik@wolterskluwer.com

Special projects and reprints (U.S./Canada):

Alan Moore, email: alan.moore@wolterskluwer.com

Special projects (non-U.S./Canada):

For Special Projects (non-U.S./Canada), email: healthlicensing@wolterskluwer.com

Reprints (non-U.S./Canada):

For Reprints, contact a representative at internationalreprints@wolterskluwer.com

Disclaimer

Although every effort is made by the publisher and editorial board to see that no inaccurate or misleading data, opinion or statement appear in this journal, they wish to make it clear that the data and opinions appearing in the articles and advertisements herein are the responsibility of the contributor or advertiser concerned. Accordingly, the publisher, the editorial board and their respective employees accept no liability for the consequences of any such inaccurate or misleading data, opinion or statement.

Drugs and drug dosages

Readers are advised that new methods and techniques described involving drug usage should be followed only in conjunction with drug manufacturers' own published literature.

2017 Subscription rates

Individual \$559 (USA); \$559 (Rest of the World). Institutional \$1,651 (USA); \$1,907 (Rest of the World). On-line only subscriptions for Institutions are available through Ovid (www.ovid.com). Prices include handling and shipping, but not sales tax, e.g. VAT, GST, MVG, MWS, AST and regional sales tax. Where applicable, please add sales tax to the listed prices at the appropriate rate. (The Canadian GST of 7% will be added to the subscription price of all orders shipped to Canada. Wolters Kluwer Health, Inc. GST Identification Number is 895524239.) Copies will be replaced without charge if the publisher receives a request within 90 days of the mailing date, both in the USA and worldwide.

Subscription information

European Journal of Anaesthesiology, Subscription Department, Wolters Kluwer Health, Inc., 14700 Citicorp Drive, Bldg 3, Hagerstown, MD 21742, USA, tel: + 1 800 638 3030. In Japan, contact Wolters Kluwer Health Japan Co, Ltd, 1-28-36 Hongo, Bunkyo-ku, Tokyo 113, Japan, tel: + 81 3 3817 5675; fax: + 81 3 3815 6776.

EUROANAESTHESIA 2017

The European Anaesthesiology Congress

GENEVA, SWITZERLAND, 3 - 5 JUNE 2017

ABSTRACT PRESENTATION PROGRAMME

Please note that all abstracts are presented as poster presentations: abstract presenters do not make a formal presentation of their abstract in a separate room, using audiovisual aids (except for the Best Abstract Prize Competition). Instead, two chairpersons will conduct, in front of each poster, a short discussion of each abstract with the presenter and the audience, for every abstract in that session. Poster presenters have been asked to stand by their poster at least 15 minutes before the start of the session and 15 minutes after, to address further questions.

Date	Time	Reference	Location	Page
Best Abstract Prize Competition (BAPC)				
04.06.2017	14:00-16:00	BAPC	Room Q	1
Learning Track 1 - General Anaesthesiology				
03.06.2017	10:30-12:00	01AP01	Poster e-Board 1	3
03.06.2017	12:30-14:00	01AP02	Poster e-Board 1	7
03.06.2017	14:30-16:00	01AP03	Poster e-Board 1	10
03.06.2017	16:30-18:00	01AP04	Poster e-Board 1	15
03.06.2017	16:30-18:00	01AP05	Poster e-Board 2	18
04.06.2017	08:30-10:00	01AP06	Poster e-Board 1	22
04.06.2017	10:15-11:45	01AP07	Poster e-Board 1	25
04.06.2017	12:00-13:30	01AP08	Poster e-Board 1	28
04.06.2017	12:00-13:30	01AP09	Poster e-Board 2	31
04.06.2017	13:45-15:15	01AP10	Poster e-Board 1	34
04.06.2017	13:45-15:15	01AP11	Poster e-Board 2	38
04.06.2017	15:30-17:00	01AP12	Poster e-Board 1	42
05.06.2017	08:30-10:00	01AP13	Poster e-Board 1	45
05.06.2017	10:15-11:45	01AP14	Poster e-Board 1	48
05.06.2017	12:00-13:30	01AP15	Poster e-Board 1	52
05.06.2017	13:45-15:15	01AP16	Poster e-Board 1	56
Learning Track 2 - Ambulatory Anaesthesia				
03.06.2017	10:30-12:00	02AP01	Poster e-Board 4	59
05.06.2017	10:15-11:45	02AP02	Poster e-Board 6	62
05.06.2017	13:45-15:15	02AP03	Poster e-Board 5	65
Learning Track 3 - Regional Anaesthesiology				
03.06.2017	16:30-18:00	03AP01	Poster e-Board 3	68
04.06.2017	08:30-10:00	03AP02	Poster e-Board 3	72
04.06.2017	10:15-11:45	03AP03	Poster e-Board 3	76
04.06.2017	12:00-13:30	03AP04	Poster e-Board 3	80
04.06.2017	13:45-15:15	03AP05	Poster e-Board 3	82
04.06.2017	15:30-17:00	03AP06	Poster e-Board 3	85
05.06.2017	08:30-10:00	03AP07	Poster e-Board 3	87
05.06.2017	10:15-11:45	03AP08	Poster e-Board 3	90
05.06.2017	12:00-13:30	03AP09	Poster e-Board 3	93
05.06.2017	13:45-15:15	03AP10	Poster e-Board 3	96

Learning Track 4 - Obstetric Anaesthesiology

03.06.2017	12:30-14:00	04AP01	Poster e-Board 4	100
03.06.2017	14:30-16:00	04AP02	Poster e-Board 4	104
03.06.2017	16:30-18:00	04AP03	Poster e-Board 4	108
04.06.2017	08:30-10:00	04AP04	Poster e-Board 4	112
04.06.2017	12:00-13:30	04AP05	Poster e-Board 4	116
04.06.2017	13:45-15:15	04AP06	Poster e-Board 4	118
05.06.2017	08:30-10:00	04AP07	Poster e-Board 4	122
05.06.2017	10:15-11:45	04AP08	Poster e-Board 4	125

Learning Track 5 - Paediatric Anaesthesiology

03.06.2017	14:30-16:00	05AP01	Poster e-Board 2	129
04.06.2017	10:15-11:45	05AP02	Poster e-Board 2	131
04.06.2017	15:30-17:00	05AP03	Poster e-Board 2	133
05.06.2017	08:30-10:00	05AP04	Poster e-Board 2	136
05.06.2017	10:15-11:45	05AP05	Poster e-Board 2	139
05.06.2017	12:00-13:30	05AP06	Poster e-Board 2	140
05.06.2017	13:45-15:15	05AP07	Poster e-Board 2	143

Learning Track 6 - Neuroanaesthesiology

03.06.2017	12:30-14:00	06AP01	Poster e-Board 3	148
03.06.2017	14:30-16:00	06AP02	Poster e-Board 3	152
04.06.2017	08:30-10:00	06AP03	Poster e-Board 2	154
04.06.2017	10:15-11:45	06AP04	Poster e-Board 4	160
04.06.2017	12:00-13:30	06AP05	Poster e-Board 8	162
05.06.2017	08:30-10:00	06AP06	Poster e-Board 9	167

Learning Track 7 - Cardiac, Thoracic and Vascular Anaesthesiology

03.06.2017	10:30-12:00	07AP01	Poster e-Board 5	170
03.06.2017	12:30-14:00	07AP02	Poster e-Board 5	174
03.06.2017	14:30-16:00	07AP03	Poster e-Board 5	177
03.06.2017	16:30-18:00	07AP04	Poster e-Board 5	180
04.06.2017	08:30-10:00	07AP05	Poster e-Board 5	184
04.06.2017	10:15-11:45	07AP06	Poster e-Board 5	187
04.06.2017	12:00-13:30	07AP07	Poster e-Board 5	191
04.06.2017	13:45-15:15	07AP08	Poster e-Board 5	194
04.06.2017	15:30-17:00	07AP09	Poster e-Board 5	197
05.06.2017	08:30-10:00	07AP10	Poster e-Board 5	201
05.06.2017	10:15-11:45	07AP11	Poster e-Board 5	204
05.06.2017	12:00-13:30	07AP12	Poster e-Board 5	207

Learning Track 8 - Acute Pain Management

03.06.2017	14:30-16:00	08AP01	Poster e-Board 10	209
03.06.2017	16:30-18:00	08AP02	Poster e-Board 10	213
04.06.2017	08:30-10:00	08AP03	Poster e-Board 9	215
04.06.2017	10:15-11:45	08AP04	Poster e-Board 10	219
04.06.2017	15:30-17:00	08AP05	Poster e-Board 8	223
05.06.2017	10:15-11:45	08AP06	Poster e-Board 10	227
05.06.2017	13:45-15:15	08AP07	Poster e-Board 10	230

Learning Track 9 - Chronic Pain and Palliative Medicine

03.06.2017	10:30-12:00	09AP01	Poster e-Board 3	232
03.06.2017	16:30-18:00	09AP02	Poster e-Board 9	235
04.06.2017	12:00-13:30	09AP03	Poster e-Board 10	238
04.06.2017	15:30-17:00	09AP04	Poster e-Board 6	242
05.06.2017	08:30-10:00	09AP05	Poster e-Board 10	244

Learning Track 10 - Critical Emergency Medicine - Trauma and Resuscitation

03.06.2017	10:30-12:00	10AP01	Poster e-Board 6	248
03.06.2017	12:30-14:00	10AP02	Poster e-Board 10	251
04.06.2017	13:45-15:15	10AP03	Poster e-Board 10	253

Learning Track 11 - Respiration and Airway Management

03.06.2017	12:30-14:00	11AP01	Poster e-Board 6	257
03.06.2017	14:30-16:00	11AP02	Poster e-Board 6	260
04.06.2017	08:30-10:00	11AP03	Poster e-Board 6	264
04.06.2017	12:00-13:30	11AP04	Poster e-Board 6	267
04.06.2017	13:45-15:15	11AP05	Poster e-Board 6	271
05.06.2017	08:30-10:00	11AP06	Poster e-Board 6	274
05.06.2017	12:00-13:30	11AP07	Poster e-Board 6	277
05.06.2017	13:45-15:15	11AP08	Poster e-Board 6	281

Learning Track 12 - Transfusion, Haemostasis and Thrombosis

03.06.2017	10:30-12:00	12AP01	Poster e-Board 2	284
03.06.2017	12:30-14:00	12AP02	Poster e-Board 2	286
03.06.2017	16:30-18:00	12AP03	Poster e-Board 6	290
04.06.2017	15:30-17:00	12AP04	Poster e-Board 4	293
05.06.2017	12:00-13:30	12AP05	Poster e-Board 4	296

Learning Track 13 - Intensive Care Medicine

03.06.2017	10:30-12:00	13AP01	Poster e-Board 7	300
03.06.2017	12:30-14:00	13AP02	Poster e-Board 7	303
03.06.2017	14:30-16:00	13AP03	Poster e-Board 7	306
03.06.2017	16:30-18:00	13AP04	Poster e-Board 7	308
04.06.2017	08:30-10:00	13AP05	Poster e-Board 7	312
04.06.2017	10:15-11:45	13AP06	Poster e-Board 7	315
04.06.2017	12:00-13:30	13AP07	Poster e-Board 7	318
04.06.2017	13:45-15:15	13AP08	Poster e-Board 7	321
04.06.2017	15:30-17:00	13AP09	Poster e-Board 7	324
05.06.2017	08:30-10:00	13AP10	Poster e-Board 7	327
05.06.2017	10:15-11:45	13AP11	Poster e-Board 7	330
05.06.2017	12:00-13:30	13AP12	Poster e-Board 7	334
05.06.2017	13:45-15:15	13AP13	Poster e-Board 7	336

Learning Track 14 - Perioperative Medicine

03.06.2017	10:30-12:00	14AP01	Poster e-Board 8	339
03.06.2017	12:30-14:00	14AP02	Poster e-Board 8	343
03.06.2017	14:30-16:00	14AP03	Poster e-Board 8	346
03.06.2017	16:30-18:00	14AP04	Poster e-Board 8	349
04.06.2017	08:30-10:00	14AP05	Poster e-Board 8	353
04.06.2017	10:15-11:45	14AP06	Poster e-Board 8	357
04.06.2017	13:45-15:15	14AP07	Poster e-Board 8	360
05.06.2017	08:30-10:00	14AP08	Poster e-Board 8	364
05.06.2017	10:15-11:45	14AP09	Poster e-Board 8	367
05.06.2017	12:00-13:30	14AP10	Poster e-Board 8	371

Learning Track 15 - Geriatric Anaesthesiology

03.06.2017	10:30-12:00	15AP01	Poster e-Board 9	375
04.06.2017	10:15-11:45	15AP02	Poster e-Board 6	377

Learning Track 16 - Patient Safety

03.06.2017	12:30-14:00	16AP01	Poster e-Board 9	380
03.06.2017	14:30-16:00	16AP02	Poster e-Board 9	383
04.06.2017	10:15-11:45	16AP03	Poster e-Board 9	388
04.06.2017	12:00-13:30	16AP04	Poster e-Board 9	391
04.06.2017	13:45-15:15	16AP05	Poster e-Board 9	395
05.06.2017	10:15-11:45	16AP06	Poster e-Board 9	397
05.06.2017	12:00-13:30	16AP07	Poster e-Board 9	401
05.06.2017	13:45-15:15	16AP08	Poster e-Board 9	405

Learning Track 17 - Education

04.06.2017	15:30-17:00	17AP01	Poster e-Board 10	408
05.06.2017	12:00-13:30	17AP02	Poster e-Board 10	411

Subject Index	416
Author Index	424

The abstracts published in this Supplement have been typeset from electronic submissions and camera-ready copies prepared by the authors. Every effort has been made to reproduce faithfully the abstracts as submitted. These abstracts have been prepared in accordance with the requirements of the European Society of Anaesthesiology and have not been subjected to review nor editing by the European Journal of Anaesthesiology. However, no responsibility is assumed by the organisers or publisher for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of methods, products, instructions or ideas contained in the material herein. Because of the rapid advances in medical sciences, we recommend that independent verification of diagnoses and drug doses should be made.

Call for abstracts

**The ESA solicits the submission of abstracts for the
Euroanaesthesia 2018 Congress
Copenhagen, Denmark
2 - 4 June 2018**

**All abstracts must be submitted online via the ESA Website
www.esahq.org**

**The submission module will be available to submitters
November - December 2017**

Submission Conditions

When submitting your abstract, you will be prompted to accept the submission conditions that will be made available on the ESA website at least one month before the submission starts.

ESA Best Abstract Prize Competition (BAPC)

BAPC-1

Effectiveness of personalised physical training intervention (prehabilitation) in high-risk patients undergoing elective major abdominal surgery: a randomised controlled trial

Ubré M.¹, Risco R.¹, Barberan-Garcia A.², Roca J.², de Lacy A.M.³, Martínez-Pallí G.¹

¹Hospital Clínic of Barcelona, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain, ²Hospital Clínic de Barcelona, Department of Respiratory Medicine, Barcelona, Spain, ³Hospital Clínic of Barcelona, Dept of Surgery, Barcelona, Spain

Background: Based on the notion that preoperative functional reserve and cardiopulmonary fitness are predictors of postoperative morbidity, prehabilitation, defined as the process of enhancing the functional capacity of the individual, appears as highly promising preventive intervention to optimise preoperatively the patient's physical condition.

Goal of Study: To evaluate the effectiveness of a personalised preoperative prehabilitation intervention on postoperative outcomes in high-risk patients undergoing major abdominal surgery.

Methods: Randomised double-blind controlled trial. 144 high-risk patients (>70 yrs-old and/or ASA III/IV) planned for elective major abdominal surgery were randomised to prehabilitation program or standard preoperative care. The intervention encompassed three steps: i) motivational interview; ii) personalized program to promote physical activity; and, iii) supervised endurance training program. The main outcome of study was the proportion of patients suffering from postoperative complications. Secondary outcome variables were: i) hospital and intensive care unit (ICU) days of stay; and, ii) endurance time measured by a cycling constant work-rate exercise testing. Comparisons have been done using chi² or Fisher's exact tests for categorical variables, and Student's or Wilcoxon tests for numerical variables.

Results: 125 patients (prehabilitation group n=62 and control group n=63) (71 ± 10 yrs-old, 75% male) were finally included in the intention-to-treat analysis. At program discharge [duration 6 (2) weeks], the prehabilitation group showed an improvement of 135 (218) % in the endurance time (p<0.001) meanwhile the control group remained unchanged. The intervention group showed 20% less of patients with postoperative complications compared with controls (RR 0.5, 95% CI [0.3-0.8]; p=0.001). The intervention group showed shorter in-hospital stay, although no statistical significant showed up [8 (8) vs. 13 (20) days (p=0.078)]. A sensitivity analysis including only those patients admitted in the ICU (n=44), showed a significant reduction of ICU stay in the intervention group [3 (2) vs. 12 (20) days; p=0.046].

Conclusions: Prehabilitation is effective reducing morbidity rates in high-risk patients undergoing major abdominal surgery. Easier alternatives based on moderate-intensity exercise programs and the role of including nutritional and psychological support should be investigated in future research. Supported by ESA Grant.

BAPC-2

The effect of age on oral liquid oxycodone pharmacokinetics in pediatric patients

Sriswasdi P.¹, Dube C.², Pereira L.², Berde C.¹, Goobie S.¹

¹Boston Children's Hospital - Harvard Medical School, Dept of Anaesthesiology & Pain Medicine, Boston, United States, ²Boston Children's Hospital, Dept of Anaesthesiology & Pain Medicine, Boston, United States

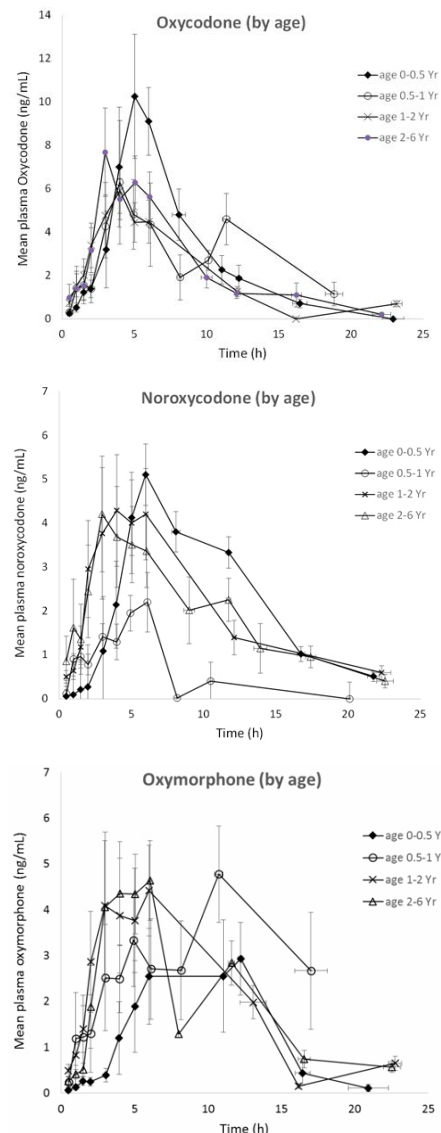
Background: Despite oxycodone marked pharmacokinetics (PK) variation among the children, we generally prescribe same oral oxycodone dose of 0.1 mg/kg. Most oxycodone (80%) breakdown by the enzyme cytochrome P450 (CYP) 3A4 into noroxycodone, up to 11% of the metabolism occurs through CYP2D6 into oxymorphone. The developmental changes and CYP3A4&2D6 maturation could potentially alter the bioavailability and metabolic pathways of oral oxycodone.

This suggests the need to rationalize oxycodone dosing regimens in children. Understanding oral oxycodone PK favors the safe and effective use of this

opioid in a wide variety of pediatric surgical patients. The aim of this study is to understand the effect of age on the PK of oxycodone and its metabolites (oxymorphone and noroxycodone).

Methods: This prospective study was approved by the hospital investigational review board. A total of 45 opioid-naïve children, aged 0-5 years have been consented. Blood samples were collected for the assay of oxycodone and its main metabolites, as well as for CYP3A4 and CYP2D6 genotyping. Oxycodone, oxymorphone, and noroxycodone levels at 10 time points were assayed using liquid chromatography- mass spectrometry (UPLC/MS/MS) and single-dose pharmacokinetics parameters were determined.

Results: The concentration data revealed a substantial interpatient PK. We divided patient into 4 age groups (n = 7; 0 - 0.5 years, n = 10; 0.5 - 1 years; n = 14, 1 - 2 years; n = 14, 2 - 6 years). Our data demonstrates that all 4 age groups appear to have same onset of absorption (2-5 hours). It seems that patients age 0 - 0.5 years old have higher peak plasma oxycodone concentration (mean ~10 ng/mL) compare to older patient age 2-6 years (mean ~8 ng/mL). All the groups except age 0.5-1 years group tend to have higher plasma noroxycodone level compare to oxymorphone level at the same time point.



[Plasma Oxycodone and its metabolites by age groups]

Conclusion: A trend appears to exist with age contributing to the variability of PK of oxycodone. This justifies the need for its consideration in the dosing optimization of Oxycodone based on individual age. It is possible that oxycodone metabolism might be different in pediatric population when compare to adult.

BAPC-3

Influence of xenon on pulmonary mechanics and tidal volume distribution

Schaefer M.S., Gauch J., Treschan T.A., Kienbaum P.
University Hospital Düsseldorf, Dept of Anaesthesiology,
Düsseldorf, Germany

Background: The anaesthetic xenon has organ protective properties [1] and might attenuate ventilator-induced lung injury in perioperative patients, as well as patients suffering from ARDS. Due to its high viscosity, xenon administration increases maximum airway pressure (P_{max}) in mechanically ventilated patients [2]. However, it is unknown whether barotrauma-associated transpulmonary pressure (P_{tp}), is also affected. Also, it is unclear to what extent xenon influences aeration of the lungs. Thus, we investigated the influence of xenon application on pulmonary mechanics, as well as distribution of tidal volume in mechanically ventilated patients.

Methods: Following ethical approval (#5161R, 29/09/15) and written informed consent, 20 patients with healthy lungs undergoing surgery with xenon-based general anaesthesia were included in this prospective observational study. During volume-controlled ventilation (8ml/kg predicted body weight, PEEP 5mbar), P_{tp} was calculated from plateau pressure and esophageal pressure (balloon catheter). Additionally, static (C_{stat}) and dynamic (C_{dyn}) lung compliance were measured. Further, using electrical impedance tomography (EIT, PulmoVista 500, Draeger), dorsoventral distribution of tidal volume was quantified (center of gravity index, CGI), and homogeneity of lung aeration was measured (inhomogeneity index, IH). Measurements were taken:

1. during awake spontaneous breathing (EIT-derived parameters);
2. after induction of general anaesthesia ($FiO_2 > 0.9$), as well as;
3. during subsequent inhalation of xenon ($FiXe 0.6$).

Statistics Paired t-test/Repeated measures ANOVA (Dunn sidak post-hoc test), $p < 0.05$.

Results: Xenon application had no impact on P_{tp} (1.5 ± 4 vs 2.0 ± 4 , $p = 0.15$). While xenon reduced C_{dyn} (33.4 ± 6 vs 30.8 ± 6 ml*mbar⁻¹, $p < 0.001$), C_{stat} remained unchanged (43.2 ± 9 vs 43.1 ± 10 ml*mbar⁻¹, $p = 0.98$).

The ventral shift of tidal volume and increased inhomogeneity of ventilation during mechanical ventilation (CGI 0.53 ± 0.03 vs 0.60 ± 0.03 , $p < 0.05$; HI 0.35 ± 0.02 vs 0.38 ± 0.03 , $p < 0.05$), remained unchanged by xenon (CGI 0.60 ± 0.03 , $p = 0.29$; HI 0.37 ± 0.03 , $p = 0.99$).

Conclusion: The xenon-associated increase in P_{max} is not associated with an increase in transpulmonary pressure, nor does xenon have any influence on tidal volume distribution or homogeneity of ventilation. Hence, we could not identify any mechanisms potentially harming the lungs during xenon administration.

1. Anesthesiology 2015;122:1312-26 [2] Acta Anaesth Scand 1999;43:1060-4

BAPC-4

Distribution of lung inflammation during assisted mechanical ventilation with titrated end-expiratory transpulmonary pressures in experimental acute respiratory distress syndrome

Kiss T.¹, Bluth T.¹, Braune A.¹, Vivona L.², Huhle R.¹,
Gama de Abreu M.¹

¹Dresden University, Dept of Anaesthesiology & Intensive Care, Dresden, Germany, ²University of Naples "Federico II", Dept of Anaesthesiology & Intensive Care, Naples, Italy

Background and Goal of Study: Evidence of lung injury due to spontaneous breathing activity (SB) in acute respiratory lung injury (ARDS) has been obtained during inappropriate settings of positive end-expiratory pressure (PEEP) and artificially high respiratory drive.

In this study, we investigated the correlation between a PEEP setting based on transpulmonary pressure (TP) and assisted SB in experimental severe adult respiratory distress syndrome (ARDS) in pigs.

We hypothesized that in severe ARDS, 12 hours of assisted SB with titrated positive end-expiratory TP levels in all lung regions, compared to a group with negative TP values, reduces lung inflammation measured by positron emission tomography (PET).

Material and methods: In 10 anesthetized pigs, custom-made intrapleural pressure sensors were placed in non-dependent and dependent lung regions by video-assisted thoracoscopy. Experimental ARDS was induced by saline lung lavage and injurious high tidal volume mechanical ventilation, until PaO_2

<100 mmHg. Following a lung recruitment maneuver and a decremental PEEP trial (26 cmH₂O - 6 cmH₂O) respiratory system mechanics and regional TP was determined for each PEEP level. The best-PEEP level was defined as the lowest PEEP yielding positive end-expiratory TP in all lung regions. Animals were then randomly assigned to airway pressure release ventilation with best PEEP + 4 cmH₂O (Group 1, "high PEEP", n=5) or best PEEP - 4 cmH₂O (Group 2, "low PEEP", n=5). SB was induced (proportion of SB being 40 to 60% of total minute ventilation) gas exchange, hemodynamics and lung mechanics were assessed for a time period of 12 hours. At the end lung inflammation was determined as the specific uptake rate (Ki,S) of Fluor-18-deoxyglucose using PET (Patlak model).

Results and Discussion: There were no significant differences in bodyweight and age. A two tailed Mann Whitney U test showed a significantly lower Ki,S for the high PEEP group (median 0.031, interquartile range 0.038-0.026) compared to the low PEEP group (median 0.048; interquartile range 0.070-0.039) ($p = 0.032$). Repeated measures two-way ANOVA showed no differences between groups for hemodynamics, gas exchange and lung mechanics. The best- PEEP level did not differ significantly from the PEEP level resulting in lowest lung elastance.

Conclusion: In a model of severe ARDS in pigs, assisted SB with titrated positive end-expiratory TP levels in all lung regions, attenuated lung inflammation.

BAPC-5

Effects of dexamethasone on cognitive dysfunction following cardiac surgery

Glumac S.¹, Kardum G.², Karanovic N.¹

¹University Hospital of Split, Dept of Anaesthesiology & Intensive Care, Split, Croatia, ²University of Split, Faculty of Humanities and Social Sciences, Department of Psychology, Split, Croatia

Background and Goal of Study: Postoperative cognitive dysfunction (POCD) is a very common complication after cardiac surgery. We focused on the role of the inflammatory response to a surgical procedure as a potential factor involved in the pathogenesis of POCD. The use of prophylactic corticosteroids to attenuate the inflammatory response was hypothesised to reduce the risk of POCD.

Material and Methods: This randomised, double-blind, placebo-controlled trial enrolled 169 patients undergoing elective cardiac surgery. Patients were randomised to receive a single IV bolus of 0.1 mg kg⁻¹ dexamethasone (n = 85) or placebo (n = 84) 10 hours before the surgery. The primary outcome measure was the incidence of POCD on the 6th day after surgery. We used a validated battery of eight neuropsychological tests to assess cognitive functions. POCD in an individual is defined as an Reliable Change Index equal to or less than -1.96 on at least one test.

We also evaluated the effect of dexamethasone on the incidence of systemic inflammatory response syndrome (SIRS), and postoperative C-reactive protein (CRP) levels.

Results and Discussion: The dexamethasone group showed statistically significant reductions in the incidence of POCD (RR, 0.43; 95% CI, 0.21 to 0.89; $P = 0.02$), the incidence of SIRS (30.0% vs. 58.0%, $P < 0.001$), and postoperative CRP levels ($P < 0.001$). At the 6th day of follow-up, 9 of the 80 patients in the dexamethasone group (11.3%) and 21 of the 81 patients in the placebo group (25.9%) fulfilled the criteria for POCD. Postoperative CRP levels are presented in Table.

Contrary to the findings of Ottens *et al.* our study found a beneficial effect of preoperative administration of dexamethasone on the incidence of POCD. Because corticosteroids may adversely affect cognitive function and to reduce inflammatory response in time, only a single low-dose of dexamethasone was used 10 hours before the surgery.

	Dexamethasone group			Placebo group		
Serum biomarker (mg/L)	POD 1	POD 2	POD 3	POD 1	POD 2	POD 3
CRP level	53.6 (29.3)	176.6 (66.1)	220.7 (69.0)	87.9 (38.6)	241.8 (60.4)	255.8 (63.6)

[CRP levels in the dexamethasone and placebo groups]

Conclusion: Preoperative administration of dexamethasone reduced the inflammatory response and therefore decreased the risk of early POCD after cardiac surgery.

BAPC-6

Functional connectivity modulations in resting state and offset analgesia in chronic pain patients: an fMRI study

Li T., Ikeda E., Kobinata H., Zhang S., Makita K., Kurata J.
Tokyo Medical and Dental University, Dept of Anaesthesiology,
Tokyo, Japan

Background and Goal of Study: Chronic pain frequently lacks diagnostic peripheral pathology, but poses significant detrimental effects on cognition and quality of life, which implies possible cerebral dysfunction. We used functional magnetic resonance imaging (fMRI) to investigate dynamic alterations in cerebral networks in a resting and task state, in an attempt to objectively measure chronic pain.

We specifically examined modulation of neuronal connectivity by offset analgesia, a disproportionately large reduction in pain perception after a brief increment of noxious stimulus.

Materials and Methods: After IRB approval and informed consent, we recruited 16 right-handed chronic pain patients (CP: mean age 42.1 yr, 9 females) and age-, gender-matched 16 healthy controls (HC: mean age 42.1 yr, 8 females). Psychophysical measurements were made including painDETECT,

short-form McGill Pain Questionnaire, Pain Catastrophizing Scale, and Beck Depression Inventory. Noxious thermal stimuli were given on the left volar forearm using a Peltier-type thermal stimulator (PATHWAY, Medoc, Israel) while fMRI were performed on a 3 T MRI scanner (GE Healthcare, UK). An experimental paradigm included 3 offset analgesia ("OA": 46-47-46 °C) and 6 sham blocks (3 "Constant" and 3 "Short"). Next, 5-min resting-state fMRI were performed. We analyzed the fMRI data sets with SPM12 (Wellcome Trust Centre for Neuroimaging, UK) and CONN Toolbox to examine functional connectivity among predetermined regions-of-interest. CP and HC were compared in different conditions and states including rest, OA, Constant, and Short.

Results: Both CP and HC groups showed comparable functional connectivity (FC) within the default mode network areas during resting state ($P_{FDR} < 0.05$). Comparing OA and Constant, CP group showed decreased FC between: periaqueductal gray and right hippocampus; nucleus accumbens and posterior cingulate cortex; and dorsolateral prefrontal cortex and palladium. OA and Short results were similar, but increased FC between periaqueductal gray and anterior cingulate gyrus ($P < 0.05$).

Conclusion and Discussion: Compared to HC, CP patients showed similar FC during resting state, but modulated FC in brain areas concerned with descending pain modulation during OA. Therefore, we hypothesize that adaptive functional network changes in endogenous pain inhibition might contribute to pain chronification.

General Anaesthesiology

01AP01-1

Comparison of 6% hydroxyethyl starch (6% HES130/0.4/9) and 5% albumin on volume therapy, complications and glycolalcalyx degradation during major abdominal surgery

Suzuki T.¹, Kurihara I.¹, Miyao H.¹, Koyama K.², Katuo T.¹
¹Saitama Medical Center, Saitama Medical University, Dept of Anaesthesiology, Kawagoe, Japan, ²Saitama Medical Center, Saitama Medical University, Dept of Anaesthesiology & Intensive Care, Kawagoe, Japan

Background and Goal of Study: Volume therapy with hydroxyethyl starch has been criticized by renal impairment especially in intensive care patients. The hypothesis of this study was that 6% hydroxyethyl starch 130/0.4/9 (HES) was equally safe and effective to 5% albumin (ALB) on volume therapy during major abdominal surgery.

Materials and Methods: The present study was a single center, open-labeled randomized trial approved by institutional ethical committee. We randomly assigned 50 patients with hepatic or pancreatic surgery to HES group (n = 25) and ALB group (n = 25). Patients were anesthetized by general anesthesia with thoracic epidural block. Goal-directed fluid therapy with a FloTrac/Vigileo™ system was performed with a following algorithm. If stroke volume variance (SVV) >10%, or stroke volume index (SVI) <35 ml/m², colloid(250 ml) was infused for 15 minutes. If the rise of SVI <10% of the previous value and mean blood pressure (MBP) <55 mmHg, norepinephrine (0.05-0.2 microgram/kg/min) was continuously infused.

	HES group (n=25)	ALB group (n=25)	P value
Colloid (ml)	1750: 1500-2100	1500: 1500-2000	0.13
Crystalloid (ml)	1800: 1500-2200	1500: 1500-2000	0.74
Urine output (ml)	720: 470-1065	440: 310-560	<0.01
Blood loss (ml)	615: 440-1635	750: 500-1320	0.86
Transfusion (ml)			
RBC	0: 0-280	0: 0-0	0.29
FFP	0: 0-240	0: 0-0	0.16
ScvO ₂ (%)	85: 79-88	85: 79-88	0.81
Lactate (mmol/L)	2.3: 0.9-3.1	1.8: 0.9-2.5	0.23
Cr (mg/dl)	0.67: 0.57-0.87	0.73: 0.65-0.93	0.29
PT-INR	1.33: 1.27-1.41	1.27: 1.21-1.41	0.22
Platelet (x 10 ⁴)	15.7: 13.4-20.4	18.1: 15.5-20.8	0.24
Heparan sulfate (μg/ml)	1: 0.8-1.1	1.1: 0.8-1.2	0.51
Syndecan-1 (ng/ml)	0.8: 0.5-2.6	2: 0.8-2.1	0.97

Data were obtained at the end of surgery except creatinine (one day after surgery) and presented as median: 25 - 75 percentile.

[Table]

The infusion rate of Ringer's acetate solution was slightly reduced but not controlled. Total volume of infusion and transfusions, urine output, blood loss, central venous oxygen saturation (ScvO₂), lactate, renal function, coagulation status, the biomarkers of glycolalcalyx (heparan sulfate and syndecan-1) were assessed in the two groups. Mortality and morbidity (eg. renal replacement therapy: RRT) were assessed during 28 days after surgery. Statistical analysis was made by Mann-Whitney U test and statistical significance was designated as $P < 0.05$.

Results and Discussion: Table shows the results of the present study. There was no significant difference except urine output between the two groups. Mortality were zero, but one patient of HES group received RRT because of severe sepsis after surgery.

Conclusion(s): 6% HES 130/0.4/9 is as safe and useful as albumin when used as colloid volume therapy in major abdominal surgery.

01AP01-2

Comparison of anesthetic induction with and without beat-to-beat invasive arterial pressure monitoring

Kamnev S.¹, Sizov V.², Kovalerova N.², Abdulina L.¹, Subbotin V.¹
¹Moscow Clinical Scientific Center, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation, ²Vishnevsky Institute of Surgery, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation

Goal of Study: There is evidence that hemodynamic fluctuations have some relation to morbidity. Low mean blood pressure (BP) or dramatic decrease of mean BP during surgery correlate with cardiac adverse events. Thereby, rapid correction of BP and its maintenance in normal limits is crucial. We decided to test whether applying of invasive arterial BP monitoring before induction of anesthesia could improve hemodynamic fluctuations during induction of anesthesia.

Materials and Methods: Radial artery was cannulated in all patients. Noninvasive BP measurement applied at the other hand and were performed every minute. Capture of data was accomplished by VitalSignsCapture program via RS232 port. Frequency of data capturing was 5 sec, so we obtained a gross sample size for each patient. Next step patients were randomized into 2 groups. In the first group (NIBP) invasive BP measurement was hidden from anesthesiologist, so physician performed induction of anesthesia using only noninvasive BP measurement. In the second group (INV) both invasive and noninvasive BP data were uncovered for physician.

Data were captured from the beginning of the induction until 5 min after intubation.

A total of 37 patients undergoing cardiovascular and thoracic surgery were included: 21 in INV group and 16 in NIBP group. There were no difference between the groups in demographic data and comorbidities. All data present in median [interquartile range].

Results: Time before intubation was significant longer in INV group compared to NIBP group: 605 sec [540;700] and 497,5 sec [370;632,5], respectively ($p=0,04$); possibly, because anesthesiologist tried to control pressure before intubation.

In NIBP group there were 4 cases (25%) of critical hypotension (defined as mean BP <55 mmHg), compared to 0 in INV group ($p=0,028$). Duration of hypotension was 30 sec, 1 min 20 sec, 1 min 35 sec and 3 min 45 sec. Although difference between groups with respect to heart rate, systolic, diastolic, mean BP and ST segment changes were insignificant.

We conducted Bland-Altman comparing of invasive and non-invasive BP in each case and revealed that non-invasive BP measurement overestimated invasive BP in low ranges and underestimated it in high ranges even if measurement was performed every minute.

Conclusion: Invasive arterial BP monitoring improves hemodynamic fluctuations during anesthesia induction and prevents from critical hypotension.

01AP01-3

Error grid analysis in arterial pressure method comparison studies

Saugel B.¹, Grothe O.², Wagner J.Y.¹

¹University Medical Center Hamburg-Eppendorf, Dept of Anaesthesiology & Intensive Care, Hamburg, Germany, ²Karlsruhe Institute of Technology, Analytics and Statistics, Karlsruhe, Germany

Background and Goal of Study: The measurement of arterial pressure (AP) is a key component of hemodynamic monitoring in anesthesiology. A variety of different innovative AP monitoring technologies became recently available. The decision to use these technologies must be based on their measurement performance in validation studies. These studies are AP method comparison studies comparing a new method ("test method") with a reference method; in these studies, different comparative statistical tests are used including correlation analysis, Bland-Altman analysis, and trending analysis. These tests provide information about the statistical agreement without adequately providing information about the clinical relevance of differences between the measurement methods. To overcome this problem, we, in this work, aimed to develop an "error grid analysis" for AP method comparison studies that allows illustrating the clinical relevance of measurement differences.

Materials and Methods: We constructed parametrized consensus error grids with calibrated risk zones derived from a survey among 25 specialists in anesthesiology and intensive care medicine. Differences between the two measurements are classified into 5 risk levels ranging from "no risk" to "dangerous risk", where the classification depends on both, the differences between the measurements and the measurements themselves.

Results and Discussion: Based on worked examples and data from the MIMIC II (Multiparameter Intelligent Monitoring in Intensive Care) database we show that the consensus error grids give information about the clinical relevance of AP measurement differences that cannot be obtained from Bland-Altman analysis and suggest how error grid analysis should be applied in AP method comparison studies.

Conclusions: We provide a calibrated error grid analysis allowing expanding and improving the critical evaluation of AP method comparison study results. Our approach also offers a framework on how to calibrate the error grid analysis plot for different clinical settings and patient populations.

01AP01-4

Five hemodynamic variables demonstrate that phenylephrine increases cardiac output by improving venous return in patients with anesthesia-induced hypotension

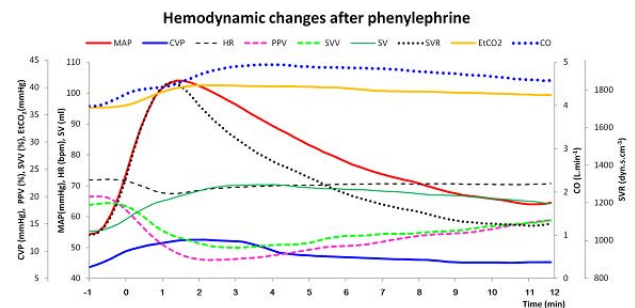
Maes J.-W.¹, Allaert S.¹, Pletinckx P.², Vanoverschelde H.¹, Scheeren T.³, Kalmar A.¹

¹Maria Middelaers Hospital, Dept of Anaesthesiology & Intensive Care, Gent, Belgium, ²Maria Middelaers Hospital, Dept of Surgery, Gent, Belgium, ³University of Groningen, University Medical Center Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background: Induction of general anesthesia regularly induces arterial hypotension, which is often treated with phenylephrine. As a pure α -agonist, phenylephrine is conventionally thought to increase afterload but not cardiac preload. The aim of this study is to describe the initial time course of the effects of phenylephrine on various hemodynamic variables, and to evaluate whether phenylephrine could be beneficial for preload optimisation as well.

Methods: After IRB approval and written IC, 26 patients scheduled for sigmoidectomy were included. MAP, HR, EtCO₂, CVP, SV, CO, PPV, SVV and SVR were recorded continuously. All patients were ventilated in volume control mode with a tidal volume of 8 ml/kg. After induction of Target Controlled propofol/remifentanyl anesthesia, when the MAP dropped below 80% of baseline value for >3 minutes in the subsequent period without surgical stimuli, phenylephrine 2 μ g/kg was administered. The averaged curves of the investigated variables were calculated and the absolute values at the moment before administration of phenylephrine (T₀) and 5 and 10 minutes thereafter were compared. Significant changes from T₀ were assessed using a paired T-test ($P<5\%$).

Results and Discussion: The MAP, SV, CO, CVP and EtCO₂ increased by 62%, 28%, 26%, 33% and 11%, respectively, while PPV and SVV dropped by 40% and 54%, respectively. The initial increase in MAP is perfectly aligned with the increase in SVR, which is expected based on the arterial α -effect. Both curves, however, decouple after 120 seconds. Together with the changes in PPV, CVP, EtCO₂ and CO, this comprises five independent indices of improved venous return following phenylephrine administration.



[Evolution of the hemodynamic variables]

	T ₀	T ₅	T ₁₀
MAP (mmHg)	54 (8)	88 (16)*	67 (12)*
HR (bpm)	72 (10)	70 (12)*	70 (11)*
EtCO ₂ (mmHg)	38 (4)	42 (5)*	40 (5)*
CVP (mmHg)	8 (5)	11 (6)*	9 (5)*
CO (L.min ⁻¹)	3.92 (0.87)	4.94 (1.2)*	4.71 (1.23)*
SV (ml)	55 (10)	70 (14)*	67 (14)*
PPV (%)	20 (7)	9 (5)*	13 (5)*
SVV (%)	19 (3)	11 (6)*	14 (6)*
SVR (dyn.s.cm ⁻⁵)	1035 (305)	1421 (499)*	1103 (350)*

[Mean (SD) evolution of the hemodynamic indices]

Conclusion: In patients with anesthesia-induced hypotension, phenylephrine increases the cardiac output by virtue of an increase in venous return.

01AP01-5**Goal-directed fluid therapy based on uncalibrated pulse contour analysis during transthoracic esophagectomy does not improve outcome**Bahlmann H.¹, Halldestam I.², Nilsson L.¹¹Linköping University, Dept of Anaesthesiology & Intensive Care, Linköping, Sweden, ²Linköping University, Dept of Surgery, Linköping, Sweden

Background and Goal of Study: Oesophagectomy is associated with significant postoperative morbidity. Goal-directed fluid therapy using the Vigileo/FloTrac® system has been reported to improve outcome after major abdominal surgery.^{1,2} Our hypothesis was that GDFT during oesophagectomy would improve postoperative outcome.

Materials and Methods: 64 patients scheduled for elective transthoracic oesophagectomy at two Swedish tertiary hospitals were randomised to either a control group following clinical routine, or an intervention group where stroke volume as measured by the FloTrac/Vigileo system was optimised using boluses of 3 ml/kg balanced tetrastarch throughout surgery, combined with a restricted background crystalloid infusion. If this did not result in a Cardiac Index ≥ 2.5 L/min/m², a dobutamine infusion was started. Vasoconstrictors were used to keep Mean Arterial Pressure >65 mmHg. Postoperative complications until postoperative day 30 were recorded using a pre-specified complication list and classified according to Clavien-Dindo.³

	Age	ASA I	ASA 2	ASA 3	BMI	Surgical time (min)	Blood loss (ml)	Colloid (ml)	Dobutamine n (%)
FloTrac (n=30)	65 (7)	6 (20%)	14 (47%)	10 (33%)	26 (4)	422 (95)	475 {250-800}	2190 (875) *	27 (90%) **
Control (n=29)	66 (10)	5 (17%)	19 (66%)	5 (17%)	26 (5)	416 (66)	400 {250-650}	1596 (759)	9 (31%)

Data are mean (SD), n (%) or median {IQR}. * P <0.05 compared to Control. ** P <0.001 compared to Control.

[Table 1. perioperative data]

Results and Discussion: 59 patients were available for analysis. Baseline data were comparable. There was no mortality during the study period. Patients in the intervention group received more colloid and more dobutamine. Crystalloid use was 2687 (735) ml in the intervention group and 2886 (580) ml in the control group (NS). There were no significant differences regarding intraoperative and postoperative fluid balance, number of complications or length of stay between the groups.

	Clavien-Dindo grade						length of stay (days)
	1	2	3a	3b	4a	4b	
FloTrac	28	37	27	17	5	11	20 {15-31}
Control	16	25	23	8	3	5	18 {15-25}

Data are n, mean (SD) or median {IQR}. There were no statistically significant differences.

[Table 2. postoperative outcome]

Conclusion: GDFT using FloTrac did not improve outcome after oesophagectomy in this restricted study. Further studies focusing on monitoring techniques as well as physiological goals are warranted.

References:

- Mayer J et al. Crit Care 2010; 14:e18.
- Benes J et al. Crit Care 2010; 14:e118.
- Dindo D, et al. Ann Surg 2004; 240:205-213.

Acknowledgements: Supported by departmental funds, Region Östergötland and Linköping Medical Society.

01AP01-6**Goal-directed fluid therapy on laparoscopic colorectal surgery within enhanced recovery after surgery program**

Resalt-Pereira M., Muñoz J.L., Cuquerella V., Molinés A., Bernat I., Pérez A.

General University Hospital of Elche, Dept of Anaesthesiology, Elche, Spain

Background: Enhanced recovery after surgery (ERAS) protocols implement peri-operative care to reduce the stress response to surgical aggression. A major aspect is fluid management, as fluid overload has been associated with increased morbidity and delayed hospital discharge. Intraoperative goal-directed fluid protocols (GDFT) have proved to reduce postoperative complications particularly in high risk patients. There is still controversy regarding whether GDFT protocols or just a zero-balance fluid therapy should be used during colorectal surgery.

Design: We conducted an observational retrospective study involving adults who were scheduled for laparoscopic colorectal surgery within an ERAS program from January 2014 to October 2016. Patients were divided into two groups according to the use of our hemodynamic optimization protocol for fluid administration during surgery (GDFT group) or the application of a zero-balance fluid therapy (ZB group).

We investigated the intraoperative amount of fluids disposed and the rate of complications such as surgical site infection (SSI), ileus, and anastomotic dehiscence up to the time of hospital discharge. Incidence of postoperative nausea and vomiting, intraoperative urine output, variability of the estimated glomerular filtration rate and length of hospital stay were additionally investigated.

Results: A total of 128 patients were included in this study; 43 in the ZB group and 85 in the GDFT group. The patient characteristics were similar in both groups.

Surgical site infection appeared in 17.3% of the ZB group and 6.3% of the GDFT group (p<0.05). Total of fluids administered was lower in the GDFT group (mean 1294 ml SD +/- 579.6) than in the ZB group (mean 1714.1 ml SD +/- 913.4) (p<0.005). The administration of crystalloids was lower in the GDFT group (mean 530.9 ml SD +/- 274.6 vs 1048.7 ml SD +/- 817.1) (p<0.001). The amount of dispensed colloids was similar in both groups.

Conclusion: Excess fluid administration is associated with SSI and ileus. Zero-balance therapies are normovolaemic therapies, but they do not provide us with a clear measurable target in which we can base fluid administration. GDFT protocols are based on optimization of cardiac output and allow us to set these fluid target more accurately. In our study, GDFT reduced the total amount of fluids disposed, with a lower incidence of postoperative complications. However, we recommend the performance of new randomized studies to confirm these results.

01AP01-7**Haemodynamic changes in Hyperthermic Isolated Limb Perfusion (HILP)**

Cvetkovic A., Vojinović Golubović V., Milanović M.

Institute for Oncology and Radiology, Dept of Anaesthesiology & Intensive Care, Belgrade, Serbia

Background and Goal of Study: HILP is limb salvage strategy, based on synergistic hyperthermia action and high cytostatic concentration on unresectable recurrent tumors, at the same time avoiding systemic cytostatic effect. There are few phases: vessels clumping, limb heat, cytostatic perfusion, exsanguination, unclamping. Despite limb isolation always exist communication between two circulations through collateral vessels. Unclamping of the isolated, exsanguinated limb may cause serious hypotension.

Materials and Methods: Chart review, 11 patients, HILP with melphalan, analysed hemodynamics: Heart Cardiac Output (HCO), Oxygen Delivery (DO₂), fluid requirements using goal directed fluid i.v. therapy. We used descriptive statistics: arithmetic mean, mediana, standard deviation, coefficient of variability, minimal and maximal value. All haemodynamic and lactate values are reported as mediana (Min-Max).

Results and Discussion: 63.6% females, average: age 59, BMI 27.94±6.63. ASA2 class: 90.9%, one patient ASA3. Cardio-comorbidities 72.73%. Average anesthesia time 272.3min±48.75. Induction: HCO 6.4 (3.1-8), 9.09% low values, DO₂ 820 (474-1154) 45.45% low values. Washout period: HCO 6 (3.2-8), 27.27% low values, DO₂ 671 (387-1104) 81.82% low values. Unclamping:

HCO 7(5-8) 18.18% high values, DO₂ 838 (607-1361), 9.09% low values. Vasoconstrictor was given in one patient at start, in washout phase for three patients. Infused solutions Med 5000 ml (3050-7000).

All patients received red blood cells, Med 4 (Min2 to Max5) doses. Lactats on induction 1.4 (0.95-2), washout 1.5 (0.9-2.36), 54.5% high values, unclumping 1,5 (0,8-2,4), 63.64% higher values. Percent of patients with HCO below normal range increased from 9.09% at anesthesia induction to 27.27% in washout. DO₂ was better in unclumping phase than at anesthesia induction and in most of the patients (81.82%) insufficient in washout period.

Conclusion(s): In this review washout was the most hemodynamic critical phase, due to exsanguination and systemic venous leak. In the phase of reconnection of circulations, haemodynamic changes were not so significant due to good goal directed fluid therapy.

References: 1. Beasley GM, Ross MI, Tyler DS: Future directions in regional treatment strategies for melanoma and sarcoma. *Int J Hyperthermia* 2008, 24:301-309.

Acknowledgements: We need bigger sample of patients for more reliable results.

01AP01-9

Risk of non-cardiac surgery after percutaneous coronary intervention with drug-eluting stents

Hur M., Kim W.H., Park S.-K., Jung H.S., Bahk J.-H., Kim M.K.
Seoul National University Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Elective non-cardiac surgery (NCS) should optimally be delayed one year after percutaneous coronary intervention (PCI) with drug-eluting stent (DES). Dual antiplatelet therapy, or at least aspirin is recommended to be continued considering the relative risk of bleeding and stent thrombosis especially during the first 4 to 6 weeks after DES implantation. However, these recommendations are based upon insufficient and conflicting evidences.

Materials and Methods: Risk factors for postoperative morbidity, including major adverse cardiovascular and cerebral event and respiratory, renal and other complications were investigated. Bleeding amounts were compared according to cessation of antiplatelet agent.

Results and Discussion: A total of 962 patients who underwent non-cardiac surgery after DES implantation were reviewed. Among them, 60 patients (6.2%) developed postoperative composite morbidities. Multivariable analysis showed that maintenance of aspirin until surgery was associated with lower incidence of postoperative morbidity (OR 0.24, 95% CI, 0.08 to 0.75, $p=0.014$). A time interval from PCI with DES to NCS of less than 30 days was significantly associated with postoperative morbidities (adjusted odds ratio [OR] 2.53, 95% confidence interval [CI], 1.32 to 4.85, $p<0.001$). Other intervals longer than 30 days were not associated with morbidity. Maintenance of antiplatelet medication was not associated with increased transfusion requirements or bleeding amount during surgery.

Conclusion(s): The incidence of postoperative morbidity was highest when NCS was performed within 30 days after DES implantation, but rate of morbidity did not differ thereafter. Continuation of aspirin before surgery was associated with decreased incidence of morbidity. Bleeding risk was not different according to antiplatelet agent continuation.

References:

1. Fleisher LA, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. *J Am Coll Cardiol* 2014; 64: e77-137
2. Wijeyesundera DN, et al. Risk of elective major noncardiac surgery after coronary stent insertion: a population-based study. *Circulation* 2012; 126: 1355-62
3. Barash P. Coronary stents: factors contributing to perioperative major adverse cardiovascular events. *Br J Anaesth* 2010; 105 Suppl 1

01AP01-11

Influence of mechanical ventilation on ECG-voltages in the frontal plane: 2 distinct patterns of the Brody-effect

Parys S., Wyffels P., Bouchez S., De Hert S., Wouters P.
Ghent University Hospital, Dept of Anaesthesiology, Ghent, Belgium

Background and Goal of Study: The R-wave amplitude of the QRS can change during mechanical ventilation (MV). These MV-induced amplitude changes in lead II have been described to correlate with Pulse Pressure Variation (PPV) ¹. It has been hypothesised that this is due to the Brody effect (e.g. changing intra-cardiac volumes influence the measured voltage of the ECG.)

The relationship between these R-amplitudes and individual Pulse Pressures (PP) has been conflicting, describing both negative and positive correlations^{2,3}.

The aim of this study is to describe the effect of MV on PP, the amplitude of the R wave vector (H) and its angle (alpha) in the frontal plane.

Materials and Methods: 9 patients undergoing CABG were included. MV was initiated under closed chest conditions, with a tidal volume of 8ml/kg, a respiratory frequency of 12/min and PEEP of 5 cm H₂O. During the observation period, all patients were monitored with a 6 lead ECG, invasive arterial line and pulse plethysmography.

During 4 consecutive respiratory cycles, Lead I and II of the ECG and the arterial pressure were simultaneously recorded.

H and alpha of the consecutive R waves were reconstructed and synchronized.

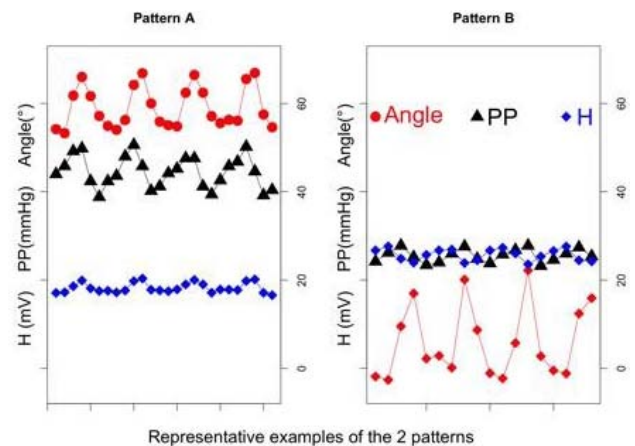
Results and Discussion: Two patterns were discerned; Pattern A: PP, alpha and H change in the same direction.

Pattern B: H changes in the opposite direction of PP and alpha. (See figure) The electrical axes (median,[range]) of the QRS for pattern A and Pattern B were 21° [6°-40°] and 58° [39°-60°] respectively (Wilcoxon rank sum test, $p=0.03$)

Conclusion(s): We found 2 patterns of MV induced changes in the electrical vector of the QRS complex. These 2 patterns relate to opposite relations between PP and H and seem to be determined by the mean electrical axis of the QRS complex. These findings provide a possible explanation for the previous seemingly contradictory findings and emphasize that MV induced changes in R amplitude are not interchangeable with PPV.

References:

1. Cannesson et al 2010
2. McManus et al 2006,³Soltner et al 2010



[Figure 1]

01AP02-1**Can Electromyography (EMG) be safer than Acceleromyography (AMG) to assess the neuromuscular block recovery with sugammadex?**

Okuyama K., Shunichi T., Hideyuki H., Makoto O.
Tokyo Women's Medical University, Dept of Anaesthesiology,
Tokyo, Japan

Background and Goal of Study: It has been reported that a Train of Four (TOF) Ratio recovers prior to T1 recovery using AMG during neuromuscular recovery with sugammadex (SUG)¹. The objective of the study was to evaluate EMG for use in patients recovering of muscle relaxants after administration of SUG, and to compare EMG to AMG.

Materials and Methods: After obtaining ethical approval, 10 patients undergoing surgery under general anaesthesia with rocuronium (ROC) were enrolled in this study. For neuromuscular monitoring, EMG (NeuroPack / MEB-9404; Nihon Kohden, Japan) and AMG (TOF Watch SX[®]; Nihon Kohden, Japan) were used. The ulnar nerve was stimulated by the TOF Watch. Then EMG monitored the adductor pollicis muscle (AP) and abductor digiti minimi muscle (AD), and AMG monitored AP. The data were compared within the 3 groups (Table 1). We defined the T1 recovery time (T1-RT) as the time from the administration of SUG (at the 25% recovery of T1) to the 90% recovery of T1, and the TOF recovery time (TOF-RT) as the 90% of the TOF ratio. The T1-RT was corrected using the last T1 value as its 100% value. The paired t-test and one-way ANOVA with post-hoc Turkey-Kramer test were used for analysis. $P < 0.05$ was considered significantly different.

Results: The T1-RT and the TOF-RT on the AP and AD were shown in Table 1.

	EMG (AP)	EMG (AD)	AMG (AP)
T1 90% recovery time (sec)	137±46*	138±39*	452±438
TOF ratio 90% recovery time (sec)	174±46#	173±56#	123±52#
P value	0.0047	0.0047	0.0364

[Table 1. T1-RT and TOF-RT (* $p < 0.05$ vs AMG)]

Discussion: It is known that a T1 value evaluates postsynaptic actions, therefore, it represents the muscle power. On the other hand, a TOF ratio assesses presynaptic actions and the release of acetylcholine. Suzuki et al. demonstrated that with AMG, the muscle power recovery might be inadequately assessed as being recovered because the TOF recovered faster than the T1¹. In our study with EMG, the T1-RT was significantly shorter than the TOR-RT. In contrast with AMG, the T1-RT was momentarily longer. Notably with AMG, the T1 recovered with a delay of 330 seconds of the TOF. It suggests that AMG may not be able to detect the muscle relaxant block recovery despite the fact that the muscle power has been recovered.

Conclusion: With EMG, the T1 recovered quicker than the TOF. Therefore, the EMG monitoring can be safer than AMG to assess the neuromuscular block recovery with SUG.

References: 1. Br J Anaesth 2011;106:823-6.

01AP02-2**Effects of magnesium chloride on rocuronium-induced neuromuscular blockade and sugammadex reversal in the isolated rat phrenic nerve-hemidiaphragm preparation**

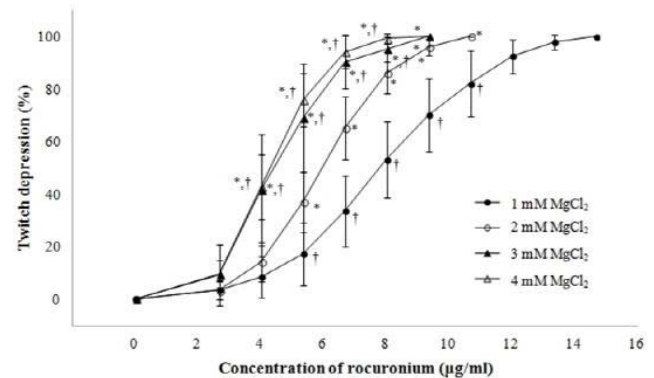
Sung T.-Y.¹, Cho C.-K.¹, Shin Y.S.², Yang H.S.³

¹Konyang University Hospital, Konyang University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Daejeon, Korea, Republic of, ²Chungnam National University School of Medicine, Dept of Anaesthesiology & Pain Medicine, Daejeon, Korea, Republic of, ³Asan Medical Center, College of Medicine, University of Ulsan, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Magnesium potentiates the effect of non-depolarizing muscle relaxants. However, studies which have been conducted by using magnesium chloride (MgCl₂) are rare. Sugammadex reverses neuromuscular block by steroidal nondepolarizing muscle relaxants. The purpose of this study is to investigate effects of MgCl₂ on rocuronium-induced neuromuscular blockade and its reversal by sugammadex.

Materials and Methods: Left phrenic nerve-hemidiaphragms from 40 Sprague-Dawley rats were randomly allocated to four groups (1 mM, 2 mM, 3 mM, and 4 mM MgCl₂ group, each n = 10). Rocuronium was administered cumulatively until the first twitch (T1) of train-of-four (TOF) completely disappeared for obtaining the effective concentration (EC) of rocuronium in each group. Thereafter, equimolar sugammadex was administered and recovery of T1 height and TOF ratio were measured for 30 minutes.

Results and Discussion: EC₅₀, EC₉₀, and EC₉₅ are significantly decreased, as each concentration of MgCl₂ is increased (all $P \leq 0.001$), except the comparison of 3 mM, and 4 mM MgCl₂ group.



[The concentration - response curves of rocuronium]

After administration of sugammadex, maximal TOF ratio (%) was decreased in 4 mM MgCl₂ group compared to 1 mM MgCl₂ group (89.6 ± 8.7 vs. 98.7 ± 8.9, $P = 0.049$). Time (sec) from sugammadex injection to achieving of maximal T1 was prolonged significantly in 4 mM MgCl₂ group compared to 1 and 2 mM MgCl₂ group (1483.9 ± 237.0 vs. 1039.0 ± 351.8 and 926.0 ± 278.1, $P = 0.002$ and 0.002, respectively).

Conclusion(s): The increase of MgCl₂ concentration reduces the ECs of rocuronium. In addition, equimolar sugammadex for administered rocuronium shows the limited efficacy as the change of MgCl₂ concentration.

References: Czarnetzki C, Tassonyi E, Lysakowski C, Elia N, Tramer MR. Efficacy of sugammadex for the reversal of moderate and deep rocuronium-induced neuromuscular block in patients pretreated with intravenous magnesium: a randomized controlled trial. *Anesthesiology* 2014; 121: 59-67

01AP02-3**Effects of MgSO₄ on neuromuscular blockade of rocuronium and sugammadex reversal in the isolated phrenic nerve-hemidiaphragm preparation of rats**

Yang H.S.¹, Cho C.-K.², Sung T.-Y.², Lee J.U.³

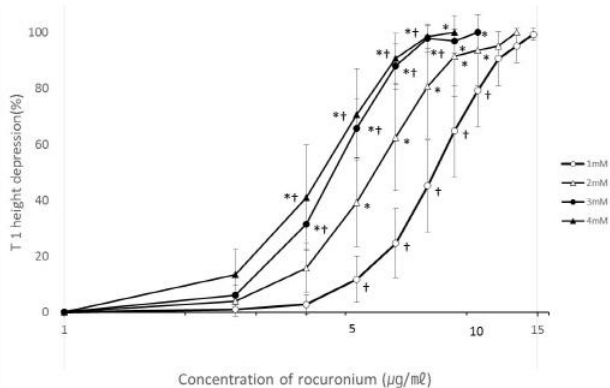
¹Asan Medical Center, College of Medicine, University of Ulsan, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Konyang University Hospital, Konyang University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Daejeon, Korea, Republic of, ³Chungnam National University School of Medicine, Dept of Anaesthesiology & Pain Medicine, Daejeon, Korea, Republic of

Background and Goal of Study: Perioperative magnesium sulphate (MgSO₄) use for analgesic, antiarrhythmic and obstetric purpose. The effects of increased MgSO₄ in clinical practice on rocuronium induced neuromuscular block and sugammadex reversal is not clearly quantified. This study was investigated the effect of MgSO₄ on neuromuscular blockade of rocuronium and sugammadex reversal in the isolated phrenic nerve-hemidiaphragm preparation of rats.

Materials and Methods: Rat phrenic nerve-hemidiaphragm preparations were isolated and randomly allocated 4 groups by MgSO₄ concentration [1mM, 2mM, 3mM, 4mM, N=10 in each group] in Krebs solution. TOFR and twitch height response were recorded mechanomyographically. The preparations were blocked by incremental dose of rocuronium (initial 200 µg + booster 100 µg in 75 ml bath) and dose-response curve with EC₅₀, EC₉₀, EC₉₅ of rocuronium in each group were calculated using a logistic model. For reversal, we used equimolar dose of sugammadex to administered rocuronium.

Recovery index, time to maximal twitch height and TOFR>0.9 after sugammadex reversal was obtained.

Results and Discussion: EC₅₀ of rocuronium didn't show difference in 4 groups. EC₅₀, EC₉₀, EC₉₅ of rocuronium were reduced significantly by the increased as MgSO₄ concentration. However, EC₅₀, EC₉₀, EC₉₅ of rocuronium were not different between 3mM and 4mM groups. Recovery index, time to maximal twitch height and TOF > 0.9 after sugammadex infusion was not different in all 4 groups.



[Dose response curve after rocuronium infusion]

Conclusion(s): Increase of MgSO₄ concentration (1mM to 3mM) enhances rocuronium induced neuromuscular block in rats' hemidiaphragm preparations. Increase of MgSO₄ concentration does not reduce reversal effect of equimolar dose of sugammadex to rocuronium in rats' hemidiaphragm preparation.

References: Bom A, Hope F, Rutherford S, Thomson K: Preclinical pharmacology of sugammadex. *J Crit Care* 2009; 24:29-35.

01AP02-4

Effects of neuromuscular presynaptic muscarinic M₁ receptor blockade on rocuronium-induced neuromuscular blockade in immobilized tibialis anterior muscles

Kim Y.B.¹, Lee S.², Choi H.R.³, In J.Y.⁴, Kwack H.J.¹, Yang H.-S.⁵
¹Gachon University Gil Medical Center, Dept of Anaesthesiology & Pain Medicine, Incheon, Korea, Republic of, ²Inje University, Sang-gye Paik Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ³Inje University, Seoul Paik Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ⁴Dong Gook University, Ilsan Hospital, Dept of Anaesthesiology & Pain Medicine, Ilsan, Korea, Republic of, ⁵Ulsan University, Seoul Asan Medical Center, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: In this study, we tested the hypothesis that acetylcholine (ACh) release modulation by muscarinic M₁ receptor in neuromuscular junction of the disused muscles may affect the tensions of the muscles during neuromuscular monitoring of rocuronium-induced neuromuscular block and compared to the normal muscles.

Materials and Methods: A total of 20 C57BL/6 (wildtype) and 10 α7 knock out (α7KO) mice were used in this experiment. As pre-experimental procedure, knee and ankle joints of right hind limbs were fixed by needle pinning at 90° flexed position. These mice were raised for 2 wks at the environment with diurnal rhythm and food and water ad libitum. As a main experiment, both tendon of tibialis anterior (TA) muscles were obtained and muscle tensions were recorded while dose-responses of rocuronium were measured three times at the same mice by serial administration of pirenzepine dose of 0, 0.001, and 0.01 µg/g. We considered statistical significance as the p<0.05.

Results and Discussion: There were no statistical differences on the body weight between wildtype and α7KO group. Weight losses were observed after 2wks of immobilization in both group and decrease of mass of TA muscles at immobilized side were observed compared with those of contralateral non-immobilized side. Tension depression of TA muscles at immobilized side of α7KO group were significantly rapid than those of wildtype group, but these differences were diminished after administration of pirenzepine. There were

no statistically significant differences on Train-of-Four fade and tension depression between different pirenzepine doses at the same side in the group.

		Wildtype			α7KO		
		control	immobilize	p-value	control	Immobilize	p-value
Initial	ED50	1.234 (0.24)	2.395 (0.48)	0.01	0.972 (0.23)	1.521 (0.49)	0.01
	ED95	1.790 (0.46)	3.669 (0.68)	0.01	1.318 (0.33)	2.154 (0.80)	0.01
PZP1	ED50	1.148 (0.42)	2.239 (0.83)	0.07	0.909 (0.19)	1.612 (0.61)	0.01
	ED95	1.608 (0.60)	3.298 (1.40)	0.09	1.259 (0.26)	2.289 (0.92)	0.02
PZP2	ED50	1.497 (0.55)	2.925 (1.48)	0.09	0.831 (0.10)	1.504 (0.40)	0.02
	ED95	2.065 (0.82)	4.053 (2.04)	0.12	1.153 (0.14)	2.158 (0.82)	0.03

[Table 1 (Data are expressed as Mean (SD))]

Conclusion(s): Tension depression may become more rapid in the α7 nAChR-expressed disused muscles by decreased ACh release on neuronal firing by blockade of facilitatory M1 mAChR.

Reference(s):

- Lee S et al. *Anesthesiology* 2014; 120: 76-85.
- Oliveira L et al. *Eur J Neurosci.* 2002; 15: 1728-36.

01AP02-5

Rapid injection of rocuronium bromide with saline dilution provides faster onset of neuromuscular blockade and reduction of individual differences. Randomized controlled trial of factors on the onset time of non-depolarizing muscle relaxants

Myoga Y., Kato H., Muto K., Kume K., Manabe H.

Kitakyushu Municipal Medical Center, Dept of Anaesthesiology & Pain Medicine, Kitakyushu, Japan

Background and Goal of Study: Shortening the onset time of neuromuscular blocking drugs is important in rapid sequence induction (RSI). Many anaesthetists use rocuronium (Roc.) in place of succinylcholine for RSI. High dose Roc.(0.9 or 1.2mg/kg) is often used for RSI, but studies on Roc. onset have revealed individual differences such as large standard deviation (SD) or variations in the distribution. Therefore, It is difficult to achieve rapid onset in all cases. We hypothesized that rapid injection of Roc. diluted with saline would shorten the onset time and reduce the individual differences. Further, we investigated the factors on the onset time and which of degrees.

Materials and Methods: Eighty-two patients randomly allocated to the control group or the other three groups, according to the dose of Roc. and the presence of saline dilution. Anaesthesia was induced with narcotic analgesic and propofol, and Roc. was administrated as follows with 5 seconds: Roc. 0.9mg/kg (Group A=Control, n=19), Roc. 0.9mg/kg in 25ml saline (Group B, n=21), Roc.1.2mg/kg (Group C, n=20), Roc. 1.2mg/kg in 25ml saline (Group D, n=20). Neuromuscular blockade was assessed using acceleromyography at the adductor pollicis muscle with train-of-four (TOF) stimulation. Onset time was measured as the time from the start of Roc. injection until TOF count 0. Multiple regression analysis was used to investigate to identify clinical characteristics associated with onset time. Significance was designed at p<0.05.

Results and Discussion: The measured onset time was significantly shorter in the Group D than the others (Median90s (86-109), p<0.05), and Individual differences were reduced in the Group D (IQR=22.5, SD=21). Rapid injection with saline shorten the onset time by 20 seconds, conversely the older the age get, the slower the time of onset (p=0.01, p=0.03). Scatter plot of 80 cases formed three clusters at regular intervals about 60 seconds, onset is in proportion to the number of times of circulation not to the time. In other words, Onset is tend to express in a staircase pattern.

Conclusion: Rapid injection of Roc. in 25ml saline provided faster onset of neuromuscular blockade and reduction of individual differences. Age and rapid injection with saline were Independent factors of Roc. onset time. It is not clear that what is proper dose of Roc.

References: Saline Flush After Rocuronium Bolus Reduces Onset Time and Prolongs Duration of Effect. Ishigaki S. *Anesth Analg.* 2016 Mar;122(3):706-11.

01AP02-6**Reversal with sugammadex for rocuronium-induced deep neuromuscular block after pretreatment of magnesium sulfate in rabbits**Kim K.S.¹, Kang W.S.²¹Hanyang University, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Konkuk University, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Magnesium sulfate (MgSO₄) has been used in the treatment of pre-eclampsia, hypertension and arrhythmia. Magnesium enhances the neuromuscular block of rocuronium. This study has been conducted to evaluate the reversal efficacy of sugammadex from deep rocuronium-induced neuromuscular block during consistent pretreatment of MgSO₄ in rabbits.

Materials and Methods: Twenty eight rabbits were randomly assigned to four groups; control group: normal saline 5 ml/kg IV for 20 min; study groups: 50% MgSO₄ 150 - 200 mg/kg bolus and 25 mg/kg/h continuously IV. The onset and time course after rocuronium 0.6 mg/kg, and recovery course after reversal of sugammadex 2 mg (2 mg group), 4 mg (4 mg group and control group) and 8 mg (8 mg group), respectively, at 1 - 2 twitches of post-tetanic count (PTC) were evaluated.

Results and Discussion: The mean serum concentration of magnesium was maintained more than 2 mmol/L in the study groups, and total dose of MgSO₄ was more than 590 mg. The onset time was more rapid, and the recovery time until 1 - 2 twitches of PTC in the study groups after rocuronium was prolonged compared to control group (P<0.001). The recovery time until train of four (TOF) ratio (T4/T1) at 90%, first twitch of TOF at 75% (T1(75)), and 95% (T1(95)) in other groups was shorter than 2 mg group (P<0.001). There was no difference in the recovery time among control group, 4 mg group and 8 mg group.

Conclusion(s): The reversal of sugammadex from deep rocuronium-induced neuromuscular block during large pretreatment of MgSO₄ was not affected by MgSO₄. But we should consider that the reversal effect of sugammadex was different depending on the dose.

01AP02-7**We have everything to succeed, but we fail to prevent residual neuromuscular blockade**Bonofiglio F.C.¹, Domenech G.¹, Kampel M.A.¹, Terrasa S.A.², Mc Loughlin S.¹¹Hospital Italiano de Buenos Aires, Dept of Anaesthesiology, Ciudad Autónoma de Buenos Aires, Argentina, ²Hospital Italiano de Buenos Aires, Research Department, Ciudad Autónoma de Buenos Aires, Argentina

Background and Goal of Study: Despite its high morbidity, the risk of residual neuromuscular blockade (RNB) during the peri operative period is still underestimated. We decided to describe the incidence and risk factors for RNB at our tertiary referral hospital.

Materials and Methods: We retrospectively studied 240 consecutive patients that received nondepolarizing neuromuscular blocking agents (NDB) from June to December 2015. Data regarding patient history and possible risk factors were collected from the electronic medical record. RNB was defined as a train-of-four ratio (TOFR) <0.9 at arrival postanesthesia care unit. Risk factors included in the multivariable analysis were: intra operative neuromuscular monitoring, use of reversal agents, choice of NDB, total dose of blocking agent as ED95.h⁻¹ and time since last NDB dose. Fischer's exact test or chi-square test were run for the comparison of categorical variables.

Results and Discussion: Total RNB incidence was 24% (58/240). Only one patient with intra operative neuromuscular monitoring (1/63) presented RNB as compared with (57/177) of the non monitored group (2% vs. 31%, respectively; p<0.001).

Multivariable regression analysis showed that ED95.h⁻¹ was associated with a fivefold increase of RNB risk (Table). The use of intraoperative monitoring was a strong protective factor for RNB, followed by rocuronium and sugammadex use. Intra operative reversal agents were used in 75 patients. Despite its use, RNB was present in 25% of the non monitored patients. No patient in the monitored group developed RNB (6/24 vs. 0/51, respectively; p=0.003).

	ODDS RATIO	95% CI	p value
Intraoperative monitoring	0.02	(0.002-0.259)	0.002
Reversal agent neostigmine	0.64	(0.100-4.106)	0.640
Reversal agent sugammadex	0.07	(0.014-0.350)	0.001
Total dose NDB ED95.h ⁻¹	5.21	(1.618-16.759)	0.006
Time since last NDB dose (every 10 minutes)	0.94	(0.865-1.026)	0.173
NDB vecuronium	1 (ref)	NA	NA
NDB atracurium	0.37	(0.060-2.293)	0.287
NDB rocuronium	0.41	(0.189-0.903)	0.027
BMI	1.07	(0.996-1.153)	0.064

[Risk factors for residual neuromuscular blockade.]

Conclusions: Intraoperative neuromuscular monitoring played a key role in preventing followed by rocuronium and sugammadex use. Total dose of blocking agent was a strong predictor of RNB risk.

01AP02-8**The injection of nefopam can influence the onset time and recovery profiles of rocuronium. A prospective, double-blinded, randomized control study**

Kim D.J., Kim S.H., So K.Y.

Chosun University Medical School, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Neuromuscular blockers (NMBs) can have drug interaction with a number of drugs. We hypothesized that nefopam also may induce the drug interaction with NMBs, because it was developed as a muscle relaxant. We investigated whether nefopam influence the onset and recovery profiles of rocuronium in patients who scheduled elective surgery.

Materials and Methods: After Institutional Review Board approval, patients, aged between 20 to 65 years old, ASA I or II, were enrolled. We excluded the patients with medication of furosemide, magnesium, cephalosporin, anti-convulsants, antidepressant or other analgesics, with neuromuscular disease and glaucoma. Thirty three patients were randomly allocated to one of two groups. Intravenous normal saline 100 ml with (group N, n=17) or without (group C, n=16) nefopam (20 mg) was infused at 100 ml/h 1 hour before surgery. Anesthesia was induced with 3.0 ng/ml of remifentanyl and 3 µg/ml of propofol with a target site concentration infusion device. And then, neuromuscular function was assessed by acceleromyography of the adductor pollicis muscle with the Train-of-Four (TOF) by using TOF-Watch®. After the supramaximal current is obtained, all patients were intubated with rocuronium (0.6 mg/kg). We recorded the onset time, clinical duration, recovery index, and total recovery time. All measured values are presented as mean (95% confidential intervals). The statistical analysis was performed by t-test, or the χ² test. P<0.05 was considered to indicate statistical significance.

Results and Discussion: There were no significant differences in demographic data between groups. The total recovery time (min) was significantly different between group C [56.8(48.3-65.3)] and N [69.4(60-78.9)] (P = 0.044).

The onset time was not significantly different between group C [135.1(116.9-153.3) s] and N [111.4(86.2-136.6) s] (P = 0.119). The clinical duration (min) was not significantly different between group C [22.4(12.2-32.6)] and N [34.9(24.0-45.8)] (P = 0.087).

The recovery index (min) was not significantly different between group C [15.7(9.9-21.5)] and N [13.9(11.5-16.2)] (P = 0.331).

Conclusion: Nefopam delayed the total recovery time of rocuronium-induced neuromuscular block even though it was non-significantly hastened the onset time. However, nefopam can induce the drug- interaction with rocuronium if enough patients were enrolled because our results showed less power (0.29) under effect size 0.5.

01AP02-10

Effect of temperature on the response to sugammadex

Kim H.¹, Kim Y.², Yang H.¹

¹Asan Medical Center, College of Medicine, University of Ulsan, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Gachon University Gil Medical Center, Dept of Anaesthesiology & Pain Medicine, Incheon, Korea, Republic of

Background and Goal of Study: During the perioperative period, hypothermia often occurs even after the efforts to keep the patient in normothermia. It is shown that hypothermia affects the muscle contraction and response to neuromuscular blocking agents. However, little is known about the effect of the change of the core body temperature on the response to sugammadex. Therefore, we aimed to evaluate the impact of the temperature on the effect of sugammadex.

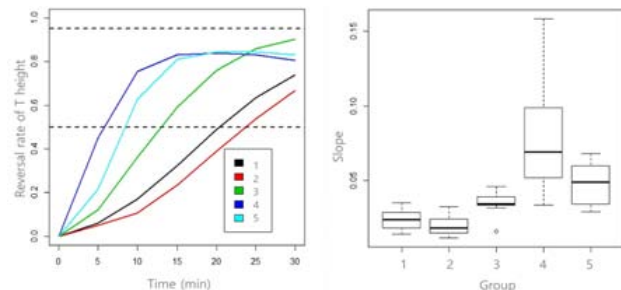
Materials and Methods: Phrenic nerve-hemidiaphragm preparations of rats were randomly allocated into five groups; Group 1, 2°C; Group 2, 28°C; Group 3, 32°C; Group 4, 36°C; Group 5, 38°C. The preparations were stimulated with train-of-four (TOF). After stabilization period for 30 minutes, rocuronium was administered until the muscle contraction of hemidiaphragm was completely blocked. After 10 minutes, rocuronium-equimolar dose of sugammadex was administered. Recovery of TOF ratio and T1 twitch-height was evaluated. T1 recovery index was also compared among the groups.

Results and Discussion: A total of 30 phrenic nerve-hemidiaphragm preparations were included in the analysis. There was no significant difference among the baseline characteristics of 5 groups. T1 recovery index of each group showed significant differences (Group 1, 756.3±158.7; Group 2, 856±135.3; Group 3, 574.3±91.5; Group 4, 283.0±150.1; Group 5, 362.5±116.0; P<0.001).

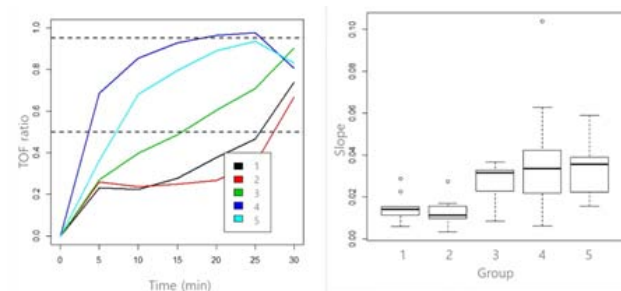
Conclusion(s): In this in vitro study, the response to sugammadex was delayed in hypothermic groups. Mild hyperthermia did not show any significant effect on the response to sugammadex.

References:

1. The influence of mild hypothermia on reversal of rocuronium-induced deep neuromuscular block with sugammadex. Lee HJ, Kim KS, Jeong JS, Kim KN, Lee BC. BMC Anesthesiol. 2015 Jan 21;15:7. doi: 10.1186/1471-2253-15-7.



[Figure 1. Reversal by sugammadex (T1 twitch-height)]



[Figure 2. Reversal by sugammadex (TOF ratio)]

01AP03-1

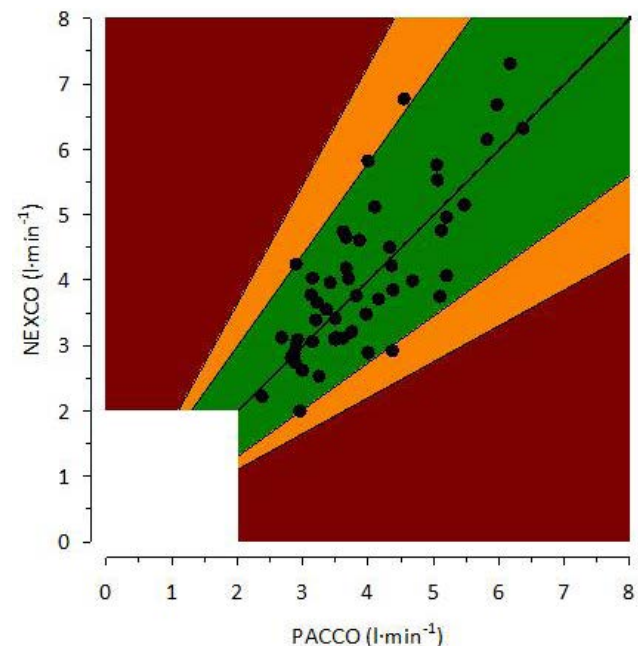
Accuracy of ^oNexfin CO-trek cardiac output versus cold-bolus thermodilution cardiac outputSpurna Weiland N.H.¹, Boer C.², Mitrev L.³, Hollmann M.W.¹, Preckel B.¹

¹Academic Medical Center, University of Amsterdam, Dept of Anaesthesiology, Amsterdam Zuidoost, Netherlands, ²VU University Medical Center, Dept of Anaesthesiology, Amsterdam, Netherlands, ³Cooper University Hospital, Rowan University, Dept of Anaesthesiology, Camden, United States

Background and Goal of the Study: It remains matter of debate whether uncalibrated, non-invasive, cardiac output (CO) measurement with ^oNexfin (NEXCO) can substitute gold-standard, invasive, pulmonary artery catheter (PAC) derived cold-bolus thermodilution cardiac output (PACCO). We tested the limits of agreement between NEXCO and PACCO in the largest sample size of patients to date.

Materials and Methods: We included 55 patients undergoing cardiac surgery with the use of a PAC in three academic hospitals and measured PACCO and NEXCO simultaneously after induction of anaesthesia, before the onset of cardiopulmonary bypass. Main outcome measures were Pearson correlation and Bland-Altman analysis of bias and precision. In addition, we propose a Clarke error grid as a novel way of presenting agreement between two CO monitors. The green area represents <30% error as proposed by Critchley and Critchley,⁽¹⁾ the orange zone represents 30-45% error as proposed by Peyton and colleagues⁽²⁾ and the red area represents >45% error. All data is mean (SD) or n (%).

Results and Discussion: Fifty-one measurement pairs were available for analysis. Mean NEXCO was 4.04 (1.24) l·min⁻¹ and mean PACCO was 3.96 (0.99) l·min⁻¹ (p=0.423) with a bias of 0.09 (0.76) l·min⁻¹ and limits of agreement between 1.58 and -1.40 l·min⁻¹. Pearson's correlation coefficient was 0.788 (p <0.001) and percentage error was 36.9%. Clarke error grid showed 46 (90%) of measurements were in the green zone and 5 (10%) were in the orange zone. No measurements were in the red zone. (fig 1) Performance of NEXCO seems to be similar to reported performance of semi-invasive techniques including pulse contour analysis, oesophageal Doppler, CO₂ rebreathing and transthoracic bioimpedance.



[Figure 1]

Conclusion(s): NEXCO tracks PACCO with a low systematic bias. In this study, we found that 90% of all NEXCO measurements had a <30% deviation from PACCO, but total percentage error was above the 30% benchmark. We therefore conclude that NEXCO cannot replace invasive CO measurement, but NEXCO may be suitable to replace a semi-invasive technique.

References:

1. J Clin Monit Comput 1999;15:85-91
2. Anesthesiology 2010;113:1220-35

01AP03-2**Accuracy of continuous noninvasive blood pressure and cardiac output measurement during living donor kidney transplantation**

Ishibashi T.¹, Hayamizu K.², Tokuda K.³, Karashima Y.⁴, Hoka S.⁴
¹Kyushu University Hospital, Dep. of Anesthesiology & Critical Care Medicine, Fukuoka, Japan, ²Kyushu University Hospital, Dept of Surgery, Fukuoka, Japan, ³Kyushu University Hospital, Dept of Intensive Care, Fukuoka, Japan, ⁴Kyushu University, Dep of Anesthesiology and Critical Care Medicine, Graduate School of Medical Sciences, Fukuoka, Japan

Background and Goal of Study: In living donor kidney transplantation (LDKT), perioperative low cardiac output (CO) and perturbation of blood pressure (BP) have been shown to be associated with poor clinical outcomes. Therefore, continuous monitoring of BP and CO are of significant interest in perioperative hemodynamic management. FloTrac™ (Edwards Lifesciences Corp., Irvine, CA, USA) monitoring system have been of great use for these purposes. Recently, a new cardiovascular monitoring system ClearSight™ (Edwards Lifesciences Corp.) was launched in our country. The mechanism of ClearSight™ is based on the volume-clamp method with which we can monitor continuous BP and CO noninvasively. An inflatable cuff wrapped around the patient's finger is the only attachment to the patient. Invasive arterial cannulation and the other catheters are not necessary. However, the accuracy of ClearSight™ is not validated in LDKT recipients. In this study, we aimed to assess the reliability of BP and CO measurement obtained by ClearSight™ when compared to an invasive monitoring system FloTrac™.

Materials (Subjects) and Methods: Two recipients undergoing LDKT were included in this study. Anesthesia was maintained with desflurane, remifentanyl, and rocuronium. We measured the mean arterial pressure (MAP) and CO every 3 minutes, simultaneously using the FloTrac™ (MAP_{FT} and CO_{FT}, respectively) and ClearSight™ (MAP_{CS} and CO_{CS}, respectively). In total, we obtained 197 points of consecutive data from two patients (patient1:90 points, patient2:107 points). Data were statistically analyzed by using the Spearman's rank-correlation coefficient and the Bland-Altman analysis.

Results and Discussion: There was a significant relationship between the (MAP_{FT} and MAP_{CS} (n=197; r=0.6303; P<0.0001). Agreement between the MAP_{FT} and MAP_{CS} was 4.51±8.30 mmHg and the mean percentage error of MAP_{FT} versus MAP_{CS} was 18.98%. In addition, we found a significant relationship between the CO_{FT} and CO_{CS} (n=197; r=0.9294; P<0.0001). However, agreement between CO_{FT} and CO_{CS} was -0.23±1.14L/min and the mean percentage error of CO_{FT} versus CO_{CS} was 31.98%. There was a weaker agreement in the parameter of CO between the two devices.

Conclusions: Measurement of the continuous BP and CO by the ClearSight™ system can be reliable parameters during LDKT. However, this is only a pilot study and further research is needed to confirm the finding in other operating procedures.

01AP03-3**Comparison between noninvasive estimated continuous cardiac output and arterial pressure cardiac output under general anesthesia**

Kurota M.¹, Otaki K.¹, Terada T.², Kotake Y.³, Ochiai R.², Kawamae K.¹

¹Yamagata University, Dept of Anaesthesiology, Yamagata, Japan, ²Toho University Omori Medical Centre, Dept of Anaesthesiology, Tokyo, Japan, ³Toho University Ohashi Medical Center, Dept of Anaesthesiology, Tokyo, Japan

Background and Goals of Study: Estimated continuous cardiac output (esCCO), a noninvasive technique to measure cardiac output (CO), is one of the various hemodynamic monitors. Several studies showed that esCCO correlated well with thermodilution CO. However, these studies included only the patients who underwent cardiac surgery or in the intensive care unit. The advantage of esCCO is to be able to obtain continuous CO noninvasively. Therefore, we studied those patients who did not need a pulmonary artery catheter during surgery, and we compared esCCO with Arterial Pressure Cardiac Output (APCO), as a reference. If esCCO shows similar values to APCO, it would help detecting risks of unexpected hemodynamic changes

noninvasively during surgery early enough to prevent the severe complications. The goal of this study is to examine availability and safety of esCCO.

Material and method: Fifty-two patients undergoing elective non-cardiac surgery for more than two hours in supine position were enrolled. During anesthesia, we recorded esCCO and APCO simultaneously. Then, we evaluated relationship between esCCO and APCO with correlation analysis and Bland-Altman analysis. We defined an acceptable bias and precision were within ±0.6L/min and 1.8L/min, respectively. We also performed polar plot analysis to determine the trending ability of esCCO.

Results: The correlation coefficient between esCCO and APCO was 0.62 (p<0.0001). We found that the bias and the precision by Bland-Altman plot are -0.5 and 1.11 L/min, respectively. Polar concordance rate at 30° was 77.8%. There was no complication detected during the measurement.

Discussion and conclusion: There was a linear correlation between esCCO and APCO. The bias and the precision were acceptable, so we conclude that esCCO is as a clinically useful CO monitor as APCO, which is well validated. The trending ability of esCCO was statistically poor, compared with APCO. The alteration degree was not so well captured, but the direction of the changes was approximately similar to APCO. In clinical settings, it is important to monitor the physiological changes noninvasively and safely. Thus, esCCO will be a good monitoring device to improve the safety of a patient under general anesthesia.

01AP03-4**Goal-Directed Fluid Therapy (GDFT) on Laparoscopic Sleeve Gastrectomy (LSG) in morbidly obese patients using a non-invasive cardiac output monitor: a pilot study**

Lucci E.¹, Silvi M.B.¹, Paolantonio N.², Di Zezza F.¹, Matteocci F.¹, Dauri M.¹

¹Tor Vergata University Rome, Dept of Anaesthesiology & Intensive Care, Rome, Italy, ²Sapienza University of Rome, Biomedical Engineering, Rome, Italy

Background and Goal of Study: In bariatric surgery there are no guidelines available for intraoperative fluid administration (1). (GDFT) is a new concept of perioperative fluid management that may improve prognosis in patients undergoing abdominal surgery (2).

Study aim: To assess the impact of GDFT in on morbidly obese patients undergoing LSG.

Materials and Methods: 20 patients enrolled into a pilot study after ethics committee approval. Procedures performed in accordance with the 1964 Helsinki declaration. Inclusion criteria: morbidly obese, age 18-65.

Exclusion criteria: ASA 4

Patients were randomly assigned to 2 groups: a GDFT and a control group, with maintenance crystalloid administration of 3ml/kg/hour.

Induction of anaesthesia: Propofol, sufentanil and rocuronium.

Maintenance:

Propofol /remifentanyl TCI.

Monitoring:

Standard ASA plus the CLEARSIGHT (Edwards Lifesciences), to assess stroke volume in-dex(SVI), stroke volume variation(SVV).

In the non-control group, fluid challenges of 250 ml of colloid (Voluven) were administered. If SVI increased by more than 10 %, the bolus was repeated. No further boluses were given once the SVI did not increase by more than 10%. An SVI greater than 10 % response defined the maximum SVI. This parameter was monitored continuously. If mean arterial pressure fell below 70 mmHg, ephedrine boluses were given.

Results and Discussion: Baseline demographic and comorbidity data between the two groups of patients were similar. Intraoperative fluid administration was significantly lower in the GDFT group (p<0,01). Postoperatively, there was a statistically significant reduction in nausea and vomiting (PONV) in the GDFT group (p<0,01). P/F ratio was higher in the PGDT group (p<0,05) with better respiratory function. Length of stay (LOS) was similar, but 2/10 in the control group, required an overnight stay in a high dependency unit.

Conclusion(s): The results demonstrate that application of GDFT in morbidly obese patients may prevent fluid overload in patients undergoing bariatric surgery. It may improve outcome, e.g de-creasing PONV or hospital stay. Further studies are required.

References:

- O'Neill T, Allam J. Anesthetic considerations and management of the obese patient presenting for bariatric surgery. *Curr Anaesth Crit Care*. 2010;21:16-23.
- Chappell D, Jacob M, Hofmann-Kiefer K, et al. A rational approach to perioperative fluid management. *Anesthesiology*. 2008;109(4): 723-40.

01AP03-5

Comparison of non-invasive (ClearSight®) and invasive (Pulsioflex®) pulse contour analysis to measure stroke volume during major surgery

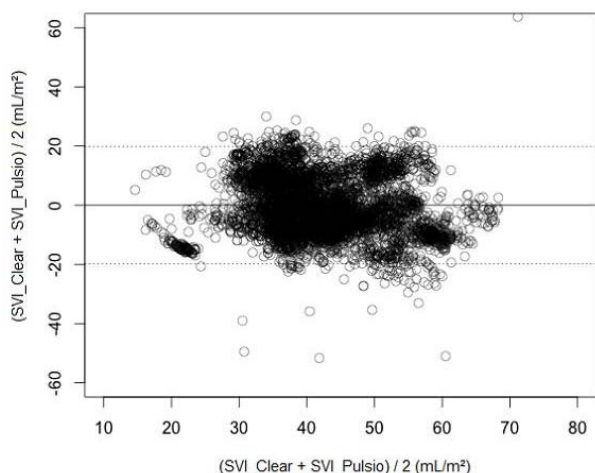
Boisson M., Pontier B., Debaene B., Frasca D.

University Hospital of Poitiers, Dept of Anaesthesiology & Intensive Care, Poitiers, France

Background and Goal of Study: Fluid management strategies have been shown to improve postoperative outcomes in major surgery¹. French guidelines recommend titration of intraoperative volume expansion (VE) by measuring stroke volume index (SVI)². We compared a new non-invasive pulse contour device using photoplethysmography (ClearSight®) with an invasive one (Pulsioflex®) to measure SVI and its changes after VE during major surgery.

Materials and Methods: Adult patients undergoing elective major surgery requiring continuous invasive arterial pressure with monitoring of cardiac output were included. Cardiac index (CI), SVI, SVI variation, blood pressure (BP) and VE-induced changes in SVI were measured. SVI measured by Pulsioflex® after auto-calibration was used as the reference. Absolute accuracy was assessed with Bland-Altman plots. Agreement between Pulsioflex® and ClearSight® to track changes of SVI after VE was assessed with Cohen's kappa coefficient.

Results and Discussion: After informed consent, thirty patients were included in the study with 6 087 pairs of measures analyzed and 62 VE procedures. Bias and limits of agreement for SVI were 0.02 ± 19.8 mL for ClearSight® compared to Pulsioflex® (Figure). Considering the VE response, the coefficient of agreement between the two devices was strong ($\kappa = 0.81$, $p < 0.05$). In responder patients (10-percent increase for SVI), VE induced a similar increase in SV between ClearSight® and Pulsioflex® (7 ± 4 mL vs 9 ± 4 mL, $p < 0.05$) (Table).



[Figure - Bland-Altman analysis for SVI]

	Before VE		After VE	
	Pulsio	Clear	Pulsio	Clear
MAP (mmHg)	76 ± 14	74 ± 12	82 ± 12	86 ± 10 *
CI (L/min/m²)	2,7 ± 0,8	2,9 ± 1,2	2,9 ± 1,0	3,0 ± 1,2
SVI (mL/m²)	33 ± 8	35 ± 9	42 ± 12 *	42 ± 13 *
SVV (%)	14 ± 3	14 ± 3	9 ± 3 *	9 ± 3 *

Data are given as median ± confidence interval
 VE, volume expansion; MAP, mean arterial pressure; CI, cardiac index;
 SVI, stroke volume index; SVV, stroke volume variation
 * $p < 0.05$ (comparison between before and after VE)

[Table. Haemodynamic data in responder patients]

Conclusion(s): In comparison with Pulsioflex®, ClearSight®, a non-invasive pulse contour device, is as reliable for tracking VE-induced changes in SVI during major surgery.

References:

1. Corcoran T. et al., Anesth Analg 2012
2. Vallet B. et al. Ann Fr Anesth Reanim 2013

Acknowledgements: This study was funded by the University Hospital of Poitiers

01AP03-6

Effects of noninvasive Pleth Variability Index monitoring on intraoperative hemodynamics in total hip surgeries

Sen G., Duger C., Kaygusuz K., Ozdemir Kol I., Isbir A.C., Gursoy S.

Cumhuriyet University, Dept of Anaesthesiology & Intensive Care, Sivas, Turkey

Background and Goal of Study: In this study, we aimed to compare the effects of standard and PVI monitoring techniques on hemodynamic parameters in the patients who undergo total hip arthroplasty which is performed under general anesthesia and are followed with standard invasive monitoring and with non-invasive PVI, afterwards.

Materials and Methods: In the study, after approval by the local Ethics Committee taken, the effectiveness of PVI measurements and standard monitoring measurements on hemodynamic parameters of a total number of 82 patients, ASA I-II, 30-85 years old, who did undergo total hip arthroplasty under general anesthesia were studied prospectively. In this study, PVI monitoring group compared with the standard set of monitoring group. Patients' SBP, DBP and MBP values measured at different times were compared and there was significant difference between groups. Measurements of standard monitoring were compared to basal measurements at 30th, 60th, 90th minutes, there were significant differences between the measurements taken at 1st and 90th minutes, 10th and 90th minutes, 30th and 90th.

Results and Discussion: During the study, when PVI measurements taken at different times were compared, there were no significant differences between the values. Despite this, PVI measurements showed a decrease in time. The initial and final Hgb values of the patients in both groups included in the study were compared and no significant differences were found. The initial Hgb values of the patients in both groups were compared and significant differences were found; however, there were no significant differences between final Hgb values. The patients in both groups were compared in terms of the total fluid, blood and blood products. There were no significant differences between the groups in terms of blood and blood products but when total fluids given to the patients were compared significant differences found between the groups. Less fluid replacement was given to the PVI monitoring group.

Conclusion(s): Using noninvasive PVI monitoring in following up the hemodynamic parameters and providing the hemodynamic stability of the patients who are under general anesthesia is more practical, easier to use and causing no complications in comparison to standard monitoring. Nevertheless, further investigation on PVI monitoring are needed to illuminate the effectiveness of PVI monitoring on other parameters except for fluid management.

01AP03-7

How should the stroke volume variation be calculated? Insights from a mathematical model

Vandenbosch T., Wyffels P., De Hert S., Wouters P.

Ghent University Hospital, Dept of Anaesthesiology, Ghent, Belgium

Background and Goal of Study: Stroke Volume Variation (SVV) can be calculated in two ways, either as the mean of the calculated SVV's of each individual respiratory cycle (RC) (I-approach) or as the mean of the pooled Stroke Volumes (SV) of all RC's (P-approach). Also, the number of RCs included varies between studies¹.

As heart rate/mechanical ventilation rate ratio (HR/MVR) is known to influence the predictive value of SVV, the methodology used to calculate SVV may affect the number².

This simulation study investigates the impact of these different variables on the precision of the calculated SVV, and this across a wide range of HR/MVR.

Materials and Methods: A mathematical model was built based on the assumption that venous inflow follows a sinusoidal curve. Variation was arbitrarily set at 20%. This curve was then partitioned into equal segments. The length of the segments depended on the HR/MVR. SV's were simulated by the integral of the curve over these individual segments. Each calculation was repeated 100 times, using a different phase lag between the beginning of the RC and the beginning of the first SV.

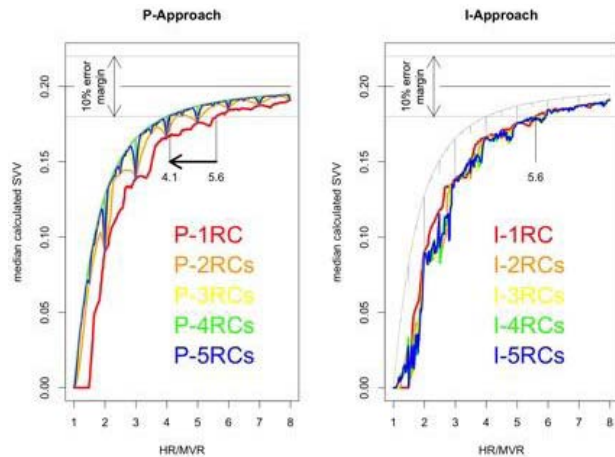
For each HR/MVR ratio between 1 and 8, the medians of the calculated SVV's were compared according to the number of included RC's (1 to 5) and to the I- and P-approach.

Results and Discussion: With only one RC, there is a systematic underestimation of the SVV, which is most pronounced at lower HR/MVR. Tolerating a 10% error margin, a minimum HR/MVR of 5.6 is needed for a reliable calculation of SVV. (See Figure)

With the P-approach, including more RC's, an upward shift of the curve and a leftward shift of the 10% error threshold were observed. When using the I-approach these effects were absent.

Conclusion: According to this simulation the P-approach gives a more accurate estimation of the SVV, with an optimal number of 4 RC's. Further simulations, using different variations within the grey zone and the classically considered responder zone, and implementation of the concept in clinical studies are needed to confirm these effects and apply the principles in clinical practice.

References: 1. Michard Anesthesiology 2005,² De Backer Anesthesiology 2009



[Figure]

01AP03-8

Intraoperative pulse pressure variation >13% is an independent risk factor for early postoperative nausea and vomiting in patients undergoing major abdominal surgery: a retrospective observational study

Lin C.-H.¹, Wu C.-Y.², Chuang F.-L.², Chang Y.-J.²

¹National Taiwan University Hospital Yunlin Branch, Dept of Anaesthesiology, Yunlin County, Taiwan, Republic of China,

²National Taiwan University Hospital, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China

Background and Goal of Study: Intraoperative fluid status may be associated with postoperative nausea and vomiting (PONV) development. Pulse pressure variation (PPV) is an accurate fluid status predictor in surgical patients, but its influence on PONV is unclear.

Materials and Methods: Data on radial arterial catheter-measured PPV values in consecutive adult patients aged 20-79 years undergoing major abdominal surgery were obtained from a prospectively maintained database from September 2014 to March 2015. Patients with arrhythmia, heart failure (New York Heart Association Classification III or IV), ASA physical status classification IV or V, morbid obesity, gastro-oesophageal reflux disease, and preoperative opioid or antiemetic use were excluded.

Each patient received postoperative patient-controlled intravenous analgesia with morphine and ondansetron (4 mg). Independent nurse anaesthetists assessed PONV development on the next day after surgery. Multivariate logistic regression analysis was used to investigate the association of intraoperative PPV with PONV by assessing the presence of intraoperative PPV >13%, intraoperative averaged PPV, and other intraoperative variables.

Results and Discussion: Of the 229 patients enrolled, 59 (25.8%) developed PONV and 139 (60.7%) experienced at least one episode of PPV >13% intraoperatively. The averaged PPV was $9.6\% \pm 3.3\%$. More patients with intraoperative PPV >13% developed PONV than those without intraoperative PPV >13% (34.5% vs 12.2%; $P < 0.001$). Multivariate logistic regression analysis revealed that intraoperative PPV >13% [adjusted odds ratio (OR) = 3.3, 95%

confidence interval (CI): 1.3-8.2, $P = 0.01$] and Apfel scores (adjusted OR = 1.6, 95% CI: 1.1-2.3, $P = 0.014$) were independent risk factors for PONV. Age, sex, body mass index, surgical duration and type (open or laparoscopic), and intraoperative averaged PPV were not associated with PONV. Our results are consistent with previous studies, which indicated that intraoperative fluid status plays a vital role in PONV development. In our institute, intraoperative PPV is maintained at 10%-13%. The effect of averaged PPV on PONV may be attenuated because high averaged PPV was avoided. However, our data suggest that PPV >13% is an indicator of an intraoperative hypoperfusion event and potentiates PONV development.

Conclusion: Intraoperative PPV >13% is an independent risk factor for early PONV development in patients undergoing major abdominal surgery.

01AP03-9

Prediction of hypotension attack using pleth variability index monitoring and its association with individual factors

Senel H., Duger C., GURSOY S., Kaygusuz K., Isbir A.C.,

Mimaroglu C.

Cumhuriyet University, Dept of Anaesthesiology & Intensive Care, Sivas, Turkey

Background and Goal of Study: Hypotension occurred in patients during induction of general anesthesia has to be particularly severe in the elderly and patients with needing fluid. In order to monitor hemodynamic parameters a careful and meticulous follow-up is essential. Major health complications of invasive methods used for standard monitoring are concerned. In recent years, in order to carry out close hemodynamic follow-up without applying any invasive procedure process led to the new pursuits and it increased interest in studies about Pleth Variability Index (PVI) which is a non-invasive method of monitoring.

Materials and Methods: In this study, we recorded PVI, SBP, DBP, MBP and HR values in the patients who undergo abdominal surgery before the induction. And we recorded them after induction.

Results and Discussion: General anesthesia were studied prospectively. In this study, patients' SBP, DBP and MBP values measured at different times were compared and there was significant difference between groups. Measurements were compared to basal measurements at first, second, third, fourth ve fifth minutes, there were significant differences between the measurements. SBP, DBP and OAB values had decreased at first, second, third minutes. They had increased at fourth ve fifth minutes (because of intubation). These values showed poor correlation compared with baseline PVI values of patients and just the decline of the MBP at the second minute was statistically significantly correlated with the PVI.

There was no correlation between PVI and SBP, DBP, MBP, HR values at intraoperative 30th, 60th, 90th and 120 th minutes. PVI values of the patients receiving fluid preoperatively were higher than who didn't. But there was no statistically significantly correlation.

Conclusion(s): In conclusion, we acknowledge that using noninvasive PVI monitoring in following up the hemodynamic parameters and providing the hemodynamic stability of the patients who are under general anesthesia is more practical, easier to use and causing no complications. PVI monitoring fluid therapy can be used in monitoring but it is useless in following intraoperative hemodynamic parameters.

However, PVI monitoring can help to predict hypotension may occur during induction of anesthesia. Nevertheless, further investigation on PVI monitoring are needed to illuminate the effectiveness of PVI monitoring on others parameters except for fluid management.

01AP03-10

The effect of lower legs intermittent sequential pneumatic compression (ISPC) device on FloTrac: report of two cases in living donor liver transplantation

Chen H.H.¹, Lu I.C.², Cheng K.I.¹

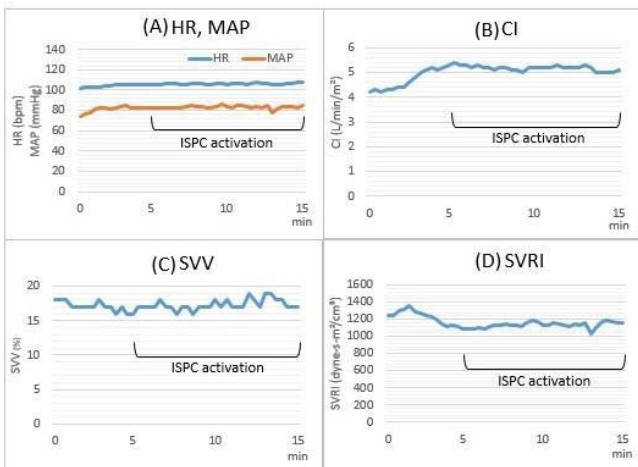
¹Kaohsiung Medical University Hospital, Dept of Anaesthesiology, Kaohsiung, Taiwan, Republic of China, ²Kaohsiung Municipal Hsiao-Kang Hospital, Kaohsiung Medical University, Dept of Anaesthesiology, Kaohsiung, Taiwan, Republic of China

Background: Hemodynamic monitoring and venous thromboembolism prophylaxis are important issues in liver transplant (LT). In our hospital, intermittent sequential pneumatic compression (ISPC) over lower legs (Fig. 1) and FloTrac (Edwards) are applied simultaneously in LT. Herein we present the effect of ISPC devices assessed by FloTrac during LT.

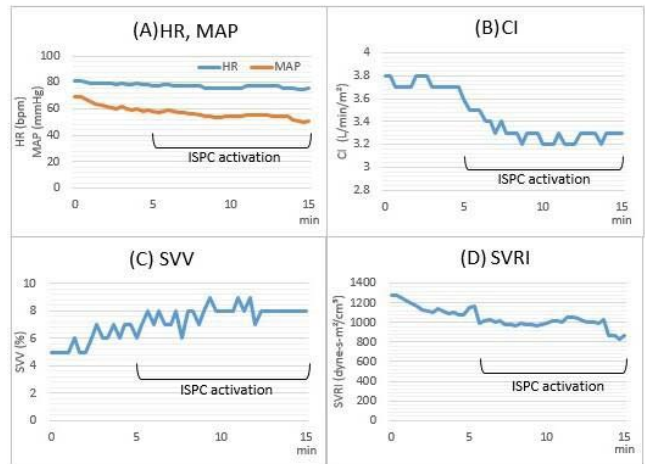


[Fig. 1 Compression stockings and ISPC sleeve.]

Case report: The donor was a 20-year-old male. The recipient was a 60-year-old male with history of hepatocellular carcinoma, hepatitis C, liver cirrhosis, and the MELD score was 11. The surgery took 9 hours in donor and 12 hours in recipient. The blood loss was 575 ml and 1910 ml, respectively. After ISPC was activated, heart rate (HR), mean arterial pressure (MAP), cardiac index (CI), stroke volume variation (SVV), systemic vascular index (SVRI) remained unchanged in donor (Fig. 2). In recipient, HR and SVRI remained unchanged, SVV elevated, MAP and CI decreased (Fig. 3).



[Fig. 2 Donor's hemodynamic change.]



[Fig. 3 Recipient's hemodynamic change.]

Discussion: Previous study showed the activation of ISPC augmented cardiac output¹. But the results in our cases were different. Possible reasons include: First, the volume of calf was small in comparison to whole leg. The compression stockings reduced the calf volume and further attenuate the effect of ISPC. Second, health patients were able to compensate the effect of ISPC. In conclusion, longer ISPC sleeves may be beneficial on hemodynamics for LT recipient.

Reference: 1. Am J Surg. 2011 Jul;202(1):16-22

Learning points: ISPC devices and FloTrac may both be beneficial in LT. Further studies are required to assess how ISPC devices affect FloTrac parameters.

01AP03-11

The new transpulmonary thermodilution measurement to assess hemodynamic change in patients undergoing open abdominal cytoreductive surgery with hyperthermic intraperitoneal chemotherapy (HIPEC): a prospective observational study

Park J.E., Lee J.S., Lee K.-Y.

Yonsei Cancer Center, Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Current treatment of peritoneal cancer combines cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (HIPEC). This is known for the extensive and quality of life threatening procedure. Optimal anesthetic management of patients treated with this surgery requires control of a complex interplay of physiologic mechanisms. We aimed to investigate the intraoperative physiologic change including extravascular lung water of patients undergoing cytoreductive surgery with HIPEC in our department of colorectal surgery.

Materials and Methods: In this prospective observational study, among 31 patients who underwent cytoreductive surgery with HIPEC, a total of 21 patients were enrolled. We applied the VolumeView system to all patients, a system has been introduced that employs a novel algorithm for the mathematical analysis of the thermodilution curve; an internal jugular vein and a femoral artery access were required to monitor hemodynamic parameters. These reflected the patient's respiratory, cardiovascular and intravascular volume states, which were monitored by an EV1000 monitor and arterial blood gas analysis. We recorded and analyzed at 7 time-points; before skin incision, 30 minutes before HIPEC, 30 minutes, 60 minutes and 90 minutes after HIPEC, 30 minutes after the end of HIPEC, and 10 minutes before the end of surgery.

Results and Discussion: During the HIPEC period, patients showed a rise in temperature (up to 38°C), a decrease in systemic vascular resistance index, and an increase in cardiac output. The global end diastolic volume index ranged from 715.4 to 809.7, the extravascular lung water index ranged from 6.9 to 7.3 ml/kg, and the pulmonary vascular permeability index ranged from 2.0 to 2.6. An average of 6.8 unit rapid insulin was administered because of increased glucose level. And lactate level steadily increased during the HIPEC period. Only one patient was presented with acute kidney injury postoperatively, and the average hospital length of stay was 17 days.

Conclusion(s): The hyperdynamic circulation state developed and microcirculation deteriorated because of increased temperature, glucose and lactate level during HIPEC period. Therefore, further developed hemodynamic monitoring including optimal intravascular volume status should be considered for these patients.

01AP04-1

A comparison of McGrath MAC videolaryngoscopy and Macintosh laryngoscopy for orotracheal intubation in children: a randomised controlled trial

Ji Eun K., SuHyun S., Dae Hee K., Sook Young L., Jong Yeop K.
Ajou University School of Medicine, Dept of Anaesthesiology & Pain Medicine, Suwon, Korea, Republic of

Background and Goal of Study: The McGrath videolaryngoscope (VL) offers better laryngeal view compared to Macintosh laryngoscopy in adult patients and increases success rate of orotracheal intubation in patients with difficult airways. This prospective randomized controlled study was performed to evaluate the usefulness of the McGrath VL compared to Macintosh laryngoscopy in paediatric patients during routine orotracheal intubation, by comparing the time to intubation and ease of intubation.

Materials and Methods: Eighty-four patients, aged 1-10 years (ASA physical status I-II) undergoing tracheal intubation for elective surgery were randomly assigned to the Macintosh group (n = 42) or McGrath group (n = 42). Anaesthesia was induced with propofol 2.5-3.0 mg/kg, sevoflurane 5-8 vol%. Orotracheal intubation was performed 2 min after rocuronium 0.6 mg/kg injection with McGrath VL or Macintosh laryngoscope. The primary outcome was time to intubation assessed by a blind observer. Cormack and Lehane glottic grade, and intubation difficulty score (IDS) were also assessed. Haemodynamic changes were recorded at baseline, 1 min after induction, before, and 1 min after intubation.

Results and Discussion: Median time to intubation [interquartile range] was not different in the McGrath group than in the Macintosh group (25.0 [22.8-28.3] s vs. 26.0 [24.0-29.0] s, p = 0.301). The incidence of grade I glottic view was significantly higher in the McGrath group than in the Macintosh group (95% vs. 74%, p = 0.013). There was significant difference in median IDS between the McGrath group than in the Macintosh group (p = 0.018). There were no significant differences in haemodynamic changes over time between the two groups.

Conclusion(s): This study shows that the McGrath VL provides better laryngoscopic views and lower IDS, but similar intubation time compared to Macintosh laryngoscope during routine orotracheal intubation in paediatric patients.

References:

- Endo S, Saito T, Hashimoto Y, Arai T, Asai T, Okuda Y. Usefulness of the McGrath® Videolaryngoscope in 100 Children. *Masui* 2015; 64: 1097-100.
- Kim JT, Na HS, Bae JY, Kim DW, Kim HS, Kim CS, Kim SD. GlideScope video laryngoscopy: a randomized clinical trial in 203 paediatric patients. *Br J Anaesth* 2008; 101: 531-4.

01AP04-2

Anesthetic management for interventional rigid bronchoscopy, compared with dexmedetomidine and remifentanyl

Murozono M.¹, Miyashita R.¹, Takeda A.¹, Honma T.¹, Yanagita K.²

¹Tokyo Medical University Ibaraki Medical Center, Dept of Anaesthesiology, Ibaraki, Japan, ²Tokyo Medical University Ibaraki Medical Center, Dept of Intensive Care, Ibaraki, Japan

Background and Goal of Study: Interventional rigid bronchoscopy procedures are very effective ways of treating airway lesions such as stenosis due to a tumor, tracheoesophageal fistula or foreign body. However, spontaneous respiration must be maintained during rigid bronchoscopy[1]. The aim of our study was to evaluate anesthetic management using dexmedetomidine and remifentanyl and compare it with that by interventional rigid bronchoscopy procedures.

Materials and Methods: Anesthetic data for 54 patients undergoing interventional rigid bronchoscopy procedures between April 2008 and December 2015 were reviewed retrospectively. Dexmedetomidine was used in 36 pa-

tients (group D) whereas remifentanyl was used in 18 (group R). We evaluated: patient characteristics; use of other anesthetic agents and cardiovascular agonists; time to insertion of rigid bronchoscopy from the induction of anesthesia; time to the end of anesthesia from completion of the surgical procedure; postoperative status of the airways. We employed the unpaired t-test and chi-square test between the two groups, and p<0.05 was considered significant.

Results and Discussion: Propofol and local anesthetic were used in all cases. No significant differences were found between the two groups with regard to propofol dose (p=0.257), time to insertion of rigid bronchoscopy from the induction of anesthesia (p=0.119), or in the time to the end of anesthesia from completion of the surgical procedure (p=0.199). Requirements for fentanyl (μg) (0.22 ± 0.13 vs. 0.14 ± 0.13 , p=0.039) and of vasopressor (%) (55.6 vs. 17, p=0.006) in group D were significantly more than those in group R. There was no significant difference between groups with respect to postoperative requirements of a supraglottic airway device or tracheal tube (p=0.540).

Conclusion(s): Before interventional rigid bronchoscopy procedures, local anesthetics are sprayed onto the airways for intubation, and sedation (using propofol or volatile anesthetics) is necessary. Analgesic use relieves stimulation by surgery and leads to stable management of anesthesia[1]. Dexmedetomidine and remifentanyl can be used safely in interventional rigid bronchoscopy if the characteristics of each drug are considered carefully.

References: 1. Natalini, G., P Fassini, V. Seramondi, et al., (1999). *Eur J Anaesthesiol*, 16(9): p. 605-9.

01AP04-3

Clinical application of the intubation difficulty scale on Taiwanese patients

Tseng A.C.-C.¹, Kang T.-W.¹, Sun H.S.², Tsai Y.-C.¹, Wu Y.-H.³, Wang J.⁴

¹National Cheng Kung University Medical College and Hospital, Dept of Anaesthesiology, Tainan, Taiwan, Republic of China,

²Institute of Molecular Medicine, National Cheng Kung University Medical College, Research and Development Department, Tainan, Taiwan, Republic of China, ³Ditmanson Medical Foundation Chia-Yi Christian Hospital, Dept of Anaesthesiology, Chia-Yi, Taiwan, Republic of China, ⁴National Cheng Kung University Hospital, College of Medicine, Department of Public Health, Tainan, Taiwan, Republic of China

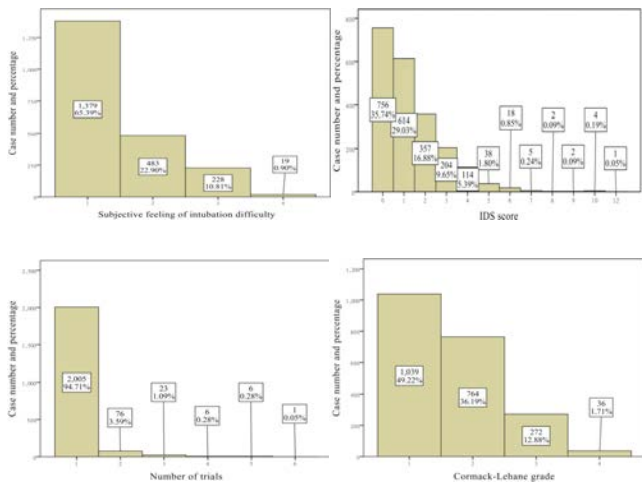
Background and Goal of Study: Difficult tracheal intubation (DI) is a major source of concern for perioperative care. There appears no consensus definition of DI^{1,2}. To address this, Adnet et al. proposed an intubation difficulty scale (IDS)³. This study is to validate the IDS on Taiwanese patients.

Materials and Methods: After IRB proved and got the written inform consent, 2500 cases were prospectively recruited during 2009-14. All were adult and received tracheal intubation with a Macintosh blade.

The demographic data were collected before op. After induction of anesthesia, the patients were intubated by one of the 12 experienced anaesthesiologists (work year >5). The numbers of trial, intubation doctors, apparatus, were recorded. The Glottic exposure as defined by the Cormack grade (CG) (1-4), extra lifting force (Y/N), the external laryngeal pressure (Y/N) and vocal cord position (Y/N) and the total time needed for successful intubation and doctor's feeling of difficulty (Likert scale 0-5) were recorded.

The correlation between IDS and other data were analyzed by using the Pearson correlation, P<0.05 indicating significance.

Results: A total of 2107 patients were enrolled. There were 756 cases with IDS = 0 (35.7%) and 32 cases (0.7 %) with IDS >5. The subjective feeling of intubation difficulty with 247 cases (11.7%), with scores ≥ 3 . Thirty five cases (1.6%) needed at least 3 trials and 2006 cases (94.8%) received one trial only. 308 cases (14.5%) got CG ≥ 3 and 1039 cases (49.1%) had a CG=1.



[Figure 1. Distribution of the four difficult intubation outcome measurements]

Four of the DI measurements has mild to moderate correlation. The subjective difficulty feeling has the highest correlation to IDS score.

	IDS	Difficult feeling	Number of trials	Total time
IDS	1	0.744**	0.568**	0.601**
Difficult feeling		1	0.360**	0.431**
Number of trials			1	0.635**
Total time				1

[Table 1. The correlations of the four difficult trials]

Conclusion: The IDS is a comprehensive outcome measurement that correlates well with the other three measurements ($r = 0.744$ to 0.568 , $P < 0.001$). Yet, the lower rates of $IDS = 0$ (35.7%) and $IDS > 5$ (0.7%) compared to those original result (53.0% and 6.3%, respectively).

01AP04-4

Comparison of new generation Baska Mask® with second generation I-Gel® and first generation classical laryngeal mask in outpatient urological interventions: randomized controlled clinical study

Bindal M., Demir A., Koçulu R., Sabuncu Ü., Özgök A. Türkiye Yüksek İhtisas Hospital, Dept of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: In this study, we evaluated and compared the performance of the Baska Mask® (PTY Ltd,Australia) , I-Gel®(Intersurgical Ltd,UK) and Classic laryngeal maske airway(LMA) for use in anaesthesia in adult patients undergoing a variety of outpatient urologic interventions.

Materials and Methods: One hundred fifty patients with ASA I-III physical status were enrolled for elective urological interventions without neuromuscular blocking. The patients were divided into Baska Mask, I-Gel, and classic LMA groups, each with 50 patients. We evaluated the “first attempt” success rates, insertion time, ventilation time, airway dynamics-complications and hemodynamic variables.

Results and Discussion: There were no significant differences among three groups regarding demographic data, airway dynamics and complications (throat-lips-teeth discomfort, dysphonia, dysphagia, desaturation, laryngospasm, regurgitation) and hemodynamic variables. The “first attempt” success rate were 98%, 92%, 88% classic LMA, I-Gel, Baska Mask, respectively. Insertion and ventilation times were different between groups ($p < 0.001$ for each). Both insertion and ventilation times of classical LMA were found to be shorter than others (insertion times 5.78 ± 1.72 sec & ventilation times 11.72 ± 4.72 sec). The insertion and ventilation times in the I-Gel group were 7.28 ± 2.66 and 15.38 ± 6.7 sec. The longest insertion and ventilation times were in Baska Mask with 12.04 ± 6.25 and 21.26 ± 8.53 sec. When considering the additional maneuvering requirements during placement, 1% (49/1), 8% (46/4), 20% (40/10) were found for cLMA, I-Gel and Baska Mask, respectively.

Conclusion(s): Insertion and ventilation times of Baska Mask was significantly longer than others. Also Baska mask needed more additional maneuvering requirements during placement. The three supraglottic airway devices were comparable in terms of significant alteration in the hemodynamic status, and complications. Baska mask, I-Gel and cLMA devices can be comparable clinical used in patient who undergoing urological interventions, although there is some delay in the initial performances of Baska mask.

Parameters	cLMA (n=50)	I-Gel (n=50)	Baska Mask (n=50)	p value
Insertion Time (sec)	5.78±1.72	7.28±2.66	12.04±6.25	cLMA-Igel p=0.001 cLMA-Bsika p<0.001 Igel-Bsika p<0.001
Ventilation Time (sec)	11.72±4.72	15.38±6.7	21.26±8.53	cLMA-Igel p<0.001 cLMA-Bsika p<0.001 Igel-Bsika p<0.001
Success in First attempt %	%98 (49/1)	%92 (46/4)	%88 (44/6)	p=0.135
Additional Manipulation Requirement	%2 (1)	%8 (4)	%20 (10)	cLMA-Igel p=0.169 cLMA-Bsika p=0.004 Igel-Bsika p=0.084
Mask Size				cLMA-Igel p=0.012 cLMA-Bsika p<0.001 Igel-Bsika p=0.046
	3 %10(5) 4 %56(28) 5 %34(17)	%18(9) %70(35) %12(6)	%30(15) %68(34) %2(1)	
Blood staining on mask	%6 (3)	% 6 (3)	%6 (3)	1.000
Dysphagia				
none	%90 (45)	%92 (46)	%96 (48)	
Mild	%2 (1)	%4 (2)	%2 (1)	0.491
yes	%8 (4)	%4 (2)	%2 (1)	
Tongue trauma	%2 (1)	%0 (0)	%0 (0)	0.602
Lip trauma	%0 (0)	%2 (1)	%0 (0)	0.365
Dental trauma	%0 (0)	%2 (1)	%0 (0)	0.365
Palate trauma	%0 (0)	%2 (1)	%2 (1)	0.551
Sore throat				
Nona	%92 (46)	%90 (45)	%92(46)	
Mild	%2 (1)	%6 (3)	%6 (3)	0.924
Yes	%6 (3)	%4 (2)	%2 (1)	
Hoarseness	%0 (0)	%0 (0)	%0 (0)	-
Desaturation	%0 (0)	%0 (0)	%0 (0)	-
Laryngospazzm	%0 (0)	%0 (0)	%0 (0)	-
Regurgitation /aspiration	%0 (0)	%0 (0)	%0 (0)	-

[Table 2: Data regarding insertion of cLMA, I-Gel a]

01AP04-5

Sore throat incidence in intubated patients

AlJa'bari A. University of Jordan, Dept of Anaesthesiology & Intensive Care, Amman, Jordan

Background and Goal of Study: Sore throat is a common postoperative complaint, occurring most often following tracheal intubation. Factors such as tracheal-tube size and cuff design have been shown to be important causative factors. Routine tracheal intubation for elective surgical procedures can result in pathological changes, trauma and nerve damage which may also account for postoperative throat symptoms. Careful insertion techniques for the tracheal tube is of paramount importance in the prevention of airway trauma and postoperative sore throat.

Materials and Methods: 300 patients sharing same characteristics, they underwent elective surgeries of diverse kinds from different sub-specialties requiring end tracheal intubation.

Results and Discussion: Females of young age with similar body weight developed sore throat. Non smokers and patients with history of upper respiratory tract infection in the last 2 weeks were at more risk of developing sore throat. The usage of flexo-metallic and preformed endotracheal tubes along with throat pack developed higher rates of sore throat for less than 1 hour surgery.

Conclusion(s): Symptoms of postoperative throat discomfort such as sore throat, hoarseness and dysphagia are common, and are associated with trauma to the larynx and the pharynx. Careful airway management technique is therefore essential. Appropriate sizes of tracheal tube should be appropriately chosen. Lubricants containing local anaesthetics such as xylocaine gel does appear to be beneficial as well as dexamethasone 8 mg intravenously.

01AP04-6**Dexmedetomidine as sedative in the management of anticipated difficult airway**

Makrypodi M., [Andreeva A.](#), Dimakopoulou A., Douma A.
General Hospital of Athens - G. Gennimatas, Dept of
Anaesthesiology, Athens, Greece

Background and Goal of Study: A number of patients admitted for emergency or elective procedures are frequently identified as having an anticipated difficult airway. In cases where safe ventilation and oxygenation are in doubt, and there is suspicion of unfeasible intubation, management of the airway with the patient awake has been suggested. In this study, we present our experience and results of the use of dexmedetomidine as a sedative agent during awake intubation, with regards to its effects on oxygenation and haemodynamic parameters, but also to the patients' comfort.

Materials and Methods: To facilitate the awake intubation, ranitidine 50mg, ondansetron 4mg and dexamethasone 8mg were administered intravenously (IV) as premedication. Also, xylometazoline 0.1% nasal drops were used and xylocaine 10% spray was instilled in both nostrils and hypopharynx. Sedation was achieved with dexmedetomidine, administered as a loading dose of 1 mcg/kg/h intravenously over 10 minutes, followed by a continuous infusion of 0.7-1.2 mcg/kg/h.

Results and Discussion: We present 3 cases of successful awake intubation with the use of dexmedetomidine as a sedative agent, in patients with a predicted difficult airway. In each case, based on patient and disease-specific parameters, a different airway technique/modality was used; the fiberoptic nasal technique, the Airtraq laryngoscope and blind nasal intubation.

All of our patients had no recall of the procedure, and remained co-operative, responsive to commands and maintained oxygen saturation above 90% throughout. A RSS score greater than 2 was achieved in all cases, prior to airway manipulations.

With regards to complications, we report the incidence of bradycardia in one of our patients, that was successfully treated with 0.6mg of atropine IV.

Conclusion(s): Dexmedetomidine has sedative, analgesic, anxiolytic, anti-alagogue and opioid-sparing properties. The advantages of minimal respiratory depression and easily treatable complications² make dexmedetomidine a valuable agent for the anaesthetist in cases of an anticipated difficult intubation.

References:

- DeCarli D, Simoes Correa N, Castelo Branco Vilar Silva T, Malta Maradei E. Blind nasotracheal intubation in awoken patient scheduled for hemimandibulectomy. *Rev Bras Anesthesiol*; 58:1, Janeiro-Feveiro, 2008.
- Joana Alfonso, Flavio Reis. Dex: Current Role in Anesthesia and Intensive Care. *Rev Bras Anesthesiol* 2012; 62:1:118-133.

01AP04-8**The curvature of the endotracheal tube exacerbated postoperative sore throat**

[Yahagi M.](#)¹, [Satsumae T.](#)², [Tanaka M.](#)²

¹University of Tsukuba Hospital, Dept of Anaesthesiology, Tsukuba, Japan, ²Faculty of Medicine / University of Tsukuba, Dept of Anaesthesiology, Tsukuba, Japan

Background and Goal of Study: Sore throat after general anesthesia decreases patient's satisfaction. Generally, the endotracheal tube (ETT) is connected to the respiratory circuit with keeping natural curvature during general anesthesia. However, when the position of ETT is restricted in order to secure a clean field, we have to curve ETT artificially. In this study, we examined whether the two supporting methods of ETT affected the frequency and severity of postoperative sore throat.

Materials and Methods: Thirty patients scheduled to undergo general anesthesia requiring endotracheal intubation were included. In the natural group (n = 15), ETT was connected to the breathing circuit with keeping natural curvature. In the curved group (n = 15), ETT was bended 90 degrees to the right and connected to the breathing circuit (Figure). After obtaining muscle relaxation using rocuronium, trachea was intubated using McGrath™. A Parker Flex-Tip™ endotracheal tube (internal diameter: 7.0 mm) was used. Seal pressure of a cuff was adjusted to 20 cm H₂O. To evaluate the severity of postoperative sore throat, the sore throat score (0 = none, 1 = less severe than with a cold, 2 = similar to that not with a cold, 3 = more severe than with

a cold) was used. A blinded anesthesiologist recorded the sore throat score on the day of surgery (2 hours after surgery) and the next day of surgery (24 hours after surgery). For statistical analysis, chi-square test and Mann-Whitney U test were used and $P < 0.05$ was regarded as significant difference.

Results and Discussion: The incidence of postoperative sore throat were 4/15 (27%) in the natural group and 12/15 (80%) in the curved group ($P = 0.01$). The mean postoperative sore throat score were 0.73 in the natural group and 1.2 in the curved group on the day of surgery ($P = 0.05$), and 0.27 in the natural group and 0.8 in the curved group on the next day of surgery ($P = 0.01$).

Conclusion(s): The incidence and severity of postoperative sore throat in the curved group were significantly higher than in the natural group. If ETT is bent during general anesthesia, the risk of postoperative sore throat may increase.



[Figure]

01AP04-9**Evaluation of transcutaneous laryngeal ultrasonography for vocal cord examination in the immediate postoperative period following total thyroidectomy**

[Blanco Pérez I.](#)¹, [De Miguel Negro M.](#)¹, [Pelaez de la Fuente E.](#)¹, [Caubet Busquet E.J.](#)², [González López O.](#)², [Martín Mora V.](#)¹
¹Vall d'Hebron University Hospital, Dept of Anaesthesiology, Barcelona, Spain, ²Vall d'Hebron University Hospital, Dept of Surgery, Barcelona, Spain

Background and Goal of Study: Transcutaneous laryngeal ultrasound (TLUS) has emerged as a promising imaging tool for vocal cord examination in patients undergoing thyroid surgery. The focus of this prospective study was to assess the accuracy of TLUS compared with videostrobolarngoscopy (VSL) in the diagnosis of vocal cord paralysis in the immediate postoperative period following total thyroidectomy.

Materials and Methods: Ninety-three patients undergoing total thyroidectomy and assessed by the 2 techniques were studied. VSL was carried out the day before surgery and was repeated at 4 days postoperatively. TLUS was performed before surgery in the preanesthesia holding area and at completion of the procedure in the postanesthesia care unit. The preoperative and postoperative TLUS results were compared with those of VSL. The statistical analysis included the sensitivity, specificity, positive predictive value, and negative predictive value (with 95% CI) of TLUS for detecting vocal cord paralysis.

Results and Discussion: The visualization rate associated with TLUS was 93%. The total vocal cord paralysis rate was 16.1%. The performance of TLUS for diagnosing this condition was as follows: sensitivity, 93.3% (95% CI, 77.3%-100%); specificity 96.1% (95% CI, 91.2%-100%); positive predictive value, 82.3% (95% CI, 61.2%-100%); negative predictive value, 98.6% (95% CI, 95.4%-100%).

The present study demonstrates that laryngeal examination using TLUS, a noninvasive technique, has a high sensitivity, specificity, and positive predictive value for detecting vocal cord paralysis shortly after thyroidectomy.

Conclusions: TLUS may be a suitable technique for detecting vocal cord paralysis shortly after total thyroidectomy.

01AP04-10**The effectiveness of the tests used for predicting intubation difficulty and the use of McGrath Videolaryngoscope in cases BMI >30 kg/m²**

Basar H., Baltaci B., Cakirca M., Bedevi R.

Ankara Training and Research Hospital, Dept of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: In this study it is aimed to evaluate the effectiveness of the tests which are used to determine the difficulty of intubation and to evaluate the effectiveness of McGrath Videolaryngoscopy in obese patients (BMI >30kg/m²) undergoing elective surgery.

Materials and Methods: ASA I-III one hundred patients, aged above 18 years, which are undergoing elective surgery and endotracheal intubation was included into the study with informed consent after approval from Ankara Training and Research Hospital Training Planning Committee (date-number of approval:10.02.2016 - 628, approval reference:5262).

Mallampati test and required measurements were done in the operating room. Which include height, weight, neck circumference, thyromental distance, sternomental distance and mouth opening. It was also evaluated the association height to neck circumference ratio with intubation.

Cormack-Lehane classification was evaluated with Macintosh Laryngoscope following anesthesia induction and mask ventilation of three minutes. Thereafter mask ventilation was continued. Cormack-Lehane classification evaluated again with McGrath Videolaryngoscope by a second anesthetist and then endotracheal intubation was performed.

Duration of intubation and the number of attempts were recorded. Intubation Difficulty Scale (IDS) was used to evaluate the difficulty of intubation.

Descriptive statistics was showed as mean \pm standard deviations. T-test, Mann-Whitney U test, Kruskal Wallis and Wilcoxon test was used for analysis. P<0,05 was accepted as statistically significant.

Results and Discussion: Difficult intubation according to IDS scoring (IDS>5) was not seen in our study. A significant positive correlation was found between Mallampati classification, Cormack-Lehane classification and neck circumference and the duration of intubation. A significant negative correlation was found between height to neck circumference ratio and the mouth opening and the duration of intubation.

Conclusion(s): In this study, it is found that videolaryngoscopy is effective in obese patients and height to neck circumference ratio may be used to predict difficult intubation. More studies needed to test the effectiveness of height to neck circumference ratio for predicting difficult intubation.

01AP04-11**TotalTrack VLM: our first experience**

Hinojal Blanco I., González Carrasco F.J., Casas Vila I.,

Díaz Jover R., Moral Garcia V.

Hospital de la Santa Creu i Sant Pau, Dept of Anaesthesiology & Pain Medicine, Barcelona, Spain

Background and Goal of Study: More than 30% of deaths related with anaesthetic act are related with bad ventilation. Nowadays, Macintosh Laryngoscope is the election technique in airway management. The conjunction of anatomic factors and external situations can result in the worst of the situations to the anaesthesiologist who manages the airway: a non-ventilable and non-intubable patient. Totaltrack VLM is a hybrid device that combines a supraglottic device with an intubation channel, that lets ventilation and intubation at the same time, under operator view.

The goal of this retrospective analysis is analysing hemodynamic response and ventilation efficiency after the use of TotalTrack VLM, and operator satisfaction.

Materials and Methods: Retrospective analysis of a 10 case series in patients admitted to surgery.

Results and Discussion: Since TotalTrack VLM was acquired in our center, it has been used in 10 patients admitted for elective surgery. Systolic and diastolic pressure increasing after intubation (1 and 5 minutes later) is less than 1%, and so it happens regarding cardiac frequency. Hypertension and tachycardia has been described as usual hemodynamic response in literature as consequence in laryngoscopy. We consider that TotalTrack, which insertion procedure is similar to a laryngeal mask, is a correct alternative to avoid this response.

In this series, in 9/10 of the cases we get correct ventilation (saturation over 92%), and successful intubation in 9/10 cases. After intubation with TotalTrack device, 100% patients were ventilated correctly. Operator satisfaction was positive in 9/10 cases.

Conclusion(s): This retrospective analysis study demonstrated that the Totaltrack VLM facilitates tracheal intubation while allowing adequate oxygenation and ventilation when securing an airway. However, considering the novelty of this particular device, further research is warranted to determine its usefulness in patients with known or predicted difficult airways.

References:

1. Acha Gandarias P. Advances in airway management: the future is here. Rev Esp Anestesiol Reanim. 2016 Jan;63(1):1-2. doi: 10.1016/j.redar.2015.10.006.
2. Niforopoulou P, Pantazopoulos I, Demestihia T, Koudouna E, Xanthos T: Video-laryngoscopes in the adult airway management: a topical review of the literature. Acta Anaesthesiol Scand. 2010, 54 (9): 1050-1061. 10.1111/j.1399-6576.2010.02285.x.

01AP05-1**Bariatric surgery, sleep apnea and pulmonary hypertension**

Donat A.¹, Stalla-Bourdillon A.¹, Bouattour K.¹, Pourcher G.²,

Roisman G.³, Mercier F.J.¹

¹Hôpital Antoine Bécclère - Faculté de Médecine Paris XI, Dept of Anaesthesiology, Clamart, France, ²Hôpital Antoine Bécclère - Faculté de Médecine Paris XI, Dept of Surgery, Clamart, France, ³Hôpital Antoine Bécclère - Faculté de Médecine Paris XI, Sleep Laboratory, Clamart, France

Background and Goal of Study: Prevalence of obstructive sleep apnea syndrome (OSAS) is high (up to 70%) in bariatric population[1]. OSAS is described as a risk factor of group 3 pulmonary arterial hypertension (PAH)[2]. No guidelines are available for preoperative PAH detection in patients with OSAS. Our study assesses the prevalence of PAH in this context and the benefit of its potential systematic screening by trans-thoracic cardiac ultrasound before bariatric surgery.

Materials and Methods: We have conducted a retrospective study over a period of 13 months in consecutive patients who underwent bariatric surgery in our institution. Preoperative screening for OSAS was performed routinely by polysomnography. A trans-thoracic cardiac ultrasound was performed when severe OSAS was detected or in the presence of suggestive factors of associated cardiac disease (arterial hypertension, diabetes, chronic kidney failure or heart murmur on examination). Ultrasound screening of PAH was based on 2015-ERS recommendations by analyzing the tricuspid regurgitation velocity peak and the search for indirect signs[3].

Results and Discussion: During the study period, 422 patients underwent bariatric surgery and 245 patients had a preoperative trans-thoracic cardiac ultrasound: 197 were performed in the context of severe OSAS and 48 for the other previously cited reasons. Only 5 suspected cases of PAH were detected with intermediate probability grades: Among these 5 cases, 4 were associated with severe OSAS and 1 associated with moderate OSAS. None of these 5 patients showed any clinical sign justifying a right catheterization examination or a specific anesthetic management. These 5 patients did not experience any perioperative anesthetic or surgical complications.

Conclusion: PAH prevalence appeared to be low whether or not severe OSAS was present in this bariatric surgery population. Anesthetic management was not modified and perioperative morbidity was not increased in our patients when PAH was detected. In this context, carrying out a systematic preoperative screening of PAH by trans-thoracic cardiac ultrasound may not be useful.

References:

1. Minai et al. Frequency and impact of pulmonary hypertension in patients with obstructive sleep apnea syndrome. AJC 2009
2. Simonneau et al. Updated clinical classification of pulmonary hypertension. JACC 2013
3. Galìè et al. ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. Eur Respir J 2015

01AP05-2**Change of concepts in protective ventilation during general anesthesia: the concept of intraoperative protective ventilation changes according to the times and the level of knowledge**

Kim S.H., Na S., Kim J.

Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: In spite of evolution of lung-protective ventilation strategies during general anesthesia, it remains unclear what the most appropriate ventilation for patients under general anesthesia. The purpose of this study is to elucidate the trends of intraoperative ventilation over ten years and to find out whether the level of knowledge leads to change of clinical practice.

Materials and Methods: All patients who underwent surgery under general anesthesia at a university hospital in 2004 and 2014 were included in this retrospective analysis, and patients were divided into 2004 group and 2014 group. To match the patients according to sex and height, we performed propensity matching with two groups, and 817 patients in each group were included for final analyzing. We also carried out a survey designed to assess the clinician's knowledge on lung protective ventilation, and actual mechanical ventilation practices including tidal volume, positive end expiratory pressure (PEEP). Total 82 anesthesiologists in a university hospital participated in the survey in 2014.

Results and Discussion: The mean tidal volume per ideal body weight (IBW) were bigger in 2004 group than 2014 group (9.9 ± 1.4 mL/kg vs. 8.4 ± 1.0 mL/kg, $p < 0.001$). Usage of PEEP was also increased (0.1% vs. 49.5%, $p < 0.001$) for ten years. Especially in obese patients whose body mass index is more than 30, tidal volume per IBW was reduced (10.7 ± 1.5 mL/kg vs. 8.9 ± 0.9 mL/kg, $p < 0.001$), and the usage of PEEP was increased (0.1% vs. 55.3%, $p < 0.000$) (table1). On survey, there was a significant difference in the usage of PEEP in laparoscopic surgery according to whether the anesthesiologists knew about lung protective ventilation or not (62.5% vs. 95.8%, $p = 0.012$).

year	number of patients	tidal volume per ideal body weight (mL/kg)	tidal volume per absolute body weight (mL/kg)	tidal volume (mL)	usage of PEEP, number of patients (percent)
2004	817	9.9 ± 1.4	9.1 ± 1.3	559.6 ± 80.9	1 (0.1)
2014	817	8.4 ± 1.0	7.7 ± 1.1	475.6 ± 59.5	381 (49.5)
p-value		<0.001	0.010	<0.001	<0.001
2004 (body mass index >30)	32	10.7 ± 1.5	7.0 ± 1.1	583.1 ± 99.1	0 (0)
2014 (body mass index >30)	38	8.9 ± 0.9	5.8 ± 0.7	504.5 ± 74.5	21 (55.3)
p-value		<0.001	<0.001	<0.001	<0.001

[Table1]

Conclusion(s): Intraoperative lung protective ventilation strategies have become more widespread in 2014 compared to 2004. We believe this trend is related to the universalization of knowledge of lung protective ventilation. This highlights the need for continued investigation and education regarding the potential benefits of intraoperative lung protective ventilation.

01AP05-3**Comparison between Standard Preoxygenation and Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE) in Difficult Airway during Induction of Anaesthesia**

Belamaric Z., Nagore D., Jimeno J.P., Bilbao A., Garth T., Harky A. Barts Heart Centre, St. Bartholomew's Hospital, Dept of Anaesthesiology & Intensive Care, London, United Kingdom

Background and Goal of Study: Securing the airway can prove to be a challenge for the Anaesthetist and may require use of different tools and change of strategy. In this phase it is pivotal to improve the oxygenation and prevent desaturation.

We compared THRIVE and standard preoxygenation during induction of anaesthesia in patient with predicted difficult airways.

Materials and Methods: 30 adult patients, undergoing elective surgery in whom the presence of difficult airway was known or strongly anticipated based on unfavourable predictors (BMI >35, decreased thyro-mental distance, limited mouth opening, limited neck extension, Mallampati score ≥ 3) were randomised into two groups:

1. Standard 5 minutes pre-oxygenation (100% FiO₂) + mask ventilation between intubation attempts
2. THRIVE: 5 minutes pre-oxygenation with THRIVE (100% FiO₂) at a rate of 60 l/min + continuous THRIVE until a definitive airway was secured. Induction was standardised for both groups as Fentanyl (2 mcg/kg) + Propofol (2 mg/kg) + Rocuronium (0.6 mg/kg) with background maintenance of Propofol infusion (0.3 mg/kg/min). Intubation was performed in all 30 cases by the same Consultant Anaesthetist. Primary end-point of the study was the number of desaturation episodes (SpO₂ <92%) until a definitive airway was secured.

Secondary end-points included the time to secure the airway, adverse effects (airway trauma, bradycardia, hypo/hypertension) and the number of laryngoscopy attempts.

Results and Discussion: The 2 groups were similar in demographic parameters.

Mean baseline SpO₂ was 97.8 % in both groups.

The mean time to secure the airway was 161.9 ± 49.6 sec for THRIVE and 166.7 ± 54.7 sec for the Standard group (p value = 0.80).

There was 1 adverse effect in THRIVE and 4 in Standard group (p value = 0.24). The mean number of laryngoscopy attempts was 1.73 in THRIVE and 2 in Standard group (p value = 0.5).

The number of desaturation episodes was significantly different: no episodes for THRIVE vs. 4 episodes for the Standard group (p value = 0.03).

Conclusion(s): Although there was no statistically significant difference in the time or number of attempts to secure the airway or in the incidence of adverse effects, THRIVE significantly reduced the number of desaturation episodes. In our opinion THRIVE may prove to be an useful tool especially in cases of unexpected difficult intubation.

01AP05-4**Diabetes mellitus affects the respiratory mechanics and the ventilation perfusion ratio**Fodor G.H.¹, Balogh A.L.², Sudy R.², Vigh E.², Petak F.¹, Babik B.²¹University of Szeged, Dept. of Medical Physics and Informatics, Szeged, Hungary, ²University of Szeged, Dept of Anaesthesiology & Intensive Care, Szeged, Hungary

Background: Diabetes mellitus leads to several complications as a consequence of micro- and macro vascular destruction. Chronically increased serum glucose level causes structural and functional alterations of matrix proteins. The lung could be one of the affected organs by diabetic complications due to the large amount of collagen in the extracellular matrix. The pulmonary vessels are also concerned in diabetes mellitus and could enhance the hypoxic pulmonary vasoconstriction (HPV) due to the vascular remodelling. Our aim was to investigate the ventilation and perfusion matching and the alterations in the mechanical properties of the respiratory system in patients with diabetes mellitus.

Methods: Three groups of patients undergoing elective cardiac surgeries were studied in a prospective descriptive manner: patients with type two insulin dependent (IDDM, n=20) or insulin non-dependent (NIDDM, n=20) diabetes mellitus and the control group by propensity score matching (CTRL, n=20). The pulmonary shunt fraction (Qs/Qt) and the Horowitz-quotient (HQ) were calculated from arterial and central-venous blood samples. The airway resistance (R_{aw}), the tissue damping (G), and the tissue elastance (H) were assessed from the forced oscillatory input impedance spectra of the respiratory system by model fitting.

Results: The Qs/Qt was significantly higher in the group CTRL ($10.1 \pm 0.4\%$) compared to the IDDM group (6.5 ± 0.5 [SE]%, $p < 0.001$), however there was no statistically significant difference between the two diabetic groups (NIDDM: $8.8 \pm 0.5\%$). There was no difference in HQ among the protocol groups. R_{aw}, G and H were significantly higher in the IDDM (10.6 ± 1.6 cmH₂O.s/l, 17.1 ± 2.9 cmH₂O/l and 37.8 ± 3.8 cmH₂O/l) and in the NIDDM (5.1 ± 0.9 cmH₂O.s/l, 9.6 ± 1.4 cmH₂O/l and 29.6 ± 2 cmH₂O/l) groups compared to those obtained in the CTRL group (2.5 ± 0.14 cmH₂O.s/l, 4.7 ± 0.34 cmH₂O/l and 20.7 ± 1.2 cmH₂O/l, $p < 0.05$).

Conclusions: The decreased intrapulmonary shunt fraction in IDDM may develop as a consequence of the increased HPV. Although, HPV has a beneficial effect for the gas exchange in long-term hyperglycaemia, it leads to deterioration in cardiac function because of higher afterload. The uniform worsening in the mechanical properties of the respiratory system manifested in the increased work of breathing.

These findings facilitate the special need for choosing specific ventilation strategy in patients with diabetes mellitus.

Sponsored by OTKA-NKFI 115253 and GINOP-2.3.2-15

01AP05-5

Effects of hyperbaric oxygen therapy (HOT) in the treatment of severe soft tissue infections

Freitas Silva R., Rosa P., Melo F., Gomes A., Cabral T., Lima C.
Divino Espírito Santo Hospital, Dept of Anaesthesiology, Ponta Delgada, Portugal

Background and Goal of Study: The Hyperbaric Medicine Service (HMS) is part of the Anesthesiology Department of Divino Espírito Santo Hospital, where one of the few devices available in Portugal is located. The doctors collaborate in the consultations and follow the patients that are indicated for the treatment with hyperbaric oxygen therapy (HOT).

Necrotizing soft tissue infections, such as necrotizing fasciitis, fournier's gangrene and gangrenous cellulitis, can progress rapidly to sepsis and multi-organ failure, with very high mortality rates. This study aims to demonstrate the effect of the use of HOT in patients with necrotizing soft tissue infection.

Materials and Methods: A retrospective study was carried out in which 12 patients, referred to the Hyperbaric Medicine Service (HMS) between January 2012 and September 2014, were diagnosed with necrotizing fasciitis (7), fournier's gangrene (3) or gangrenous cellulitis (2).

Results and Discussion: Of the referenced users only 8 completed HOT, performing on average 18 sessions (in each session they fulfilled 90 min of O₂ to 100% to 2.4 ATM). The remaining 4 patients, despite presenting OTH criteria, did not performed it because of need for ventilatory support (2), refusal of treatment (1) and lack of conditions to perform the treatment - long term oncologic disease (1). All patients underwent surgical debridement and systemic wide-spectrum antibiotic therapy. In the users that completed the HOT sessions, there was a favorable healing evolution with a marked improvement in the affected areas, reinforcing the benefits of the blood supply with greater content in oxygen.

One patient did not completed the treatment because he was transferred to his origin country, resulting in a loss of follow-up.

Conclusion: A multidisciplinary approach using HOT, accompanied by surgical debridement and adequate antibiotic therapy proved to be quite effective in controlling the pathologies in question, optimizing the conditions of local healing and the control of the systemic disease. The use of negative pressure and plastic surgery can be advantageous for the surgical reconstruction of the affected areas.

References: 1. MATHIEU, Daniel - Handbook on Hyperbaric Medicine. Netherlands: Springer, 2006. ISBN 10 1-4020-4448-8.

01AP05-6

Evaluation of regional lung ventilation in different surgical positions with electrical impedance tomography

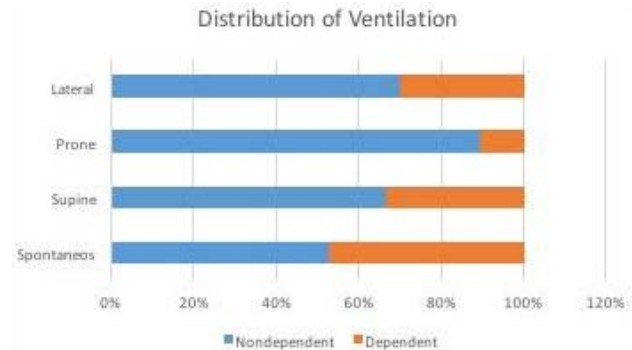
Goncalves A.S., Amorim Ribeiro R.A., Souza Nogueira de Abreu L., de Almeida Macruz T., Ferez D., Falcao L.F.d.R.,
Cardiopulmonary Physiology Study Group
Federal University of Sao Paulo, Dept of Anaesthesiology, Sao Paulo, Brazil

Background and Goal of Study: Understanding how mechanical ventilation changes air distribution in the patient's lung is essential to the anaesthetist's practice. A skewed distribution can lead to ventilation/perfusion mismatch, and patients submitted to surgeries in various different positions are particularly prone to these complications.

Materials and Methods: Ten healthy patients submitted to elective surgery were monitored with an Electrical Impedance Tomography during the perioperative period. The patients were positioned to each procedure and the

assistant anaesthetist was blinded to the results of the EIT monitoring. The ventilator was set to $V_T=8$ mL/kg of predicted body weight, PEEP=5 cmH₂O, and FiO₂=50%. V_T and PEEP were kept constant despite changes in patient position and no recruitment maneuvers were. The proportion of ventilation in the Nondependent region (NDR) and Dependent region (DR) was measured during spontaneous ventilation in supine and during mechanical ventilation in supine, prone and lateral positions.

Results and Discussion: Before sedation the distribution of ventilation was even between NDR (53%) and DR (47%). As soon as anaesthesia started there was a noticeable shift of ventilation to NDR. The NDR/DR distribution of ventilation was 66%/34% in supine, 89%/11% in prone and 70%/30% in lateral position.



[Figure 1: Changes in the regional lung ventilation during spontaneous ventilation and during mechanical ventilation in supine, prone and lateral positions.]

Conclusion(s): Maintaining mechanical ventilation settings during changing surgical positions, without recruitment maneuvers, can lead to a shift of ventilation distribution to NDR in supine, prone and lateral positions. Further studies are needed to find maneuvers that can promote a less skewed distribution of ventilation in surgical patients.

01AP05-7

Is there any relationship between oxygen reserve index (ORI) and arterial partial pressure of oxygen? A preliminary study in surgical patients

Duca A.¹, Del Rio E.¹, Fuentes I.¹, Incertis R.¹, Llau J.¹, Ferrandis R.²
¹Hospital Clinico de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²Hospital la Fe, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

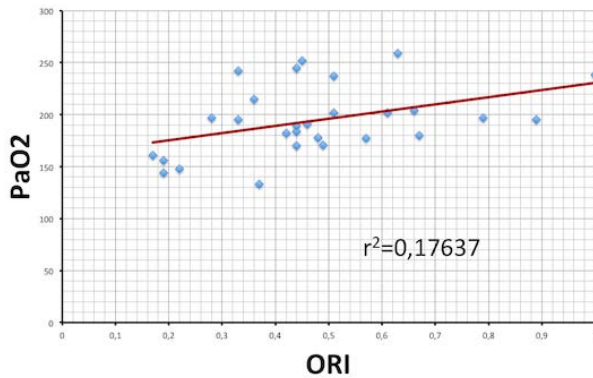
Background and Goal of Study: The Oxygen Reserve Index (ORI) is not a measure of PaO₂, but a non-dimensional index ranging between 1.0 (high reserve of oxygen) and 0.0 (no oxygen reserve). It has been proposed that the measurement of ORI could add information to SaO₂ in order to anticipate a desaturation or to assess a hyperoxic situation. The objective of this study is to assess the relationship between ORI and PaO₂.

Materials and Methods: This study included patients with an arterial line (cannulated as current practice). They were monitored with the co-oxymetry monitor Radical7 (Masimo, Irvine, CA). During the perioperative period we only took the samples we needed to monitor from the gasometry results, comparing with the ORI values. To search the correlation between ORI and PaO₂, a regression analysis was performed (r^2) using Microsoft Excel 2011â (Microsoft Corporation. No other statistical analysis was necessary.

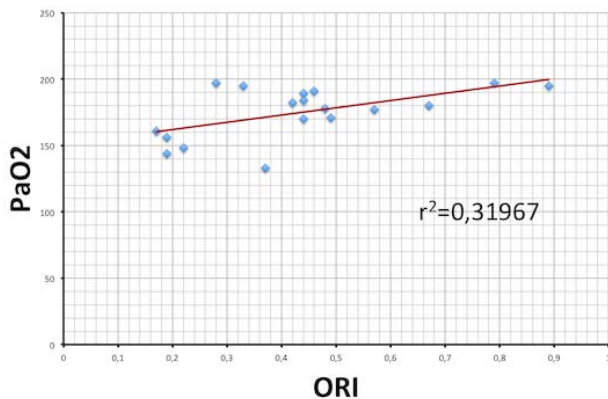
Results and Discussion: 28 ORI values and PaO₂ measurements were obtained from intraoperative data collection in 13 patients (7M-6F, 2 ASA IV-8 ASA III-3 ASA II). All patients had SaO₂ \geq 97%.

Range of PaO₂ values was 144-259 mmHg; range of ORI values was 0,17-1,00. Regression study showed that there was no good global ORI-PaO₂ ratio ($r^2=0,17637$) (Fig 1). Although it was higher if we consider only PaO₂ values <200 mmHg (n=18) ($r^2=0,31967$, PaO₂ range 144-195, ORI range 0,17-0,89) (Fig 2), it does not reach a suitable correlation.

Individual results did not show that high values of ORI (even >0.75) suggested necessarily a hyperoxic state.



[Figure 1. Global ORI-PaO₂ correlation]



[Figure 2. ORI-PaO₂ correlation only for PaO₂ < 200 mmHg]

Conclusion(s): These results suggest that ORI could be useful to anticipate the patient desaturation. The correlation between ORI and PaO₂ values is not suitable, although more studies are needed to fully assess its usefulness.

References: Anesth Analg 2016;123:626-33. Anesthesiology 2016;124:779-84.

01AP05-8

Isocapnic hyperventilation provides early extubation after sevoflurane anaesthesia for major ENT surgery: a pilot study

Hallén K., Pether J., Stenqvist O., Ricksten S.-E., Lindgren S.
Sahlgrenska Academy, Gothenburg University, Dept of Anaesthesiology & Intensive Care, Gothenburg, Sweden

Background: Isocapnic hyperventilation (IHV) is a method that shortens time to extubation after inhalation anaesthesia by increasing end-tidal CO₂ during hyperventilation. In a pilot study on patients undergoing sevoflurane anaesthesia for major ear-nose-throat (ENT) surgery, we evaluated a technique of connecting an external CO₂ source to the breathing circuit of an anaesthesia apparatus.

Methods: Fifteen adult patients weighing 76±12 kg were intubated and mechanically ventilated during surgery and subjected to IHV during weaning. From normo-ventilation and low-flow sevoflurane anaesthesia, HV was achieved by doubling minute volume and increasing fresh gas flow to 10 L/min. Respiratory rate was increased from 12 to 20 min⁻¹. CO₂ was delivered (DCO₂) to the inspiratory limb of a standard breathing circuit via a mixing box. The DCO₂ was dosed according gender and weight based on a nomogram calculated from a previous mechanical lung model study. Time to extubation and eye-opening was recorded. Respiration and circulation were monitored by blood-gas analysis, spirometry and arterial blood-pressure. Cognition tests were performed at the preoperative evaluation and at arrival in the post-anaesthesia care unit (PACU) and repeated at 20, 40 and 60 min after arrival.

Results: A DCO₂ of 285±45 ml/min was necessary to achieve isocapnia during HV. The corresponding FICO₂-level remained stable at 3.0±0.3%. Using IHV, time from turning of the vaporizer (1.3±0.1 MAC) to extubation (0.2±0.1 MAC) was 11.3±1.8 min (range 8-14 min) after 342±131 min (6 ±2 h, range 3.5 - 11 h) of sevoflurane anaesthesia. PaCO₂ and ETCO₂, was 5.1±0.4 kPa

and 5.1±0.4 %, respectively, before IHV and PaCO₂ was 6.2±0.5 kPa directly after extubation. By arrival in PACU the PaCO₂ and ETCO₂ was 5.5±0.6 kPa and 5.0±0.8 % respectively. Postoperative psychomotor and cognition recovery tests at the PACU returned to 83-100 % of preoperative status within 60 min.

Conclusion: In this pilot study of isocapnic hyperventilation on ENT surgery patients, we were able to extubate the patients shortly after discontinuing long-term sevoflurane anaesthesia. Perioperatively we did not find clinically relevant adverse effects on respiration, circulation or cognition. The alternative method for isocapnic hyperventilation described can potentially be used with the intention to decrease emergence time from inhalation anaesthesia.

References: Hallén K et al 2016 ACTA Anaesthesiol Scand (1,2)

01AP05-9

Spirometry: is it a reliable morbidity and mortality predictor in morbid obese patients who undergo a bariatric surgery?

Tarraga Honrubia C.¹, Salas Rezola E.¹, Martinez A.R.¹, Aristy C.¹, Alvarez M.¹, Mas-Serrano P²

¹Hospital General Universitario de Alicante, Dept of Anaesthesiology, Alicante, Spain, ²Hospital General Universitario de Alicante, Dept of Clinical Pharmacology, Alicante, Spain

Background and Goal of Study: Morbid obesity (MO) marks a huge determinant for anesthetic management as well as an increase in surgical risk. Lung function tests are part of routine preoperative testing for patients who undergo bariatric surgery (BS), due to the association between MO and respiratory disorders which may be related with an increased risk of postoperative respiratory complications (PRC). This study's main objective was to consider the validity of lung function test to predict the incidence of PRC after surgery. **Materials and Methods:** Clinical files of 178 patients who underwent BS between 2011 and 2015 were reviewed. They were classified according to the Obesity Surgery Mortality Risk Score (OR-MRS), with A (0-1 risk factors) being low risk; B (2-3), moderate risk; and C (4-5), high risk. FEV₁, FVC and Tiffeneau Index (IT) were gathered from preoperative spirometry, and patients were classified in accordance with the GOLD score for COPD (stage I: mild; II: moderate; III: severe; IV: very severe). Values for preoperative pO₂ and pCO₂ were also documented, as well as neck circumference and the presence of Chronic Obstructive Pulmonary Disease (COPD), asthma, Sleep Apnea Syndrome, smoking and CPAP treatment. Lastly, respiratory complications 6 months and 1 year after surgery were registered.

Results and Discussion: Out of 178 patients (45 males and 133 females, with a mean BMI of 49.3 Kg/m²), 6 presented PRC (3 at 6 months, and 3 after 1 year), and there were 2 deaths unrelated to the study. Patients with GOLD ≥1 were associated with an increased incidence of immediate complications, from 0.6% to 12.5% (Sn = 0.67, Sp = 0.92, PPV = 0.125 and NPV = 0.99; p<0.05). There was no greater incidence of late complications in these patients (p>0.05). Patients with IT <0.7 did not present an increase in immediate or late complications (Sn = 0.33, Sp = 0.94, PPV = 0.08 and NPV = 0.98; p>0.05). However, a 4.3% rise of immediate PRC was observed in patients with BMI ≥50 Kg/m² (p<0.05).

Conclusions: We concluded that spirometry is not a good predictor of both immediate and late PRC. Statistically significant differences were seen for prediction of immediate PRC, but only in patients with respiratory symptoms suggestive of COPD (GOLD ≥1) and for BMI ≥50kg/m² as an independent risk factor.

01AP05-10**Inhaled budesonide does not improve the incidence and severity of acute mountain sickness**

Macholz F.¹, Sareban M.², Fried S.³, Bärtsch P.³, Mairbörl H.³, Berger M.M.¹

¹University Hospital Salzburg, Dept of Anaesthesiology & Intensive Care, Salzburg, Austria, ²University Hospital Salzburg, Department of Sports Medicine, Salzburg, Austria, ³University Hospital Heidelberg, Department of Sports Medicine, Heidelberg, Germany

Acute mountain sickness (AMS) is a syndrome of neurologic symptoms, experienced by non-acclimatized individuals at altitudes >2500m. The cardinal symptom is headache, accompanied by anorexia, nausea, dizziness, and sleep disturbances. AMS is thought to have its origin in the brain. However, recent data indicate that the lung may play a primary role in the pathophysiology of AMS by releasing pathogenic signals that induce inflammatory and oxidative processes in the brain.

The present prospective, randomized, double-blind and placebo-controlled trial investigated whether inhalation of the corticosteroid budesonide improves the incidence and severity of AMS at 4559m. Fifty-one subjects were randomized into 3 groups (n=17 per group) to receive either placebo or budesonide at 200 or 800 µg twice/day. Inhalation was started 1 day prior to the ascent from 1130m to 4559m in <20h with an intervening overnight stay at 3611m. AMS was evaluated by the Lake Louise score (LLS) and the AMS-C score of the Environmental Symptom Questionnaire. Individuals were scored AMS-positive when they had a LLS ≥5 and an AMS-C score ≥0.70. Pulmonary artery systolic pressure (PASP) was assessed by transthoracic echocardiography, and plasma and 24h-urine concentrations of ACTH and cortisol, respectively, were measured to evaluate systemic effects of inhaled budesonide. Capillary blood samples were analysed for the determination of PO₂. The study was approved by the Ethical Committee Salzburg, Austria, and the Ethical Committee of the University Torino, Italy. Statistics: 2-Way-RM-ANOVA. Data are given as mean±SD.

Ascent to high-altitude decreased capillary PO₂ from 84±7 mmHg to 47±5mmHg (P<0.001), and increased AMS-scores without a difference between the 3 study groups (for placebo, budesonide 200 and 800 µg b.i.d.: incidence 44% vs 50% and 63%; LLS: 6.4±4.0 vs 6.6±2.8 and 8.2±3.5; AMS-C: 0.8±0.8 vs 1.0±0.9 and 1.3±1.1 after the first night at 4559m (all P>0.23). At high-altitude PASP increased about 2-fold and was not affected by budesonide (P>0.25). Neither ACTH nor free cortisol in the 24-h urine samples differed significantly between the 3 study groups (all P>0.41).

This study demonstrates that inhalation of budesonide has no beneficial effect on the incidence and severity of AMS after active and rapid ascent from low-altitude to 4559m. Therefore, budesonide cannot be recommended of prevention of AMS. Our data do not support a primary role of the lung in the pathophysiology of AMS.

01AP05-11**Inflammatory gene polymorphism and prolonged mechanical ventilation after liver transplantation: preliminary study**

Kim T.L., Kim E.J., Choi S.H.

Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Liver transplantation (LT) is the most effective treatment option for liver failure patients. As most LT recipients are subject to postoperative mechanical ventilation in pursuit of hemodynamic stability, the duration of mechanical ventilation tends to be more prolonged in post-LT patients compared to other post-surgical patients. Prolonged mechanical ventilation (PMV) should be avoided for it is associated with longer ICU stay, higher infection and increased mortality rate. The aim of this study was to investigate clinical risk factors and inflammatory gene polymorphism related to PMV in LT recipients, and to develop clinico-genetic model for predicting PMV.

Materials and Methods: Forty-six adult patients scheduled for LT surgery were enrolled. PMV was defined as more than 24 hours of mechanical ventilator care after surgery. 11 polymorphisms from 9 candidate genes known to be associated with PMV and other respiratory complications were inquired. Potentially significant perioperative variables and candidate gene polymorphism from univariate analysis were entered into multivariate logistic regression analysis.

Results and Discussion: Of 46 patients, 8 patients (17%) experienced PMV. Multivariate analysis using clinical parameters showed male gender, height, weight, child-pugh score, ASA criteria, intraoperative urine output, preoperative neutrophil (%) and hematocrit to be associated with PMV (P<0.05). Among the candidate genes, NFE2L2 was selected as the predictor for PMV (P<0.05) from multivariate analysis. However, none of the parameters showed significance in developing profound clinico-genetic model for predicting PMV.

Conclusion(s): As clinical parameters and candidate inflammatory gene polymorphism showed relation to PMV after LT, further study is needed for establishing profound clinico-genetic model for PMV in post-LT patients.

References: O'Mahony DS, Glavan BJ, Holden TD, Fong C, Black RA, Rona G, Tejera P, Christiani DC, Wurfel M. Inflammation and immune-related candidate gene associations with acute lung injury susceptibility and severity: A validation study. PLoS ONE. 2012;7:e51104

01AP06-1**Hypnosis as an adjuvant treatment in open septorhinoplasty**

Ozgunay S.E.¹, Ozmen S.², Karasu D.¹, Taymur I.³, Yilmaz C.⁴

¹University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Dept of Anaesthesiology & Intensive Care, Bursa, Turkey, ²University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Otorhinolaryngology Dept, Bursa, Turkey, ³University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Dept of Psychiatry, Bursa, Turkey, ⁴University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Department of Pulmonary Diseases, Bursa, Turkey

Background and Goal of Study: Hypnosis is a nonpharmacological procedure with proven effectiveness as an adjuvant therapy for postoperative pain. A pilot study is presented here on the investigation of the effects of pre-operative hypnosis on haemorrhage and pain in open septorhinoplasty.

Materials and Methods: This prospective, randomised pilot study has been carried out with 22 patients undergoing open septorhinoplasty under general anaesthesia. The patients were equally divided into two groups. One group of patients, depicted as the hypnosis group (HG,) were hypnotised in 3 sessions carried out on different days before the operation. The patients in HG were also instructed on autohypnosis for postoperative analgesia. The other 11 patients constituted the control group (CG). In all patients remifentanyl infusion, controlled on the basis of the mean blood pressure, was maintained intraoperatively. Blood pressure, heart rate and oxygen saturation were recorded. Also, the level of bleeding at the 30, 60, 90 and 120th minutes was assessed according to a scoring scale on surgical field quality adapted by Boezaart et al from Fromme et al. Pain killer use and verbal analog scale (VAS) records were evaluated at the postoperative 0, 1, 2, 3, 4, 8, 16, 24 hours. Statistical analyses were carried out by the student T-test and the Mann Whitney test. A p value of <0.05 as accepted as statistically significant.

Results and Discussion: Haemodynamic parameters followed in the preoperative stage, and the data on the quality of the surgical field and postoperative analgesic requirement did not differ significantly between the HG and the CG. However, intraoperative total remifentanyl use was significantly lower in the HG (p<0.034). Also, the postoperative VAS scores were significantly lower at the 2nd (p<0.028) and the 3rd hours (p<0.047) in the HG as compared to the CG.

Conclusion(s): Preoperative use of hypnosis as an adjuvant therapy decreased the intraoperative remifentanyl requirement and the postoperative pain. However, the use of hypnosis did not affect the quality of the surgical field. The results have indicated that use of adjunctive hypnosis has beneficial effects on the patient peri- and postoperatively.

References: Montgomery GH, David D, Winkel G, Silverstein JH, Bovbjerg DH. The effectiveness of adjunctive hypnosis with surgical patients: a meta-analysis. Anesth Analg 2002;94:1639-45.

01AP06-2

Catecholamine secreting tumors - an anesthetic challenge

Carreteiro J., Alves D., Costa Martins I., André A.I., Palma Mira F., Aguiar I.

Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal

Background: Catecholamine secreting tumors present particular challenges to anesthesiologists¹. Intraoperative success relates to proper preoperative optimization, which should be ensured.

Case report:

Case 1: 45-year-old female with paraspinal mass invading T1-T2 was proposed for tumor excision. Intraoperative mass mobilization was associated with marked hemodynamic instability. She was admitted to ICU and a functioning paraganglioma was diagnosed. After stabilization and 9-day course of α and β blockers, she underwent angiographic embolization of the mass. Nevertheless, during the procedure, initial mobilization of the tumor was still accompanied by adrenergic manifestations.

Case 2: 64-year-old female presented with repeated syncope, paroxysmal tachycardia and resistant hypertension. The study revealed a suprarenal mass suggestive of pheochromocytoma. Preoperatively, a 30-day therapy with α and β blockers was maintained. Surgical procedure progressed uneventfully. A week later symptoms recurred and a new study revealed a functioning paraganglioma. The second intraoperative period went with marked hemodynamic instability aggravated by accidental laceration of the left renal vein.

Case 3: A 26-year-old male underwent adrenalectomy for pheochromocytoma. Preoperatively, undertook 21 days of α -blocker therapy for hemodynamic stabilization. Intraoperatively, remained hemodynamically stable with a hypertensive peak during surgical manipulation of the tumor.

All patients developed hypotension after tumor isolation from circulation, requiring vasopressors whose effectiveness allowed an uneventful postoperative ICU period.

Discussion: There must be a high degree of suspicion towards posterior mediastinum and periaxillary masses as clinical presentation can be atypical². Furthermore, intraoperative mortality associated with catecholamine secreting tumors not previously identified reaches 50%, being reduced to less than 2% with adequate preoperative optimization.

References:

1. Ramakrishna H. Pheochromocytoma resection: Current concepts in anesthetic management. *J Anaesthesiol Clin Pharmacol.* 2015;31:317-323;
2. Lenders JW et al. Pheochromocytoma and paraganglioma: an Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab.* 2014;99:1915-1942

Learning points: Correct preoperative stabilization and anticipation of intraoperative problems with low threshold for intervention prove to be essential to a favorable outcome in such tumors.

01AP06-3

General anesthetic management of Prader-Willi syndrome patient undergoing bariatric surgery: a case report

Lijnzaat L., Rodrigues J., Pelicano Paulos J., Romão C., Silva Pinto J.M., Fragata I.

Central Lisbon Hospitalar Centre, Dept of Anaesthesiology, Lisbon, Portugal

Background: Prader-Willi syndrome (PWS) is a rare genetic disorder with severe hypotonia during the first years, hyperphagia with a risk of morbid obesity, intellectual and behaviour impairment. They can also have sleep apnea with high pain threshold, temperature instability, hypothyroidism and growth hormone deficiency. Forehead is narrow, hands and feet small, height short and skin color is light.^{1,2,3}

Anaesthetic concerns of PWS include morbid obesity and sleep apnea, difficult intravenous (IV) access and airway management, risk for perioperative respiratory failure, primary myocardial involvement, aggressive behavior, convulsions, and disturbances in thermoregulation as well as glucose intolerance.^{2,3}

Case report: 17-year-old PWS female patient, with a BMI of 89 kg/m², who underwent biliopancreatic diversion with duodenal switch. The patient had already undergone surgery 12 years ago (amygdalectomy and adenoidec-

tomy), and the only information we had is that she went post-operatively to an intensive care unit. A C-MAC video laryngoscope was the first option for intubation, and a total intravenous anesthesia was the choice for this case. Intubation was performed successfully after 3 attempts by the same anesthesiologist. Due to the difficulty with the insertion of an IV access, it was decided to place a central venous line and also an arterial line for monitoring. The surgery was uneventful. The patient was transferred to the Intensive care unit, where extubation was performed after a few hours.

Discussion: PWS patients can now reach the 5th decade if extreme obesity is avoided¹. Bariatric surgery can be performed for weight control.² Anesthesia is certainly a challenge in these cases. Airway management can be challenging, as well as the IV access. There's also a risk of postoperative complications that the anesthesiologist should be aware.

References:

1. Irizarry KA, Miller M, Freemark M, et al. *Advances in Pediatrics*, 2016 Aug, 63 (1): 47-77
2. Alqahtani AR, Elahmedi MO, Awadh R. Al Qahtani AR et al. *Surgery for Obesity and Related Diseases*, 2016 Jan, 12(1): 100-110
3. Lee JY, Cho KR, Kim MH, et al. *Korean J Anesthesiol*, 2012 Jul; 63(1): 85-86.

Learning Points: Patients like this are a challenge for the anesthesiologist, and planification is the most important thing to avoid complications. This will help to maintain a calm environment in the operating room, which will help the patient and all the staff.

01AP06-4

Huntington's disease: an anaesthetic challenge

Vidal Seoane M., Perez de Lis Novo M., Silva Carballal I., Pensado Castiñeiras A.

Complejo Hospitalario Universitario A Coruña, Dept. of Anaesthesiology and Perioperative Care, A Coruña, Spain

Background: Huntington's chorea is a rare hereditary disease of the nervous system that causes movement, cognitive and psychiatric disorders(1). The most ominous motor symptom is dysphagia; dysfunction of pharyngeal muscles increases the risk of bronchial aspiration(2). These patients present high-risk of gastric content aspiration, prolonged apnoea, intense shivering and generalized tonic spasm, altered response to barbiturates and succinylcholine and increased sensitivity to midazolam and anticholinergics(3).

Case report: A 74-year-old male diagnosed with Huntington's disease, presenting choreiform movements of the four limbs and mild dementia, was admitted for an elective urethroplasty. Medical history included idiopathic renal failure that required a kidney transplant in 2006. He was receiving immunosuppressive, antipsychotic and antidepressant drugs. On admission, blood analysis revealed only mild renal insufficiency, chest radiography showed no abnormal findings, EKG proved left ventricular hypertrophy. Surgery premedication included intravenous 50 mg ranitidine and 4 mg ondansetron. In the operating room, patient underwent routine non-invasive monitoring. Regional anaesthesia was chosen: subarachnoid anaesthesia with 10 mg hyperbaric bupivacaine on a T10 level. Surgery and postoperative period were uneventful.

Discussion: Anaesthesiologists must be aware that Huntington patients are usually on psychotropic medication. General anaesthesia might exacerbate psychiatric symptoms and increase aspiration risk. Regional anaesthesia should be used when possible(2). If necessary, total intravenous or balanced anaesthesia, and non-depolarising neuromuscular blocking have proved to be safe. Thiopental, midazolam and succinylcholine should be used with caution. Metoclopramide and anticholinergic drugs must be avoided(3).

References:

1. Charles F Cangemi Jr, Robert J Miller. Huntington's disease: Review and anesthetic management. *Anesth prog* 1999;45:150-1532-Kang et al.
2. Anesthetic management of a patient with Huntington's chorea. *Korean J Anesthesiol* 2013;64:262-2643-Gilli E, Bartoloni A, Fiocca F, Dall'Antonia F, Carluccio S.
3. Anaesthetic management in a case of Huntington's chorea. *Minerva Anestesiol* 2006;72:757-62

Learning Points: Huntington's disease represents a big challenge for the anesthesiologist. An ideal anaesthetic management consensus is yet to be reached. Regional anaesthesia is the best choice, if possible.

01AP06-5**Brachial plexus neuropraxia after CT-guided radiofrequency ablation in a patient with a narrowed costoclavicular space**

Ong Y.Y., Zeng L.A., Lew J.P.

Singapore General Hospital, Dept of Anaesthesiology, Singapore, Singapore

Background: We report a case of brachial plexus neuropraxia(BPN) in a patient who underwent remote anaesthesia. The unusual anatomy of the patient predisposed the development of this complication in spite of best perioperative care. We highlight some issues regarding identification, monitoring as well as management of this problem.

Case report: The patient is an elderly gentleman with a previously undiagnosed narrowed costoclavicular space. He underwent a CT guided RF ablation of a hepatocellular carcinoma in the radiology suite under anaesthesia. After the procedure, the patient complained of right upper limb weakness and numbness in the C5 and C6 nerve root distributions.

MRI brachial plexus done the next day showed abnormal enhancement along the right brachial plexus at the level of the trunks. His costoclavicular space was noted to be narrowed. Nerve conduction studies done 1 month later was inconclusive for right brachial plexopathy.

The patient recovered 90% of his right upper limb sensation and strength 3 months after the injury.

Discussion: In a patient suspected with post procedural BPN, thorough neurological examination should be done. Management of the injury should involve a multidisciplinary team of neurologist, occupational therapist and physiotherapist. Nerve conduction studies and electromyography may assist in diagnosing brachial plexus injury, as well as determining its age and severity. Treatment of BPN is mainly supportive, consisting simple analgesics and physical therapy. Antineuropathic agents can be useful. The prognosis of brachial plexus injury is generally good.

References: Cooper DE et al. The prevention of injuries of the brachial plexus secondary to malposition of the patient during surgery. *Clinical Orthopaedic and Related Research* 1988; 228: 33-41

Learning points: Brachial plexus neuropraxia during anaesthesia has been reported in various surgeries and is caused by the stretching and compression of the plexus due to positioning. It is largely considered the responsibility of the anaesthetist in most cases. This case highlights something less common; anatomical abnormalities of the thoracic outlet with which the plexus runs through as a contributing cause. Good perioperative positioning is considered standard of care and this unusual case highlights the importance of continued monitoring and adequate follow up when the patient did not have any overt risk factors.

01AP06-6**Effects of Pringle maneuver on systemic hemodynamics during liver resection surgery under thoracic epidural anaesthesia. Role of dynamic arterial elastance (Eadyn)**

Varela J.A., Perez Peña J., Lisbona C., Blanco J., De Miguel A., Olmedilla L.

Gregorio Marañon General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Occlusion of hepatic blood flow by Pringle maneuver (PM) is used in liver surgery to minimize blood loss. The aim of this study was to describe the hemodynamic changes during PM and the use of dynamic arterial elastance (Eadyn) as a measure of vascular tone to predict this response during liver resection in patients under epidural anaesthesia.

Materials and Methods: 61 patients who underwent liver open resection with PM and combined general and thoracic epidural anaesthesia were included. Mean PM duration was 23+/- 16 min. Hemodynamic parameters were monitored with a transpulmonary thermodilution system (PiCCO, Pulsion Medical Systems): heart rate (HR), mean arterial pressure (MAP), central venous pressure (CVP), cardiac index (CI), stroke volume variation (SVV), pulse pressure variation (PPV), global end diastolic index (GEDI), cardiac function index (CFI), left heart contractility (dPmx), systemic vascular resistance index (SVRI) and Eadyn (PPV/SVV). They were recorded at 3 time points: 5 min before (T1) and 5 min after clamping (T2) and 5 min after unclamping (T3). Statistical analysis: Student's T test. A p-value <0.05 was considered statistically significant.

Results and Discussion: PM produced a mild reduction in venous return (CVP -11%, SVV and PPV -20%) and in CI (-13%). Decreased in contractility (dPmx -12%, CFI - 9%) was compensated by an increase in vascular tone (SVRI and Eadyn +8%) in order to keep MAP unchanged despite the sympathetic epidural block At T3 HR, MAP, CI, CFI and dPmx significantly increased above T1 values but SVRI and Eadyn fell under their T1 values. SVV and PPV values were similar to T1 ones.

The group of patients with low vascular tone (Eadyn <0.8) at T1 underwent a greater decrease in MAP between T1 and T3 (-7 ± 13 vs +5 ± 15 p 0.01), and had lower MAP (68±11 vs 76±13 p 0.04) at T3 than those with Eadyn >0.8. Patients with Eadyn <0.8 showed higher dPmx at T1 (1198±566 vs 797±277) and T2 (975±548vs 723±298) and higher CFI at T1 (4.3±1.3 vs 3.3±0.76), T2 (3.8±1.0 vs 3.1±0.9) and T3 (4.3±1.0 vs 3.7±0.9), compared to Eadyn > 0.8 (p<0.03). SVRI measured before, during and after PM was lower (not significant) in the Eadyn <0.8 group.

Conclusions: Hemodynamic changes induced by MP in patients with thoracic epidural block are compensated with a reflex increase in vascular tone. Patients with lower vascular tone before PM (Eadyn < 0.8) show higher MAP reduction despite the contractility increase.

01AP06-7**Postoperative opioid consumption after opioid free anesthesia for major abdominal surgery: going towards opioid-free analgesia?**

Daouphars T., Anger M., Beloeil H., Estebe J.-P.

CHU Pontchaillou, Dept of Anaesthesiology & Intensive Care, Rennes, France

Background and Goal of Study: Due to the morbidity and mortality associated with opioids [1][2], opioid free anesthesia (OFA) has recently become more popular. Since 2015, we have been using OFA for major abdominal surgery in our institution. The aim of this study was to evaluate the benefit of OFA on postoperative morphine consumption before designing a randomized controlled trial.

Materials and Methods: After IRB approval (CERAR 00010254-2016-007), we retrospectively analyzed, the files of 80 patients who underwent major abdominal surgery, between February 2015 and November 2016. OFA protocol associated continuous infusion of Dexmedetomidine, Lidocaine and Ketamine, with Dexamethasone and Cisatracurium. Propofol or Halogenated gases were used for hypnosis. During surgery, depth of anesthesia (BIS ®) and pain (ANI ®) levels were monitored. Post-operative analgesia was multimodal. Opioid were used as rescue analgesia. Microsoft Excel 2016 was used for descriptive analysis (Median, Mean and Standard Deviation).

Results and Discussion: Patients were mostly men (58%), with a mean age of 64 ± 11 years, mean BMI of 26 ± 5kg/m2 and a median ASA score of II. The mean length of surgery was 266±118min with 65 % of laparotomy. In PACU, only 35% of patients needed opioid titration. During the first 48 postoperative hours, morphine consumption was reduced and morphine was given orally for 71 % of the patients.

	Median	Mean	Standard Deviation	Extremes
Maximal Numeric Pain Scale (NPS) in PACU	0	2.3	3.0	0 - 8
Maximal NPS at 24h	5.0	5.1	2.5	0 - 10
Maximal NPS at 48h	3.0	3.5	2.4	0 - 8
Opioid Consumption in PACU (mg)	0	2.1	3.6	0 - 15
Opioid Consumption at 24h (mg)	7.0	8.5	9.7	0 - 44
Opioid Consumption at 48h (mg)	0	4.2	7.1	0- 35

[Post-Operative (n=80)]

Mean morphine consumption in PACU after abdominal surgery under anesthesia with opioids was reported to be as high as 23 ± 6.7 mg after laparotomy and 5 ± 3mg after laparoscopy[3]. In the same study[3], postoperative opioid consumption (excluding PACU) was 22 ± 27 mg after laparotomy and 14 ± 11mg after laparoscopic procedure.

Conclusion(s): OFA allowed a meaningful reduction of opioid consumption after major abdominal surgery, but it needs randomized controlled trials to further establish its benefit.

References:

1. Lee L, Caplan R, Stephens L et al *Anesthesiology* 2015; 122: 659-65
2. Fletcher D, Martinez V Br *J Anaesth* 2014; 116: 991-1004
3. Kranke P, Jokinen J, Pace NL et al. *Cochrane Database* 2015

01AP06-8**Trigemino-cardiac reflex in open reduction for TMJ dislocation**Kim Y.¹, Lee J.², Lee W.H.¹

¹Chungnam National University School of Medicine, Dept of Anaesthesiology & Pain Medicine, Daejeon, Korea, Republic of,
²Wonkwang University, Oral and Maxillofacial Surgery, Daejeon, Korea, Republic of

Background: Trigemino-cardiac reflex occurs after manipulation around any branches of the trigeminal nerve. Oculocardiac reflex has frequently been reported. However, there have been only rare reports of such cases attributed to stimulation of division III. We report a case of trigemino-cardiac reflex in open reduction for TMJ dislocation.

Case report: A 74-year-old female presented for TMJ dislocation. Manual reduction was failed because of severe lateral pterygoid muscle contracture. Open reduction under general anesthesia was decided. During surgical manipulation of right mandibular angle, severe bradycardia (HR=20bpm) occurred. Immediately 0.5 mg atropine was administered intravenously, and the surgical manipulation was stopped. After 60 seconds, heart rate normalized. Then, during surgery, severe bradycardia occurred one more time. It disappeared spontaneously as soon as surgical manipulation was stopped. The surgery was completed uneventfully.

Discussion: Trigemino-cardiac reflex due to stimulation of division III is very rare. However, given the possibility of profound bradycardia, asystole, or even death when evoked, it is important to be aware of the trigemino-cardiac reflex during surgical stimulation of the mandibular divisions of the trigeminal nerve, in particular surgical stimulation of TMJ.

References:

1. William D. Holmes, MD et al. The Trigemino-cardiac Reflex and Dermatologic Surgery. *Dermatol Surg* 2011;37:1795-1797
2. S. Ron Choi et al. Effects of different anesthetic agents on OCR. *J Anesth* (2009) 23:489-493

Learning points: During TMJ stimulation, it is necessary to deserve attention for trigemino-cardiac reflex.

01AP07-2**Bispectral Index monitoring in rats during intravenous propofol anaesthesia**Adachi Y.¹, Taharabaru S.², Satomoto M.³, Nishiwaki K.³

¹Nagoya University Graduate School of Medicine, Dept of Anaesthesiology & Intensive Care, Nagoya, Japan, ²Nagoya University Hospital, Dept of Anaesthesiology, Nagoya, Japan, ³Nagoya University Graduate School of Medicine, Dept of Anaesthesiology, Nagoya, Japan

Background: Bispectral Index (BIS) monitoring is developed by analyzing of electroencephalogram (EEG) of human during general anesthesia. Recently, some studies reported that BIS monitoring could be useful in an area of veterinary medicine including laboratory animals, such as horse, calf, goat, pig dog, cat and rabbit. Rodents are very popular animals in laboratory investigations: however, there are few reports for BIS monitoring. Thus, we assessed the possibility of BIS monitoring in awake and anesthetized rats during propofol anaesthesia.

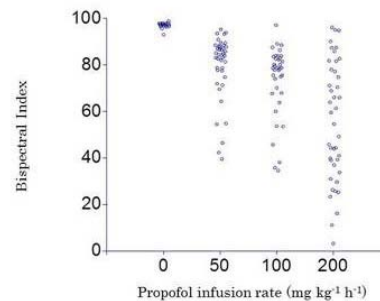
Methods: After obtaining approval from the committee of the institute, 10 male SD rats weighing 220-240 g were used. The rats were received brief anaesthesia by inhalation of sevoflurane (3%) and were attached the 4 pierced electrodes on the head. Each rat was given recovery period at least 48 h. The electrodes were connected the leads immediately before the examinations. EEG signal was analyzed by Vista A-3000 (Nihon Kohden, Tokyo, Japan). Each rat was administered propofol from a tail vein using an infusion pump. The infusion rate of propofol was changed every 10 minutes and the rate was randomly set at 0 (control), 50, 100 and 200 mg/kg/h. Every rat was received

subsequent 6 period of propofol anaesthesia (totally 1 h). The BIS Index, spectral edge frequency 95% and amplitude were recorded after the equilibrium period (5 and 10 min) from the change in the infusion rate.

Propofol infusion rate	Bispectral Index	Spectral edge frequency 95 (Hz)	Amplitude
0 (mg kg ⁻¹ h ⁻¹)	96.9 ± 1.2 [92.9 - 98.7]	22.1 ± 5.2 [10.5 - 27.2]	11.6 ± 1.9 [8.2 - 14.4]
50	79.3 ± 13.9 [39.4 - 95.1]	21.8 ± 2.3 [16.9 - 26.0]	13.2 ± 3.6 [5.7 - 23]
100	73.2 ± 15.4 [34.4 - 97.0]	21.8 ± 2.7 [17.2 - 29.6]	14.4 ± 3.3 [6.7 - 23.6]
200	55.6 ± 25.6 [3.0 - 95.9]	22.8 ± 4.0 [15.3 - 28.8]	12.6 ± 4.2 [5.4 - 20.9]

Data are expressed as mean ± SD, and ranges. *: p < 0.05 between groups.

[Table. The infusion rate of propofol and the values of Bispectral Index]



[Figure. The infusion rate of propofol and the values of Bispectral Index]

Results and Discussion: Before the induction of anesthesia, all animals were awake and showed high values of BIS (96.9 ± 1.2). Following to the increase of the infusion rate, the BIS values were significantly decreased and the variance was increased (Table, Fig).

Although the accuracy of monitoring for the depth of anesthesia would not be fully acceptable in the current system, the significant and dose dependent relationships between the infusion rate and BIS values were observed.

Conclusions: There is a room for discussion to evaluate a depth of anesthesia and BIS monitoring in experimental animals; however, the current investigation firstly demonstrated a validity of BIS monitoring in rats during intravenous propofol anaesthesia.

01AP07-3**Bispectral Index monitoring in rats during sevoflurane anaesthesia**Taharabaru S.¹, Adachi Y.², Satomoto M.³, Nishiwaki K.³

¹Nagoya University Hospital, Dept of Anaesthesiology, Nagoya, Japan, ²Nagoya University Graduate School of Medicine, Dept of Anaesthesiology & Intensive Care, Nagoya, Japan, ³Nagoya University Graduate School of Medicine, Dept of Anaesthesiology, Nagoya, Japan

Background: Bispectral Index (BIS) monitoring is widely spread as a measure for evaluating the depth of anaesthesia in clinical settings. Although the analyzing of electroencephalogram (EEG) calculating BIS value was based on humans, some recent studies reported that BIS monitoring could be useful in animals including laboratory species. Rats are very popular animals in laboratory investigations as same as mice: however, there is scarce information of BIS monitoring in rodents.

Thus, we evaluated the usefulness of BIS in awake and anesthetized rats during sevoflurane anaesthesia.

Methods: 12 male SD rats weighing 220-240 g were used. The rats were briefly anaesthetized by inhalation of sevoflurane (3%) and were attached the 4 pierced electrodes on the head. Each rat was given recovery period at least 48 h. The electrodes were connected the leads immediately before the examinations. EEG signal was analyzed by Vista A-3000 (Nihon Kohden, Tokyo, Japan).

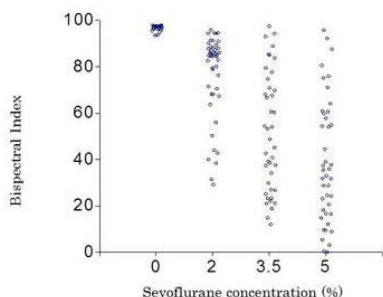
Each rat was anaesthetized with sevoflurane in a small box chamber. The concentration of sevoflurane was changed every 10 minutes and the concentration was randomly set at 0% (control), 2%, 3.5% and 5%. Every rat was received 6 period of sevoflurane anaesthesia (totally 1 h), and thereafter the

inhalation was terminated. The BIS Index, spectral edge frequency 95% and amplitude were recorded after the equilibrium period (5 and 10 min) from the change in the concentration.

Table. The sevoflurane concentration and the values of Bispectral Index

Sevoflurane concentration	Bispectral Index	Spectral edge frequency 95 (Hz)	Amplitude
0%	96.4 ± 1.2 [93.3 - 97.7] *	20.0 ± 3.6 [14.4 - 26.4] *	9.2 ± 2.3 [6.4 - 14.2] **
2%	76.7 ± 18.1 [29 - 95.6] *	18.6 ± 3.9 [11.2 - 25.3]	10.3 ± 2.1 [6.8 - 17.7]
3.5%	51.4 ± 25.5 [11.9 - 97.3] *	19.5 ± 4.8 [7.3 - 26.7]	12.5 ± 3.6 [7.0 - 22.9]
5%	38.8 ± 28.6 [1 - 95.6]	16.3 ± 6.3 [3.2 - 28.6]	11.6 ± 4.4 [5.8 - 28.6]

Data are expressed as mean ± SD and ranges. *; p < 0.05 between groups.



[Figure. The sevoflurane concentration and the values of Bispectral Index]

Results and Discussion: Before the induction of anesthesia, all animals were awaking and showed high values of BIS (96.4 ± 1.2). Following to the increase of the sevoflurane concentration, the BIS values were significantly decreased and the variance was increased (Table, Fig).

The significant and dose dependent relationships between the sevoflurane concentration and BIS values were observed. But, the accuracy of monitoring for the depth of anesthesia would not be fully acceptable in the present system.

Conclusions: Although there is a room for discussion to evaluate a depth of anesthesia using BIS monitor in animals, the current preliminary investigation firstly suggested a validity of BIS monitoring in rats during sevoflurane anaesthesia.

01AP07-4

Comparison between two versions of the Patient State Index® during propofol and sevoflurane anesthesia, with or without remifentanyl

Kuizenga M.H., Colin P.J., Vereecke H.E.M., Struys M.M.R.F
University Medical Center Groningen, University of Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: Patient State Index® (PSI-1) (Masimo, Irvine, CA, USA) is a processed electroencephalogram (EEG) parameter that quantifies the level of EEG inhibition by anesthetic drugs. Recently, a new PSI algorithm (PSI-2) was launched with improved performance in low power EEG and reduced susceptibility to electromyography.

The objective of this study was to compare PSI-1 and PSI-2 in their correlation with propofol and sevoflurane drug concentrations and with the Modified Observers Assessment of Alertness and Sedation (MOAAS) scale. We also assessed the influence of respectively 2 or 4 ng/ml effect-site concentration of remifentanyl (Ce_{REM}) on the performance.

Materials and Methods: After institutional ethics committee approval (University Medical Center Groningen, Groningen, Netherlands) we included 36 healthy volunteers, stratified per age. Each volunteer was randomly allocated to a sequence of four sessions of anesthesia with a one week interval. During one session, we administered propofol in graded effect-site concentration steps. Sevoflurane was administered in session 2 driven by end-tidal vol%. In sessions 3 and 4 steps were repeated with addition of 2 or 4 ng/ml Ce_{REM}. At each step, a 12 minute equilibration delay was maintained before testing the MOAAS and taking a blood sample for propofol and remifentanyl concentrations measurement. We collected raw frontal EEG by means of a Root® monitor and a SedLine® sensor (Masimo, Irvine, CA, USA).

Post-hoc, we extracted time synchronized PSI-1 and PSI-2, and plotted both versus respectively measured propofol or sevoflurane concentration. We used

non-linear mixed effect modeling to fit a sigmoidal E_{max} dose response relationship. We also plotted PSI versus MOAAS.

Results and Discussion: After modeling PSI versus concentration, PSI-2 shows reduced population variability and improved baseline stability compared to PSI-1. The E_{max} model parameters are comparable except for E_{max}, which has a wider descriptive range for PSI-2. Looking at PSI versus MOAAS, PSI-2 has a lower interindividual variability than PSI-1. Both PSI's distinguish MOAAS 5,4 and 3 better during propofol anesthesia compared to sevoflurane. This difference disappears when adding remifentanyl.

Conclusion(s): PSI-2 has enhanced signal stability and a better description of the dose-response relationship. PSI-2 has therefore improved capacity as a pharmacodynamic monitor of anesthesia compared to PSI-1.

01AP07-5

Effects of ketamine on EEG data: a case report

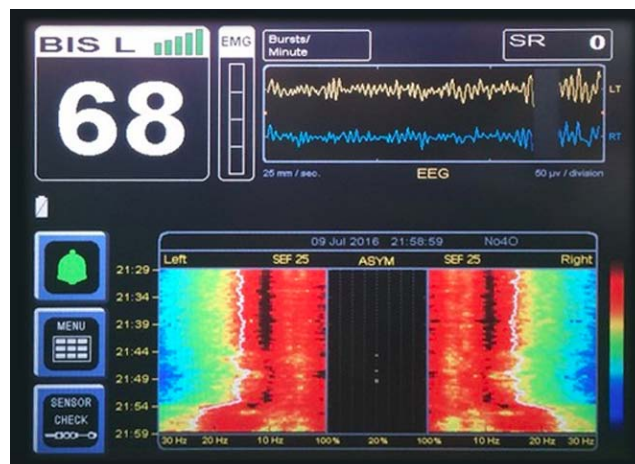
Nunes R.R.¹, Lopes C.G.², Cavalcante S.L.F.¹, Fernandes M.B.C.¹, Nunes Filho R.R.¹, Rodrigues P.V.T.¹

¹Hospital Geral de Fortaleza, Dept of Anaesthesiology, Fortaleza, Brazil, ²Hospital Sao Carlos, Dept of Anaesthesiology, Fortaleza, Brazil

Background: Ketamine is an arylcyclohexylamine derivative with sedative properties, which is also used in the management of perioperative and neuropathic pain. The compound produces a dissociative state apparently through electrophysiological inhibition of thalamocortical connections and stimulation of the limbic system. In this report we describe an EEG-derived spectrographic pattern observed after ketamine administration.

Case report: A 30-year-old male patient (80 kg) presenting with acute abdomen from a bullet wound was submitted to general anesthesia (sufentanil 75 µg, propofol 200 mg, succinylcholine 70 mg), orotracheal intubation and neuromuscular blockade (rocuronium 1ED95%). Anesthesia was maintained with desflurane adjusted to maintain a BIS value of 45-60 and zero burst suppression. The spectrogram evidenced hypersynchronization of alpha, delta and slow oscillations, with low amplitudes at high frequencies. After anesthesia stabilization, ketamine (80 mg) was administered, resulting in a rise in the BIS value from 46 to 69, a rise in the raw EEG frequency, and high amplitudes predominantly in the beta band, with attenuation of alpha, delta and slow oscillations.

Discussion: Ketamine administration during anesthesia with desflurane significantly increased beta oscillations and reduced alpha, delta and slow oscillations as a result of the inhibition of the glutamatergic stimulus in the inhibitory GABAergic interneurons, producing aberrant excitatory activity in the cortex, hippocampus and the limbic system.



[Pic. 1]

References: 1. Akeju O, Hamilos AE, Song AH et al. GABA_A circuit mechanisms are associated with ether anesthesia-induced unconsciousness. Clin Neurophysiol. 2016;127:2472-81. 2. Brown EN, Lydic R, Schiff ND. General Anesthesia, Sleep, and Coma. N Engl J Med 363;27: 2638-2650

Learning points: Ketamine produces an aberrant excitatory activity in the brain, due to its down-regulation of inhibitory tone, as we can see in the spectrographic pattern observed in this patient.

01AP07-6**Remifentanyl attenuates the spindle activity and decrease EEG amplitude during propofol anesthesia**Hagihira S.¹, Kang H.², Takashina M.³, Mori T.¹¹Osaka Prefectural Osaka General Medical Center, Dept of Anaesthesiology, Osaka, Japan, ²Osaka University, Graduate School of Medicine, Dept of Anaesthesiology & Intensive Care, Suita, Japan, ³Osaka University Hospital, Surgical Center, Suita, Japan

Background and Goal of Study: It is generally thought that opioids have little effect on EEG, especially when noxious stimuli were not added. However, we felt that EEG amplitude (Amp) seemed to become smaller after starting the infusion of remifentanyl during propofol anesthesia. To examine this, we compared the Amp observed without remifentanyl and that with remifentanyl during propofol anesthesia.

Materials and Methods: We analyzed the EEG data obtained in the previous study. After approval of the ethical committee of our institute and obtained written informed consent from the participants, we enrolled 26 female patients (aged 33-65) who were scheduled mastectomy for breast cancer. Besides the standard monitors, we used BIS monitor (BIS-XP) and all raw EEG packet as well as EEG derived parameters were recorded on a computer using our original software "BSA for BIS". We defined the amplitude of EEG as the half of the voltage difference between the adjacent two local peaks, and Amp was defined as the average of EEG amplitude in the latest 20 seconds of EEG signals. Propofol was infused using TCI pump (TE-371; TERUMO, TOKYO, JAPAN). We determined Amp without remifentanyl and Amp with remifentanyl infused at 0.2 µg/kg/min at the same effect-site concentration of propofol before incision. We also compared the powerspectrum of EEG, with or without remifentanyl. The propofol concentration was adjusted to surgical level of anesthesia in each patient by EEG monitoring.

Results and Discussion: In all cases, amplitudes of EEG were decreased after infusion of remifentanyl. Amp without remifentanyl was 13.1 ± 2.6 (µV) and Amp with remifentanyl was 10.7 ± 2.3 (µV) (p < 0.001) (Mean ± SD). And power of alpha frequency (8-13 Hz) was also significantly decreased after infusion of remifentanyl, 20.7 ± 14.2 (µV²) vs. 10.2 ± 8.1 (µV²) (p < 0.001), which suggested that spindle activity was attenuated by remifentanyl.

Conclusion: We found that EEG amplitude became smaller when remifentanyl was infused at 0.2 µg/kg/min with propofol. Remifentanyl seemed to attenuate the spindle activity at this anesthetic level.

01AP07-7**The effect of neuromuscular block on the depth of anesthesia as measured by bispectral index**

Kang H., Kim H., Lee J.

Chungbuk National University Hospital, Dept of Anaesthesiology & Pain Medicine, Cheonju-si, Korea, Republic of

Background and Goal of Study: There have been controversies about the effects of neuromuscular block on the depth of anesthesia. Some reports have shown that neuromuscular block did not reduce anesthetic requirements. However, other studies claimed that the depth of anesthesia was increased by neuromuscular blocking agents, decreasing anesthetic requirements. This study was performed to determine the effects of neuromuscular relaxation on the depth of anesthesia using the bispectral index (BIS). While it is extremely difficult to maintain the desired level of neuromuscular block for a certain period of time, we used mivacurium which has pharmacokinetic advantage compared with other neuromuscular blocking agents.

Materials and Methods: This study was performed in 15 patients undergoing body surface surgery after obtaining IRB approval. General anesthesia was provided with propofol TCI (3-5 µg/ml) and fentanyl (100 µg), and a laryngeal mask airway (LMA) was inserted. Neuromuscular relaxation was successfully achieved by mivacurium adjusted for the first twitch in a TOF to be provided as five predetermined levels in the order of 80 ± 5% (T1), 60 ± 5% (T2), 40 ± 5% (T3), 20 ± 5% (T4) and 0% (T5) of the pre-relaxation control level, and each level was maintained constant for a few minutes. BIS and cardiovascular variables were recorded at the predetermined ranges of neuromuscular block.

Results and Discussion: Mean awake BIS value significantly decreased after loss of consciousness and LMA insertion from 97.4 to 46.1 (Tukey test, P < 0.001). There was no significant differences between mean BIS values at

different degrees of neuromuscular block during unconscious state at constant target concentration (3.3 µg ml⁻¹) of propofol: 47.1 (T1), 48.6 (T2), 48.7 (T3), 46.5 (T4) and 49.2 (T5).

Conclusion(s): There was no correlation between the level of neuromuscular block and the depth of anesthesia as measured by BIS.

01AP07-9**Intravenous lidocaine decrease isoflurane requirements during posterior lumbotomy as monitored by bispectral index**

Nakhli M.S., Kahloul M., Harrathi A., Chebbi N., Naija W., Mhamdi S.

Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse, Tunisia

Background and Goal of Study: Peri operative effect of intravenous lidocaine infusion was evaluated on pain relief, cytokine responses, recovery and length of hospital stay particularly in intra abdominal surgery. Our hypothesis is to show whether intravenous lidocaine infusion can decrease the minimum alveolar concentration isoflurane required to keep Bispectral Index between 40 and 60 during anesthesia for lumbotomy.

Materials and Methods: Fifty ASA physical status 1 and 2 patients were scheduled for elective lumbotomy during general anesthesia. Exclusion criteria were: history of hepatic, renal or cardiac failure, allergy to local anesthetics, nephrectomy for renal transplantation. Patients with history psychiatric disorder, arrhythmia or seizures were also excluded. Patients were randomized to receive either intra operative systemic lidocaine infusion (group L): 1.5 mg/kg before skin incision then perfusion of 1 mg/kg/hr or normal saline infusion (group C). BIS was maintained between 40-60. Primary endpoint was the Et-Iso concentration and MAC-Iso. Secondary endpoint was the consumption of remifentanyl and the delay to extubation.

Results and Discussion: The two groups were comparable in terms of demographic and surgical data. The MAC-Iso and Et-Iso fractions recorded during the surgical procedure were less important to the group (L) than the group (S) with a statistically significant difference. The average consumption in remifentanyl was less important in the group (L) than the group (S) [0.12 ± 0.04 µg/kg/mn vs 0.19 ± 0.05 µg/kg/mn; p < 0.01]. Time to extubation was shorter in the lidocaine group [5.6 ± 1.8 min vs 8 ± 2 min; p < 0.01].

This study showed that continuous infusion of intravenous lidocaine reduces requirement of remifentanyl and isoflurane during the surgical procedure for lumbotomy. It also shortens the time to extubation. It was suggested an inhibitory effect of lidocaine on central nervous system potentiating the action of halogenated inhalational anesthetics.

Conclusion(s): Intra operative intravenous lidocaine infusion reduced volatile agent requirement during urologic surgery for lumbotomy. It also reduced intra operative opioids consumption.

01AP07-10**Predictor factors in the continuous register of entropy in etomidate anesthetic induction**Bermúdez Geant G.J.¹, Casares Acuña S.¹, Martins Cruz K.¹, Sampedro-Nuñez M.², Lopez Sánchez C.¹, De la Calle Elguezabal P.¹¹Hospital Clínico San Carlos, Dept of Anaesthesiology & Pain Medicine, Madrid, Spain, ²Hospital Universitario La Princesa, Instituto de Investigación Princesa, Madrid, Spain

Background and Goal of Study: Several factors have been described that could influence the effect of hypnotic drugs according to state entropy (SE) and response entropy (RE). However, it is not known that individual factors could affect the hypnotic effect of Etomidate (E), as well as its association with other drugs. The aim of this study was to determine which factors may affect maintenance of the hypnotic state during induction with E, as well as to evaluate the effect of the Rocuronium (R) association.

Materials and Methods: Retrospective observational study of patients that undergoing elective digestive surgery. It was recorded: hypnotic drug, continuous NIBP, HR, SE and RE during anesthetic induction. Decreased anesthetic

depth (AD) was defined when: hemodynamic parameters > 15% of baseline or SE / RE > 50. Analysis of survival and factors involved by Kaplan-Meier method and Cox regression using STATA v12.0.

Results and Discussion: We analysed 73 patients (38 women, age 67 ± 15 years). 34 patients with E 0.3 mg / kg + R 1 mg / kg, 18 with E 0.5 mg / kg + R 0.5 mg / kg and 21 with E 0.5 mg / kg + R 1 mg / kg. It was observed that the median time to AD was 219 seconds (CI 185-256). The association of E 0.5 mg / kg + R 1 mg / kg was a protective factor of AD with HR of 0.51 (IC 0.27-0.97). The female sex multiplied the risk by 1.7 (CI 0.97-2.94) but did not reach statistical significance (p 0.06).

Conclusion(s): The association of E 0.5 mg / kg + R 1 mg / kg improves hypnotic effect and monitoring of entropy parameters. There may be a different response to the hypnotic effect of medication in the female sex. To know these factors helps the interpretation of continuous records of entropy.

References:

1. Effects of etomidate on bispectral index scale and spectral entropy during induction of anesthesia by means of the raw electroencephalographic and electromyographic characteristics. Kim HM¹, Shin SW, Yoon JY, Lee HJ, Kim KH, Baik SW. *Korean J Anesthesiol.* 2012 Mar;62(3):230-3
2. Drugs and sex differences: a review of drugs relating to anaesthesia. Ciccone GK¹, Holdcroft A. *Br J Anaesth.* 1999 Feb;82(2):255-65.

01AP07-11

Longitudinal individual follow-up of physiological variables during general anesthesia: development of a mathematical signature of general anesthesia

Dubost C.¹, Humbert P.², Oudre L.³, Buffat S.⁴, Ould-Ahmed M.¹, Vidal P.⁵

¹Begin Military Hospital, CognacG Research Lab, Dept of Anaesthesiology & Intensive Care, Saint-Mande, France,

²CMLA, Mathematics Lab, Cachan, France, ³Université Paris 13, Mathematics Lab, Paris, France, ⁴Institut de Recherche Biomédicale des Armées (IRBA), Department of Human Factor, Paris, France,

⁵CognacG Lab University Paris Descartes, Department of Neurophysiology, Paris, France

Background and Goal of Study: Precise identification of the depth of anesthesia remains an unmet need in anesthesia. The gold-standard for depth of anesthesia remains the electroencephalogram (EEG), which is not realistic in the daily routine. Thanks to multimodal monitoring, we aimed at developing a mathematical signature of the anesthesia, which will then allow the development of a predictive model of consciousness.

Materials and Methods: The monitoring included electrocardiogram (EKG), pulse oxymetry, non-invasive blood pressure, gas analysis and plethysmography. The 2-channel EEG was recorded at 100 Hz, EKG at 300 Hz and all the other variables at 1 Hz.

In order to do machine learning, we calibrated the hyperparameters of the algorithm using cross-validation and Grid Search. Variables were then analyzed with a Hidden Markov Model.

Results and Discussion: The development of a free software allowed proper and stable recording of the desired variables. Ten patients were included and demonstrated high quality signal throughout the recording.

Boosting trees algorithm was the best predictive model. After cross-validation and training on the first 8 patients, identification of the hyperparameters was done on the 9th patient and then the algorithm demonstrated on the last patient a good predictability of the anesthesia state. The prediction was done only on one patient, with sensibility of 100% and specificity of 73%.

The good predictability obtained by our algorithm must be interpreted cautiously as only one patient was tested. This explains the particularly high value of sensibility and specificity of 100 and 73%, respectively. The next step for our work will be to test this algorithm on more patients and check its robustness. Moreover, we only worked on the prediction of surgical anesthesia compared to the awoken state. This means that we have not worked on the prediction of the transition states.

Conclusion(s): In this work, we presented a simple model to encode the anesthesia process. We then learned a policy on this model, using expert trajectories. The performances of the resulting policy results look promising, and future research directions might include the creation of a more complex model, where inverse reinforcement learning could be used.

01AP08-1

A new look over the anesthetic approach of arthrogryposis multiplex congenita

Ribeiro B., Candeias M., Gordillo I.

Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal

Background: Arthrogryposis multiplex congenita (AMC) is a rare clinical condition characterized by congenital, non-progressive, multiple and persistent joint contractures with generalized muscle wasting found generally at birth (1) which may be associated with multiple congenital anomalies (2).

Case report: We present a clinical case of a 26 years old man, proposed for tympanomastoidectomy of his left ear and septoplasty. He was 174cm tall and weighed 50kg with a body mass index of 16.6. He had an AMC with severe contractures of all extremities and muscle atrophy and a Mallampati Class II airway. Vital signs, laboratory values, chest X-ray and electrocardiogram were unremarkable. The case was managed with a total endovenous general anaesthesia with remifentanyl perfusion and Target Controlled Infusion of propofol to a BIS level of 40-50. Rocuronium (0.6 mg/kg) was given and uneventful laryngoscopy and intubation were performed. He was ventilated to maintain an end tidal carbon dioxide of 29-33 mmHg and warmed to maintain a core temperature of 35-37 °C. Vitals were stable throughout the 4.5 hours of surgery. Nausea and vomiting prophylaxis was given and postoperative analgesia was managed with paracetamol and metamizole. Propofol and remifentanyl perfusions were stopped after the nasal tamponade and neuromuscular blockade reversed with sugammadex (2 mg/kg). He was extubated after full reversal of the blockade and was discharged after 2 days.

Discussion: AMC patients need meticulous care during surgeries since various associated anomalies, rather than AMC itself, can pose challenges to anesthesiologists. This approach has proven to be safe and effective in these patients and should be considered if a general anesthesia is required.

References:

1. Jung JW, Heo BY, Oh EJ, Chung YH. Anesthesia in patients with arthrogryposis multiplex congenita: a report of 10 patients. *Korean Journal of Anesthesiology.* 2014;67(Suppl):S89-S90. doi:10.4097/kjae.2014.67.S.S89.
2. Pujari VS, Shivanna S, Anandaswamy TC, Manjunath AC. Arthrogryposis multiplex congenita: An anesthetic challenge. *Anesthesia, Essays and Researches.* 2012;6(1):78-80. doi:10.4103/0259-1162.103380.

Learning Points: Anesthesia in AMC patients is sparsely documented in the literature, few cases using muscle relaxants are described and none using rocuronium and its reversal agent sugammadex. With this case report we want to demonstrate the efficacy and safety of this anesthetic approach in an AMC patient.

01AP08-2

Anaesthesia for laparoscopic cholecystectomy in a patient with fabry's disease

Lucci E.¹, Silvi M.B.¹, Anselmo A.², Paolantonio N.³, Storti G.¹, Dauri M.¹

¹Tor Vergata University Rome, Dept of Anaesthesiology & Intensive Care, Rome, Italy, ²Tor Vergata University Rome, Liver Transplant and HBP Unit, Rome, Italy, ³Sapienza University of Rome, Biomedical Engineering, Rome, Italy

Background: Fabry's disease is an inherited multi-system lysosomal storage disease, characterized by progressive neurological, cutaneous, renal, cardiovascular and cerebrovascular manifestations(1). We present a case of a patient with Fabry's disease and anaesthetic management.

Case report: A 58 year old man, ASA 3, 63 kg, diagnosed with Fabry's disease 20 years previously was scheduled for laparoscopic cholecystectomy. He had undergone two kidney transplants, which were unsuccessful and required haemodialysis. Preoperative ECG revealed ischaemic changes in leads II, V5 and V6 and a transthoracic echocardiogram showed an ejection fraction of 40%. Preoperatively, consideration was given to the risks of laparoscopic surgery in a patient with a low EF. Induction of anaesthesia was performed using propofol, sufentanil and cisatracurium. Maintenance with Propofol TCI. A decision was made to utilise a non-invasive tool for determination of cardiac index CLEARLIGHT (Edwards Lifesciences). (CI), stroke volume (SV), stroke volume variation (SVV) and blood pressure were continuously monitored. Intra-abdominal pressure was kept to a minimum. The pa-

tient maintained a CI above 2.4l/min/m² throughout the procedure. Recovery was uneventful and the patient was transferred to a High Dependency Unit for overnight observation.

Discussion: The incidence of Fabry's disease is reported to be 1 in 80,000 live births, but when late-onset variants of the disease are considered, a prevalence of 1 in 3000 has been suggested(2). The implications of not diagnosing this condition could have serious consequences under anesthesia. These risks are accentuated by laparoscopic surgery and include raised intra-abdominal pressure by pneumoperitoneum and reverse Trendelenburg tilt. This case highlights that the effects of anaesthesia and surgical manipulation can be life-threatening. It is imperative that a joint approach to management of patients with this condition is undertaken.

References:

1. Moller AT1, Jensen TS , Neurological manifestations in Fabry's disease *Nat Clin Pract Neurol.* 2007 Feb;3(2):95-106.
2. Woolley J, Pichel AC. Peri-operative considerations for Anderson-Fabry disease. *Anaesthesia.* 2008 Jan;63(1):101-2

Learning points: A thorough pre-operative assessment is required in patients with this diagnosis to assess the impact upon the body systems. A multi-disciplined approach should be adopted in patients with this condition presenting for surgery.

01AP08-3

Anesthesia for patients with *PTRF* mutations

Hirano A.¹, Takada T.¹, Busujima Y.², Takahashi H.¹, Suzuki T.¹

¹Tokyo Metropolitan Bokutoh Hospital, Dept of Anaesthesiology & Pain Medicine, Sumida ku, Japan, ²Tokyo Metropolitan Bokutoh Hospital, Dept of Dentistry and Oral Surgery, Sumida ku, Japan

Background: Caveolae are abundant cell-surface organelles involved in lipid regulation and endocytosis (1). Mutations in the *PTRF* gene, which encodes a caveolar-associated protein, cause congenital generalized lipodystrophy (CGL) associated with myopathy (2) and symptoms such as abnormal glucose and lipid metabolism, cardiac arrhythmias, nephropathy, growth disturbances, and skeletal anomalies (3). However, there are no reports regarding anesthesia in patients with *PTRF* mutations.

Case report: A 29-year-old man (height, 126 cm; weight, 22 kg) with *PTRF* mutations was scheduled for mandibular dentigerous cystectomy. His primary symptoms were CGL, myopathy, long QT syndrome, refractory nephrosis, and abnormal lipid metabolism. Anesthesia was induced with continuous dexmedetomidine administration (DEX, 4 µg/kg/h) for 15 min; midazolam(7 mg) was added while monitoring bispectral index and physical reactions. Remifentanyl (100 µg) and rocuronium (10 mg) were added immediately before endotracheal intubation.

The operator used local anesthesia, and DEX and remifentanyl were continuously administered during the operation according to invasiveness. For immediate response to possible fatal arrhythmia, defibrillator pads were applied soon after the patient entered the operating room and kept until the next day. The operation was uneventful, and he was extubated after administration of sugammadex and flumazenil.

Despite not undergoing the standard anesthetic method, the patient reported that he was comfortable and unaware during the procedure.

Discussion: There were three major anesthesia-related concerns in this patient:

1. avoiding the use of inhalation anesthesia because of the high risk for malignant hyperthermia;
2. avoiding propofol because of the patient's abnormal lipid metabolism; and
3. avoiding arrhythmia, especially Torsades de pointes. The method chosen was adequate given the small scope and short duration of the operation.

References:

1. Hill MM, Bastiani M, Luetterforst R, et al. *Cell.* 2008; 132(1):113-24.
2. Ardisson A, 2.Bragato C, Caffi L, et al. *BMC. Med. Genet.* 2013; 14:89.
3. Hayashi YK, Matsuda C, Ogawa M, et al. *J. Clin. Invest.* 2009; 119(9):2623-33.

Learning points: To avoid malignant hyperthermia in patients with *PTRF* mutations who exhibit abnormal lipid metabolism and are at risk for cardiac arrhythmia, anesthesiologists must ensure careful planning. In this case, anesthesia was administered without inhalation agents or lipid-soluble drugs.

01AP08-4

Anesthesia of a patient with superior vena cava draining into left atrium

Altan Y.¹, Gundogdu G.¹, Ozaydin S.², Gemici H.³, Salihoglu Z.¹, Derbent A.¹

¹Saglik Bilimleri University Kanuni Sultan Suleyman Education and Research Hospital, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ²Saglik Bilimleri University Kanuni Sultan Suleyman Education and Research Hospital, Department of Pediatric Surgery, Istanbul, Turkey, ³Saglik Bilimleri University Kanuni Sultan Suleyman Education and Research Hospital, Department of Pediatrics, Istanbul, Turkey

Background: Returning of superior vena cava (SVC) to left atrium (LA) is a congenital anomaly that is rarely seen and is generally diagnosed incidentally. Although majority of these patients live asymptomatic or with mild hypoxemia, agents depressing cardiovascular function and increased pulmonary pressures may aggravate their symptoms.

Case report: A normal full-term-birth girl was diagnosed rectovaginal fistula and operated at 5.5 months of age with only the fluctuations observed in saturation during surgery. The echocardiography performed following surgery was found to be normal. 5 months later she was operated for anorectal perineoplasty without any perioperative problems. When she was 1.5 year old, a colostomy closure surgery would applied but at the fifth minute of the anesthesia, her saturation decreased to 88%. Despite the maneuvers for increasing her saturation, decrease in saturation persisted (70%). Therefore the surgery was terminated and was transported to intensive care unit and in the follow up diagnosed as SVC draining into LA.

Discussion: In cyanotic congenital cardiac anomalies with adequate or increased pulmonary flow, O₂ saturation is generally close to normal. But the procedures such as positive pressure ventilation (PPV) and positive end-expiratory pressure (PEEP) decrease the pulmonary blood flow through increasing the pulmonary pressures. In the presence of a SVC draining into LA this decrease may not be compensated due to depressive effects of certain general anesthetics on cardiac function. Therefore the decreased amount of blood oxygenated in the lungs may lead to desaturation.

References:

1. Allen HD, Gutgesell HP, Clark EB, Driscoll DJ, eds, Mos and Adams' Heart Disease in infants, children, and Adolescents, 6th ed, Philadelphia: Lippincott Williams &Wilkins; 2001:785-786
2. Mazzucco A, Bortolotti U, Stellin G, Gallucci V. Anomalies of the systemic venous return: a review. *J Card Surg.* 1990 Jun;5(2):122-33.

Learning Points: As the certain general anesthetics may depress the cardiac function and PPV decreases pulmonary blood flow, these patients may present with unexpected complications during anesthesia such as desaturation. In the presence of a SVC draining into LA an anesthesiologist should avoid from using cardiac depressive agents and also from the maneuvers that are decreasing pulmonary blood flow.

01AP08-5

Anesthetic management of a patient with CADASIL syndrome

Costa-Martins I., Carreteiro J., Carvalho P.

Centro Hospitalar Lisboa Ocidental, Dept of Anaesthesiology & Intensive Care, Lisboa, Portugal

Background: Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) is a rare but the most common genetic cause of ischemic strokes.⁽¹⁾⁽²⁾ It affects 500 families worldwide, mainly European.⁽²⁾ Few cases of anesthetic management were published.⁽¹⁾⁽²⁾

Case report: 48 year-old man with history of coronary angioplasty, hypertension and asymptomatic CADASIL syndrome was admitted for partial parotidectomy. Aspirin was stopped 5 days before and surgery took place under balanced general anesthesia, using ASA standard monitoring, capnography and BIS. Remifentanyl, propofol and sevoflurane were used for induction. Intubation was performed without muscle relaxation. Anesthesia was maintained with remifentanyl and desflurane. Through the procedure, the patient was hemodynamically stable, with MAP 60-70 mmHg and heart rate 50-60 bpm. The end-tidal carbon dioxide was kept between 27 to 34 mmHg. Surgeons repeatedly monitored facial nerve function and the procedure went

successfully. Extubation went uneventfully. Paracetamol and an elastomeric pump perfusion with tramadol and droperidol were administered. Anti-platelet therapy was reintroduced after 24h of surgery and the patient was discharged at 3rd postoperative day. At 1 month reevaluation there weren't any complications.

Discussion: CADASIL syndrome is a progressive non-arteriosclerotic arteriopathy with variable presentation: migraine, stroke, dementia, cognitive impairment and neuropsychiatric symptoms.⁽¹⁾⁽²⁾ Cerebral hypoperfusion appears early and cerebral autoregulation and reactivity to carbon dioxide may be impaired.⁽¹⁾⁽²⁾ Most patients take anti-platelet medication.⁽¹⁾⁽²⁾ Cardiovascular risk factors hasten the disease's progression.⁽²⁾ The main goal is the prevention of cerebral ischemia or vasospastic events by maintaining local levels of blood pressure, normocapnia and normovolemia.⁽¹⁾⁽²⁾ Whenever locoregional anesthesia is a possibility, it can be safely performed.⁽¹⁾⁽²⁾

References:

1. Chon, Lee. Anesthetic management of a patient with CADASIL syndrome. *Anesthesiology and Pain Medicine*. 2012; 7.
2. Errando et al. Anesthetic management of a patient diagnosed with CADASIL. *Anestesiología, Reanimación y Terapéutica del dolor*. 2012; 59.

Learning points: Anesthetic management of CADASIL syndrome should focus on maintenance of adequate cerebral perfusion while preventing ischemic and vasospastic events. Be aware of common use of anti-platelet medication.

01AP08-6

Approaching and managing Glanzmann Thrombasthenia - a case report

Pelicano Paulos J., Lijnzaat L., Carneiro A., Romao C., Fragata I. *Centro Hospitalar Lisboa Central, EPE, Dept of Anaesthesiology, Lisbon, Portugal*

Background: Glanzmann thrombasthenia (GT) is a rare inherited autosomal recessive platelet function disorder caused by mutations of its surface glycoproteins (GP) IIb/IIIa required for platelet aggregation¹. Severe hemorrhagic conditions are frequent. Although platelet transfusion remains the standard treatment, it can be associated with anaphylaxis and refractoriness.

Case report: A 22-year-old female patient with GT was proposed for correction of thoracolumbar scoliosis. At the age of 5, as she presented with recurrent episodes of epistaxis and post-traumatic hemorrhages, a specific blood screening was performed leading to GT diagnosis as levels of GPIIb/IIIa were below 1%. When 8 years old, a platelet transfusion was performed before a tooth extraction without any intercurrent, but when submitted to an appendectomy 3 years later, she suffered an anaphylactic reaction to platelets. After being proposed for the current procedure and due to her history, it was decided to administer tranexamic acid at the induction and recombinant factor VII during the procedure and the following 3 days instead of a platelet transfusion. In respect to postoperative analgesia, an endovenous patient-controlled device was considered safer to avoid the possible risks of a spinal technique. The patient had no hemorrhagic symptoms during her stay at the hospital and was discharged 6 days after surgery.

Discussion: Anaphylactic reactions to platelets occur in less than 20% of the transfusions but are highly heterogeneous². Epidural analgesia is an aid in controlling this intense postoperative pain but, as a platelet disorder, GT requires a focused approach to minimize adverse outcomes³. Regarding the lack of studies on its management, these patients should be viewed as the ones taking antiplatelet drugs and the ideal scenario should include a pro-coagulation status allowing the manipulation of the neuraxis.

References:

1. Poon MC, Di Minno G, d' Oiron R et al. *Transfus Med Rev* 2016;30:92-99
2. Kiefel V, *Transfus Med Hemother* 2008;35:354-358
3. Cabarique-Serrano SH, Gonzalez-Cárdenas VH, Dussán-Crosby JP et al., *Rev Colomb Anestesiología* 2016;44:249-254

Learning Points: Albeit rare, these disorders can be clinically severe and a correct evaluation is mandatory both for diagnosis and treatment. Their anesthetic management can also be challenging but still needs research to be clarified and a protocol for reliable methods of coagulation study should be created.

01AP08-7

Suspected intra-thoracic bleeding leads to CVC misplacement diagnosis

Antunes P, Santos J., Arede M.J., Nunes F., Catré D., Assunção J.P. *Hospital de São Teotónio - Centro Hospitalar Tondela-Viseu, Dept of Anaesthesiology, Viseu, Portugal*

Background: Central venous catheter (CVC) placement is a common procedure in anesthetic practice. CVC misplacement can occur at the time of placement or later due to migration¹. Its prevention includes ultrasound and EKG guidance and early x-ray analysis. Intrapleural migration is an uncommon complication of internal jugular vein (IJV) CVC placement².

Case report: 84yo female, ASA IVE submitted to urgent sick laparotomy due to bowel obstruction. Right diaphragmatic hernia containing colon was identified. Right hemicolectomy and diaphragmatic hernia repair performed and right thoracic chest tube (TCT) inserted. Triple lumen right IJV CVC was placed (1st attempt, anatomic landmarks, Seldinger technique). Free blood flow was present in the 3 lumens and chest x-ray performed postoperatively. Five packed red blood cells administered through the CVC over a 16h period due to anemia and intermittent hematic drainage through the TCT. TCT was changed and chest x-ray repeated. Later another episode of hematic drainage occurred so thoracotomy was proposed. Induction with fentanyl and etomidate through the CVC but no loss of consciousness was achieved. A white fluid was observed in TCT. Only the proximal lumen of the CVC had blood flow. CVC was removed without incidents and thoracotomy was cancelled. The patient remained hemodynamically stable and was transferred to intermediate care unit after 2h. Posterior review of 2nd r-x-ray showed the CVC in a slightly different location.

Discussion: This case reports a CVC migration since initially all lumens were functioning, initial x-ray confirmed placement but the 2nd x-ray seems to show a different location of the CVC. The homolateral TCT allowed drainage of the fluids administered through the CVC and hinted its intrapleural location.

References:

1. F. Gibson, A. Bodenham. Misplaced central venous catheters: applied anatomy and practical management. *Br.J.Anaesth.* 2013;110(3):333-346
2. P. Sandra, P. César, P. Carla, V. Pedro. When one port does not return blood: two case reports of rare causes for misplaced central venous catheters. *Braz JAnesthesiol.* 2016;66(1):78-81

Learning points: CVC misplacement may occur during placement or later. It is essential to confirm the correct position of the CVC by blood aspiration immediately, chest x-ray early after placement and whenever in doubt. Intrapleural misplacement of IJV CVC is uncommon but should be suspected when at least one of the ports doesn't show blood flow and can be confirmed administering contrast.

01AP08-8

Takotsubo syndrome in the operating rRoom before induction of anesthesia. A case report

Trabulo A., Diniz I., Corda Teixeira J., Nunes L., Pedroso V.M. *Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal*

Background: Takotsubo syndrome is an acute reversible heart failure syndrome that occurs predominantly in postmenopausal women, it is frequently preceded by a stressful trigger and often mimics an acute coronary syndrome^{1,2}. Coronary angiography shows no causative coronary occlusion and ventriculography is frequently diagnostic, showing typical wall motion abnormalities^{1,2}. We report a case of a patient who developed Takotsubo syndrome in the immediate preoperative period, presumably induced by emotional stress.

Case report: A 77-year-old woman, ASA II, was scheduled to undergo posterior lumbar decompression and fusion. Preoperative electrocardiography (ECG) and transthoracic echocardiography were normal. Upon arriving on the operating block, she expressed anxiety and concern for the surgery. While being monitored in the operating room she became acutely confused and drowsy, diaphoretic and hypotensive (blood pressure 40/20mmHg), with normal heart rate. No chest pain or breathlessness were reported. Surgery was cancelled and the patient was transferred to the Post Anesthesia Care Unit, where she spontaneously became fully aware and hemodynamically stable. ECG showed ST-segment elevation in precordial leads. Serial tropo-

nin levels were elevated. Suspecting acute coronary syndrome, the patient underwent coronary catheterization which showed no significant lesions. Left ventriculography showed apical and mid-ventricular akinesis and basal hypercontractility, with normal ventricular function. The patient was diagnosed with Takotsubo syndrome and was kept in observation in the Cardiac Intensive Care Unit for three days, where she remained asymptomatic and clinically stable. Six days later she underwent an uneventful spinal surgery under balanced general anesthesia.

Discussion: Takotsubo syndrome has been increasingly recognized and reported¹. Its pathophysiology is not fully understood, but plasma catecholamine levels seem to have a central role in it^{1,2}. Even though most patients recover completely, the possibility of relapse exists^{1,2}. It is of utmost importance to create awareness among anaesthesiologists for the possibility of developing this syndrome during the perioperative period. There is no consensus regarding the anaesthetic management of these patients, and even though some strategies have been suggested, further research is still needed^{2,3}.

References:

1. Eur J Heart Fail 2016;18:8-27
2. Can J Anesth 2016;63:1059
3. Br J Anaesth 2014;112(5):803-815

01AP08-11 PRE syndrome

AlJabari A.

University of Jordan, Dept of Anaesthesiology & Intensive Care, Amman, Jordan

Background: PRE syndrome is a very rare postoperative complication requiring a vigilant management and care.

Case report: 53 year old male patient, weighed 70 Kg, known case of diabetes mellitus. He was diagnosed with Non Hodgkin lymphoma on "CHOP" chemotherapy protocol. The patient had a history of previous general anesthesia without any complications. The patient was diagnosed with pancreatic head tumor and he was planned for Whipple procedure.

Anesthesia was induced with: Fentanyl 150 mcg, Propofol 120 mg, Cisatracurium 12 mg. Anesthesia was maintained intra-operatively using Isoflurane 1 vol% and remifentanyl 0.5 mcg/kg/min. Intra-operatively, he was invasively monitored with central line, arterial line and temperature probe. Nasogastric tube was also inserted as part of his operation.

Duration of surgery was 6 hours; he was given intravenous fluids 5 liters normal saline 0.9% and 1 liter lactated ringer. The estimated blood loss was around 500 mL with adequate urine output. He was extubated and observed in ICU. He complained from pain and was prescribed pethidine 75 mg.

5 hours later, the oncall doctor was called because the patient started to complain of blindness. Immediately ophthalmology team was consulted and their impression was:

Normal light perception but the patient is confused. The patient received naloxone to treat his confusion state without any improvement, so **Brain CT scan** (without contrast) was ordered and found to be normal. **Brain MRI** (without contrast) was ordered: Multiple nonspecific T2/FLAIR white matter hyper intense foci. Neurology consultation concluded that: Another brain MRI was performed: Bilateral occipital lobes with abnormal high signal on T2 and FLAIR sequences with cortical diffusion restriction these findings are consistent with PRES.

MRA: Arteries of circle of Willis are normal, MRV: no evidence of dural sinus thrombosis.

The patient was diagnosed with PRES.

Discussion: Posterior reversible encephalopathy syndrome (PRES), also known as reversible posterior leukoencephalopathy syndrome (RPLS), is a syndrome characterized by headache, confusion, seizures and visual loss. It may occur due to a number of causes, predominantly malignant hypertension, eclampsia and some medical treatments. On magnetic resonance imaging (MRI) of the brain, areas of edema (swelling) are seen. The symptoms tend to resolve after a period of time, although visual changes sometimes remain. It was first described in 1996.

01AP09-1

Does apnea affects the reliability of Analgesia Nociception Index (ANI), as a monitor of nociception?

Bouzit Z., Grati A.H., Dhonneur G.F

Centre Hospitalier Universitaire Henri Mondor, Dept of Anaesthesiology & Intensive Care, Créteil, France

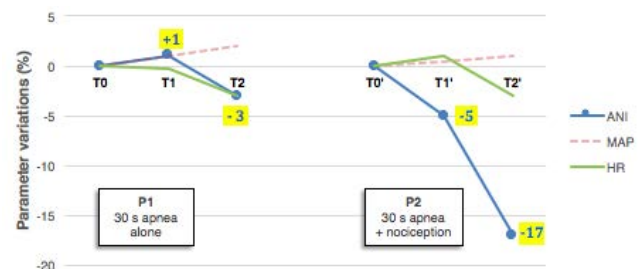
Background and Goal of Study: Assessment of nociception intensity during anesthesia is crucial. Analgesia nociception index (ANI: 0-100) allows clinicians to objectively measure pain in both conscious and anesthetized patient. ANI calculation reflects sympathetic to parasympathetic tones balance using respiratory rate (RR) and heart rate (HR) variability.

Because we aimed to evaluate nociception during tracheal intubation (TI), we conducted a study to test the reliability of ANI at monitoring nociception when RR was zero.

Materials and Methods: ASA physical status I adult volunteers participated in this experimental prospective trial. After 5 minutes resting, they were asked to perform a first 30s duration apnea (P1) starting on command at Residual Functional Capacity (RCF). After return to baseline parameters, the volunteers were asked to perform a second 30s duration apnea (P2), with 30s ulnar nerve stimulation at the wrist (single twitch, 1Hz, 25 mA). The different component of ANI (energy, mean, instantaneous: iANI), non-invasive hemodynamics (HD), blood pressure, HR, and pulsed oxygen saturation (SpO2) values were recorded at predefined time points: T0 (baseline values, just before apnea), T1 (end of apnea), T2

(T1 + 30s), for P1, and the same predefined time points (T0', T1', T2') for P2. Volunteers were asked to rate the pain intensity during P2, using a Visual Analogue Scale (VAS: 0-100). Evolutions of parameters were compared between P1 and P2. Values are mean ± SD.

Results and Discussion:



[iANI and HD variations (%) according to the stimulation]

21 healthy volunteers aged 34 ± 10 were included. Mean VAS was 27/100. During P1, there is a remarkable stability of iANI at T1 (+1%) and no significant decrease at T2 (-3%). On the opposite, a progressive decrease of iANI was evidenced during P2 (-5% at T1'), reaching a nadir 30s after the end of nociceptive stimulation (-17% at T2'). HD and SpO2 remained stable and comparable.

Conclusions: Based upon our results, ANI seems discriminant and efficient at measuring nociception in the conditions of a short apnea. ANI is thus probably reliable to measure nociception during TI. HD appears to be less sensitive than ANI to detect weak intensity nociceptive stimulus.

01AP09-3

Surgical Pleth Index and Analgesia Nociception Index for intraoperative analgesia in patients undergoing neurosurgical spinal procedures, a comparative study

Dostalova V., Schreiberova J., Dopitova P., Dostal P.

University Hospital Hradec Kralove, Dept of Anaesthesiology & Intensive Care, Hradec Kralove, Czech Republic

Background and Goal of the Study: The Surgical Pleth Index (SPI) and the Analgesia Nociception Index (ANI) have been recently suggested for the non-invasive intraoperative monitoring of nociception/anti-nociception balance. The goal of this study was to compare intraoperative use of opioids guided either by ANI, SPI or anaesthesiologist's judgment during desflurane-sufentanil anaesthesia respectively.

Materials and Methods: 72 adult ASA I - III patients scheduled for elective neurosurgical spinal procedures were randomized into the ANI group, SPI group and control group. Exclusion criteria included presence of non-sinus rhythm, pacemaker, planned postoperative ventilation, procedures with planned awake intervals, chronic pain with opioid medication, opioid addiction, epidural administration of local anaesthetic in combination with opioid, hormonal contraceptives. Anaesthesia and intraoperative use of opioids (sufentanil boluses based on body weight) were managed according to a strict protocol. The use of sufentanil was targeted to keep ANI value within the range of 50 - 70 in the ANI group and SPI value below individual postinduction baseline SPI value plus 10 points in the SPI group. In the control group, the use of opioids was left at anaesthesiologist's discretion. Results are expressed as mean \pm SD. Intergroup differences were tested using ANOVA with Student-Newman-Keuls test for all pairwise comparisons.

Results and Discussion: There were no differences in patient's baseline characteristics, duration and type of surgery, duration of anaesthesia, used concentrations of desflurane and total sufentanil dose.

Additional sufentanil boluses were administered earlier the ANI and SPI groups in comparison to the control group (3rd dose after 51.8 \pm 22.1 vs 52.7 \pm 14.8 vs 84.5 \pm 24.8 min respectively, $p = 0.001$; 4th dose after 61.3 \pm 30.1 vs 57.2 \pm 14.1 vs 120.0 \pm 26.2 min, $p = 0.003$, and 5th dose after 78.8 \pm 33.7 vs 74.0 \pm 11.6 vs 146.7 \pm 23.2 min respectively, $p = 0.009$).

There were no differences in time to spontaneous breathing at the end of anaesthesia (6.2 \pm 5.4 vs 4.4 \pm 3.2 vs 4.3 \pm 2.6 min respectively, $p = 0.207$), postoperative pain scores and complication rates between groups.

Conclusion: Both SPI and ANI monitoring provided clinically usable intraoperative sufentanil use guidance and significantly modified timing of sufentanil boluses in comparison with anaesthesiologist's guided intraoperative analgesia.

01AP09-4

Intraoperative use of low-dose naloxone decreases postoperative hyperalgesia induced by remifentanyl: a randomised controlled trial

Oh E.-A., Koo C.-H., Yoon S., Min S.-H., Seo J.-H.

Seoul National University Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Remifentanyl is a μ -opioid receptor agonist with rapid onset and offset, so even higher doses can be safely used for intraoperative analgesia without delay of postoperative recovery. However, high doses of remifentanyl may induce hyperalgesia after its discontinuation. Naloxone is a μ -opioid antagonist and it can selectively reverse side effects of opioids in low doses without worsening analgesia.

Therefore, we performed a prospective, double-blind, randomised controlled trial to investigate whether the intraoperative use of a low-dose naloxone combined with a high-dose remifentanyl decreases postoperative hyperalgesia.

Materials and Methods: This study was approved by the Institutional Review Board of Seoul National University Hospital. We enrolled adult patients undergoing elective thyroid surgery under general anaesthesia with desflurane and remifentanyl. Remifentanyl was administered via effect-site target-controlled infusion.

Patients were randomly assigned to one of three groups depending on the effect-site concentration of remifentanyl with or without continuous infusion of low-dose naloxone during anaesthesia: 4 ng ml⁻¹ of remifentanyl with 0.05 μ g kg⁻¹ h⁻¹ of naloxone in the high-remifentanyl plus naloxone group; and 4 or 1 ng ml⁻¹ of remifentanyl with placebo in the high- and low-remifentanyl groups, respectively. We measured mechanical pain thresholds with von Frey filaments on the peri-incisional area 24 (primary outcome) and 48 h after surgery, compared with Kruskal-Wallis test and Mann-Whitney U test. We also examined surgical pain intensity with verbal numeric rating scales and analgesic consumptions until 48 h after surgery, analysed with repeated measures ANOVA and Fisher's exact test.

Results and Discussion: The postoperative mechanical pain thresholds presented as von Frey numbers [median (interquartile range)] were significantly lower in the high-remifentanyl group ($n = 31$) than in the high-remifentanyl plus naloxone group ($n = 30$) and the low-remifentanyl group ($n = 30$): 3.63 (3.22-3.84) vs 3.84 (3.76-4.00) vs 3.80 (3.69-4.08), $P = 0.011$ at 24 h after surgery and 3.61 (3.22-3.84) vs 3.84 (3.76-4.00) vs 3.90 (3.69-4.08), $P = 0.004$ at 48 h after surgery.

Postoperative pain intensity and analgesic consumptions were similar between groups.

Conclusion(s): Intraoperative use of a low-dose naloxone combined with a high-dose remifentanyl attenuated postoperative hyperalgesia but did not decrease surgical pain intensity.

01AP09-5

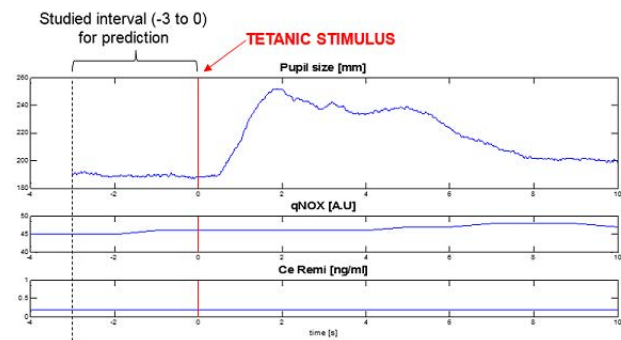
Comparison of qNOX, pupil size and remifentanyl concentration for the prediction of movement response to noxious stimulation during general anaesthesia

Capsi P.¹, González C.¹, Jensen E.W.¹, Pacheco A.², Agustí M.², Gambús PL.²

¹Quantum Medical, Research and Development Department, Mataró, Spain, ²Hospital Clinic de Barcelona, Dept of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: The aim of this work is to compare different methods for predicting responsiveness to nociceptive stimulation: an EEG based indicator like the qNOX[1] (Quantum Medical, Spain), the predicted remifentanyl effect site concentration (CeRemi) and the baseline pupil size (iD-Med, France) will be assessed as predictors of movement as a response to the tetanic stimulus.

Materials and Methods: After the Ethics Committee of Hospital CLINIC de Barcelona approval, data were recorded from 93 patients scheduled for gynecologic surgery, under propofol-remifentanyl TCI anaesthesia. Intentional movement as a response to tetanic stimuli (ulnar nerve, 100Hz, 60 mA) done with Algiscan was considered a positive response. Responses to the tetanic stimuli from each patient were classified as movers (MOV) or non-movers (NMOV). The average values in the three seconds prior to tetanus of qNOX, CeRemi [2] and the baseline pupil size (PS) (Fig.1) obtained for MOV and NMOV were compared through a t-student test and their prediction probability was assessed [3]. qNOX values with signal quality index below 55 were excluded.



[Figure 1: Example for a NMOV]

Results and Discussion: 404 tetanic stimuli were obtained from 91 patients that could finally be included in data analysis. The results (Table I) show that although all indicators present statistically significant differences between MOV and NMOV, some of them have better prediction probabilities. CeRemi appeared to be the best predictor and PS showed a slightly higher p_k value than qNOX, but not statistically significantly different due to the overlap of the p_k standard error.

	p value	P_k	SE
qNOX	< 0.0001	0.753	0.026
Pupil Size	< 0.0001	0.763	0.024
CeRemi	< 0.0001	0.819*	0.022

[Table I: Results (*converted to 0.5-1 scale)]

Conclusion: The CeRemi was the best predictor of movement response after tetanic stimulation, followed by PS and qNOX which showed a good and clinical equivalent performance.

References:

- Jensen EW et al. Acta Anaesthesiol Scand. 2014 Sep; 58: 933-41
- Minto et al. Anesth 1997;86:10-23.
- Smith WD, Dutton RC, Smith NT. Stat Med 1996; 15: 1199-215

01AP09-6

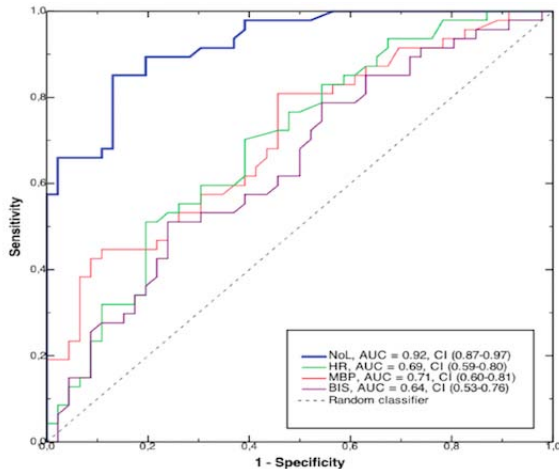
Impact of different remifentanyl doses on the Nociception Level (NOL) index response to intra-operative noxious stimuli

Stöckle P.-A., Renaud-Roy E., Maximos S., Verdonck O., Fortier L.-P., Richebé P
 University of Montreal, Dept of Anaesthesiology & Pain Medicine, Montreal, Canada

Background: Several indices based on a single parameter have been recently used to monitor nociception intensity under general anesthesia (GA). The PMD monitor (Medasense Biometrics, Israel) uses the NOL index, a multiparametric index derived from heart rate (HR), HR variability, plethysmograph wave amplitude, skin conductance and its fluctuations. The index ranges from 0 (no pain) to 100 (max pain). With the latest version PMD-200, we assessed the NOL response during noxious stimuli at various doses of remifentanyl (RF) to show an inverse correlation between RF dose and NOL.

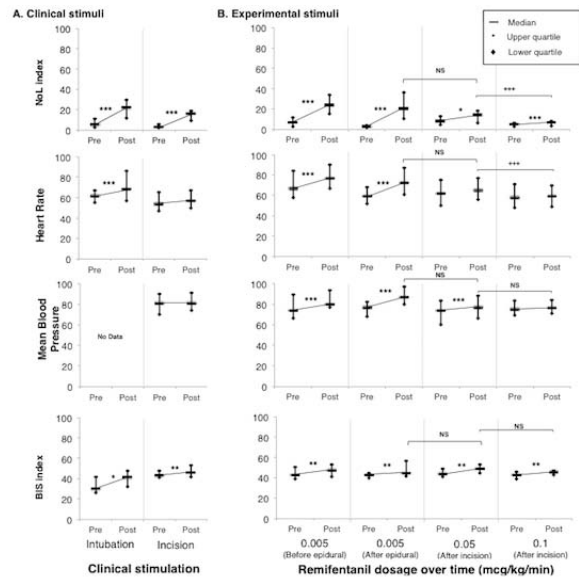
Methods: 26 patients received desflurane-RF based GA with an epidural analgesia (EA) for laparotomy. A tetanic stimulation was applied to the forearm of the patients at 3 RF doses (0.005 µg/kg/min, 0.05 and 0.1 µg/kg/min). Pre- and post-stimulation NOL values were compared. ROC curves were made to assess the ability of the NOL to discriminate between noxious and non-noxious state. Correlation between RF dose and post-stimulation NOL values was assessed. NCT#02884778.

Results: AUC (noxious vs non-noxious states) for NOL was 0.92 vs 0.69, 0.71, 0.64 for HR, MBP and BIS respectively.



[Figure. Receiver operating characteristics curve analysis of discrimination of experimental noxious stimulus at minimal remifentanyl dosage (0.005 µg/kg/min). NOL: Nociception Level Index; HR: Heart Rate; MBP: Mean arterial Blood Pressure; BIS: Bispectral Index]

Pre-stimulation NOL values ranged from 5 to 8 with no difference with higher RF infusion. Post-stimulation values at RF doses of 0.005 before and after epidural load, 0.05, and 0.1 µg/kg/min were, respectively, 24, 21, 14 and 7, significantly higher than the pre stimulation values (p<0.0083).



[Reaction of individual measures to experimental stimuli at different remifentanyl (RF) infusion dosage. Pre- to post-stimulation comparison using Wilcoxon rank signed test *P < 0.0042, **P < 0.001, ***P < 0.0001. Post-hoc analysis with Wilcoxon rank signed test *P < 0.025, **P < 0.001]

Post-stimulation values significantly decreased with higher RF dose. Correlation between NOL values and RF doses was $r = -0.584$ ($p < 0.0001$). **Conclusion:** NOL values after stimulus decreased with high RF doses, showing a significant inverse correlation between opioid dose and NOL index. The high sensitivity and specificity of the NOL index suggests its great potential as a monitor of nociception intensity during anesthesia.

01AP09-7

A comparison of pretreatment with palonosetron, pheniramine and lignocaine preceded by venous occlusion for reducing pain on injection of propofol: a prospective, randomized, double-blind, placebo-controlled study in adult Indian surgical patients

Jain A.¹, Solanki S.L.², Bala I.³, Wig J.³

¹Cleveland Clinic Abu Dhabi, Dept of Anaesthesiology & Intensive Care, Abu Dhabi, United Arab Emirates, ²Tata Memorial Hospital, Dept of Anaesthesiology & Intensive Care, Mumbai, India, ³Postgraduate Institute of Medical Education & Research, Dept of Anaesthesiology & Intensive Care, Chandigarh, India

Background and Goal of Study: To compare the effectiveness of pretreatment with palonosetron, pheniramine and lignocaine preceded by venous occlusion for reducing pain on injection of propofol: a prospective, randomized, double-blind, placebo-controlled study in adult Indian surgical patients.

Materials and Methods: After Institutional Ethical Committee approval and informed consent, 200 patients scheduled for elective surgery were randomly divided into four groups: control group (group I), lignocaine group (group II), palonosetron group (group III) and pheniramine group (group IV), with 50 patients in each group. The patients in the above four groups received placebo (2 mL of 0.9% saline),

2 mL lignocaine (40 mg), 2 ml pheniramine (44.5 mg) and 2 ml palonosetron (0.075 mg in 0.9% saline) intravenously respectively. The patients were injected with one-fourth of scheduled LCT/MCT propofol

(2.0 mg/kg body weight) via a dorsal hand vein after one minute of venous occlusion. The pain during the injection of propofol was evaluated.

Results and Discussion: Pain occurred in 62% of patients in the control group, 32% in the lignocaine group, 4% in the pheniramine group and 30% in the palonosetron group. There was a significant reduction in pain incidence in the three experimental groups compared with the control group ($P=0.00$). After lignocaine pretreatment and vein occlusion, 8% of the patients had severe pain on propofol injection. However, only 4% of the patients in the palonosetron group and no patient in the pheniramine group suffered severe pain following propofol injection ($p=0.00$).

Conclusion(s): Following venous occlusion, palonosetron pretreatment was as effective as lignocaine pretreatment in reducing the prevalence of propofol pain and it did reduce the severe pain. However, pretreatment with pheniramine with vein occlusion was most effective in preventing propofol pain in our adult Indian surgical patients.

References:

1. Apiliogullari S, Keles B, Apiliogullari B, Balasar M, Yilmaz H, Duman A. Comparison of diphenhydramine and lidocaine for prevention of pain after injection of propofol: a double-blind, placebo-controlled, randomized study. 2007; 24: 235-8.
2. Lee KH, Rim SK, Lee JY, Lee SY, Lee SN, Lee EJ, et al. Effects of pretreatment with intravenous palonosetron for propofol-remifentanyl-based anesthesia in breast and thyroid cancer surgery: a double-blind, randomized, controlled study. Korean J Anesthesiol 2014; 67: 13-9.

01AP09-8

The transient receptor potential vanilloid subfamily 1 is involved in abdominal hyperalgesia in a mouse model of lipopolysaccharide-induced peritonitis and influences the immune response

Sugiyama Y., Yoshiyama Y., Kiyosawa K., Tanaka S., Kawamata M. *Shinshu University, Dept of Anaesthesiology, Matsumoto, Japan*

Background and Goal of Study: Acute peritonitis induces a strong inflammatory response accompanying abdominal pain. The transient receptor potential vanilloid subfamily 1 (TRPV1) is a multimodal nociceptor and is known to play a pivotal role in the development of inflammatory hyperalgesia; however, the contribution of TRPV1 to abdominal pain induced by peritonitis is unclear. In this study, we investigated the involvement of TRPV1 in inflammatory abdominal pain in a mouse model of lipopolysaccharide (LPS)-induced peritonitis using TRPV1 knockout (KO) mice. We also examined whether pain sensation through TRPV1 influences the immune response.

Materials and Methods: The protocol for this study was approved by the Animal Care Committee of our institution. All procedures were conducted in accordance with the Guidelines for Animal Experimentation of the International Association for the Study of Pain.

Experiments were performed in 8-to14-week-old male wild-type (WT) and TRPV1 KO mice on a C57BL/6 background. Mice were intraperitoneally injected with or without a non-lethal dose of LPS (10 ug) in 1000 uL of PBS. Mechanical hyperalgesia was assessed by abdominal stimulation with a von-Frey filament. Activation of spinal nociceptive neurons was immunohistochemically assessed by c-Fos expression. Splenocytes were counted using a Burkert-Turk haemocytometer and analyzed by flow cytometry.

Results and Discussion: LPS-induced weight loss and decrease of body temperature occurred in both groups and these changes were not significantly different between both groups. LPS induced greater mechanical hyperalgesia from 6 hr to 48 hr in WT mice than in TRPV1 KO mice, and this hyperalgesia disappeared 3 days after LPS injection. c-Fos expression in the spinal dorsal horn 6 hr after LPS injection was significantly upregulated in WT mice compared with that in TRPV1 KO mice. Marked splenomegaly was found in TRPV1 KO mice 4 days after LPS injection, and the number of splenocytes in TRPV1 KO mice was significantly increased compared to that in WT mice. Flow cytometry analysis revealed that myeloid lineage cells, especially neutrophils, were increased in TRPV1 KO mice.

Conclusion(s): Our results showed that inflammatory pain and abdominal hyperalgesia evoked by LPS stimulation were transmitted by TRPV1. In addition, the results of splenocyte analysis suggested that the pain sensation in the acute phase of inflammation affects the immune response in the late phase of inflammation.

01AP09-9

Balanced anaesthesia and a standard 15 mmHg pneumoperitoneum is compared with a 3 liter volume AirSeal pneumoperitoneum and an anti-inflammatory opioid free anaesthesia

Mulier J.P.¹, Dillemans B.²

¹*Sint Jan Brugge-Oostende, Dept of Anaesthesiology & Intensive Care, Brugge, Belgium*, ²*AZSint Jan Brugge-Oostende, Dept of Surgery, Brugge, Belgium*

Introduction: During a pneumoperitoneum the elevated intra abdominal pressure decreases splanchnic perfusion and induces peritoneal ischemia followed by an inflammation reaction. After 30 minutes the peritoneum loses its integrity and CO₂ absorption increases. Comparing the O₂ consumption and CO₂ production before and during pneumoperitoneum allows to calculate the amount of CO₂ absorption.

Surgical stress and trauma stimulate the peritoneal inflammation further. An anti-inflammatory anaesthesia using anti-inflammatory agents like dexamethasone, NSAID's and lidocaine, frequently given for an opioid free anaesthesia might reduce peritoneal inflammation.

AirSeal® is a valve-free insufflation system that enables a stable pneumoperitoneum with continuous smoke evacuation and probably less inflammation.

Methods: This is an open randomized, controlled, parallel-group study utilizing a 2x2 factorial design. Data was analyzed using a linear regression analysis. After Ethical Committee approval, 53 Morbidly obese patients without diabetes and scheduled for a laparoscopic bariatric surgery were selected after giving informed consent. Patients are randomised into 4 groups by combining a standard Pneumoperitoneum Insufflator set at 15 mmHg or an airseal insufflator set at a pressure to reach 3 liter workspace with a balanced anaesthesia using Sufentanyl/Remifentanyl and inhalation or an anti-inflammatory opioid free anaesthesia.

All patients received a deep NMB, with PTC below 3, throughout the surgery using a rocuronium infusion and a PTC monitor. Full NMB reversal is achieved by dosing Sugammadex according to the NMB depth level at the end of the procedure.

Results: There are no demographic differences between the four groups for age, BMI and duration of laparoscopy.

The amount of absorbed CO₂ per minute was significant higher in the patients treated with a balanced anaesthesia (p<0,001) (128 +/- 35 versus 49 +/- 15 ml/min), treated with a standard insufflation at 15 mmHg (p=0,001) (100 +/- 29 versus 52 +/- 16 ml/min) and in patients undergoing a longer pneumoperitoneum. (p=0,002) (38 ml/min up to 1 hour, 79 ml/min between 1 and 2 hours, 164 ml/min more than 2 hours).

Conclusion: Anti inflammatory anaesthesia and airseal insufflation of a pneumoperitoneum at 3 liter are both independent reducing the amount of CO₂ absorption.

01AP10-1

Real-time measurement of Xenon in a binary gas mixture using ultrasound time-of-flight: a feasibility study

Williams D.J.¹, Hallewell G.², Chakkarapani E.³, Dingley J.⁴

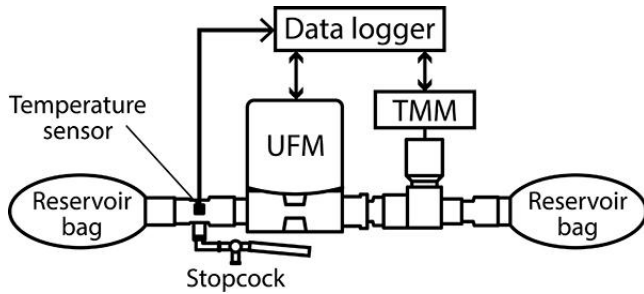
¹*ABM University Health Board, Swansea, Dept of Anaesthesiology, Swansea, United Kingdom*, ²*Centre de Physique des Particules de Marseille, Research and Development Department, Marseille, France*, ³*St. Michael's Hospital Bristol, Dept of Neonatology, Bristol, United Kingdom*, ⁴*Swansea University, College of Medicine, Swansea, United Kingdom*

Background and Goal of Study: Xenon (Xe) is increasingly used in anaesthesia with O₂ as a balance gas and typically measured using a thermal mass meter (TMM) and fuel cell respectively.¹ Speed of sound (SoS) in a binary gas mixture is related to temperature, pressure and molar masses of the component gases.²

We adapted an ultrasonic time-of-flight (ToF) flow meter (UFM) to measure Xe in O₂ (XeU) with the goal of making a single non-contact device to perform real-time flowmetry and binary gas concentration measurement.y

Materials and Methods: A bespoke microcontroller based datalogger obtained raw ToF data from the UFM (SpiroCell, UK), from which SoS was calculated and combined with ambient temperature measurements using a polyyno

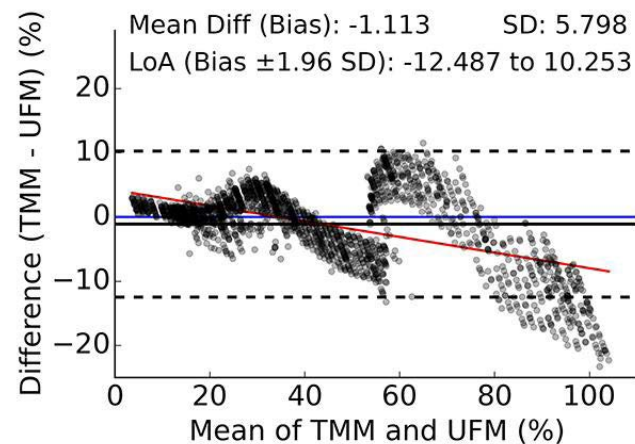
mial function to derive XeU. XeU was recorded at 0.5 Hz simultaneously with the gold standard of a TMM (GKM03, Russia) (XeT). The apparatus (Fig 1) was flushed with 100% Xe. 20 measurements of XeU and XeT were collected at 100 kPa.



[Fig 1: Apparatus]

The Xe was incrementally diluted and mixed with aliquots of O₂ and measurements repeated until XeT ~5%. XeU and XeT were compared using scatter- and Bland-Altman (BA) plots.

Results and Discussion: 2029 data pairs of XeU and XeT were collected. XeU correlated closely with XeT across the range 5% to 95% ($r = 0.989$; linear fit equation: $XeU = 1.1081 * XeT - 3.528$). BA analysis (Fig 2) showed that variability of individual readings ($\pm \sim 10\%$) was too great for clinical use due to a 1.28 Hz bimodal sawtooth oscillation in gain inherent in the UFM. Future studies will investigate and compensate for this.



[Fig 2: Bland-Altman plot]

Conclusion(s): Ultrasound ToF can be used to estimate real-time Xe% in O₂. With further work it may be possible to make a single device to perform both flowmetry and binary gas concentration measurement to a clinically acceptable degree of accuracy.

References:

1. Anesthesiol. 2000;92(3):865-8
2. Sensors 2014, 14:11260-76

01AP10-2

Sevoflurane consumption using automatic gas control versus manual gas control with Flow-I: comparative consumption in 200 patients

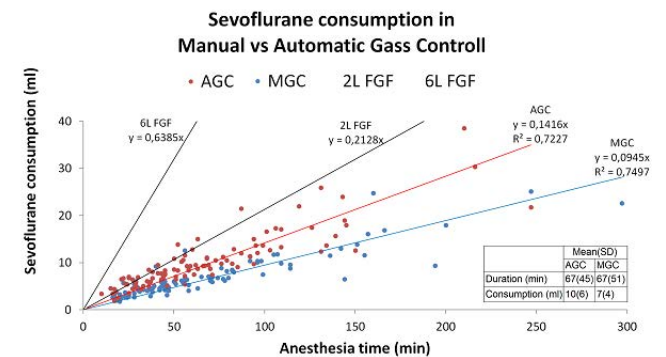
De Rydt E, Goossens J., Allaert S., Kalmar A.
Maria Middelaers Hospital, Dept of Anaesthesiology & Intensive Care, Gent, Belgium

Background: Traditionally, sevoflurane delivery was performed in high fresh gas flow (FGF), mainly owing to two reasons: lack of precise monitoring of gas concentrations, and ease of reliable administration. Being a recognised greenhouse gas with a considerable price tag, cutting down the waste of volatile anaesthetics promises important ecologic and economic benefits. Automated gas control (AGC) of the Flow-I ventilator (Maquet) permits easy

and reliable administration of volatiles with minimal operator intervention, while significantly decreasing waste. Still, manual gas control (MGC) may permit further waste reduction, albeit with significantly more manual interventions. The aim of the present study was to compare sevoflurane consumption in AGC versus low-flow MGC.

Methods: Either AGC or MGC was used in 2x100 consecutive patients. Volatile administration was initiated after induction of anesthesia (with propofol), intubation and start of mechanical ventilation. In both groups 1 MAC was pursued: in the first group, AGC mode (speed 6) was used, in the second group using MGC, sevoflurane concentration in fresh gas was set at 8%, with high FGF for 3 ventilations, and subsequently adjusted to 0.3ml/min with ensuing single-breaths of high FGF if necessary. Demographics, duration of narcosis and total sevoflurane consumption in each patient was recorded. For comparison, the theoretical consumption¹ with ventilator settings at constant 2L and 6L FGF was calculated based on anesthesia time and MAC for all 200 patients, and the linear regression line was calculated for all settings.

Results: Individual and Mean(SD) anesthesia time and consumption are shown in figure 1. Linear regression shows a consumption of 0.141 ml/min in AGC and 0.095 ml/min in MGC. The simulated consumption in constant flow administration is 0.213ml/min in 2L FGF and 0.639ml/min in 6L FGF



[Sevoflurane consumption in MGC vs AGC]

Conclusion: AGC significantly reduces the consumption compared to traditional constant FGF setting. Current AGC-algorithms still have substantial room for improvement, since manual gas control in minimal flow still results in a 33% lower consumption.

Reference:

1. Biro P Acta Anaesthesiol Scand. 2014;58:968-72.

01AP10-3

Consumption and intraoperative maniability of desflurane. A randomized trial comparing manual-assisted (Perseus® A 500 - Dräger) and automated control (Aisys® Cs2 - GE) of end-tidal concentrations

Gutton C.¹, Bonnot B.¹, Begneu E.¹, Schroedt J.², Alberti C.², Beaussier M.¹

¹CHU Hôpital Saint-Antoine. APHP, Dept of Anaesthesiology & Intensive Care, Paris, France, ²URC Robert Debré. Hôpital Robert Debré, Research and Development Department, Paris, France

Background and Goal of Study: As compared to conventional manual-assisted administration, automated-control of end-tidal inhalation anaesthetic concentration (EtControl® Aisys® Cs2 - GE) allows for a reduction of halogenated gas consumption¹ and an improvement of target end-tidal Fraction (F_{et}) maniability². However, recent real time decision support software may help anaesthesiologists to optimize the manual-assisted halogenated agent delivery (VaporView®, Perseus A500® - Dräger). The aim of this study was to compare these two modalities of delivery.

Materials and Methods: Prospective randomized study comparing Etcontrol® and Vaporview® modes in daily clinical practice conditions with an hypothesis of non-inferiority. The Vaporview® followed a protocol similar to the Etcontrol® for the wash in and wash out periods, and followed the Vaporview® curve to adjust delivered Fraction (Fd) during the maintenance of end-tidal Fraction (Fe) at 0.5 l.min⁻¹ fresh gas flow. Consumptions were measured by micrometric weighing of vaporizers.

The non-inferiority limit was 2 ml.h⁻¹ with a standard deviation of 2.5 ml.h⁻¹. Kinetics profile of Desflurane and number of intraoperative Fd or Fet adjustments were compared with Wilcoxon test.

Results and Discussion: 58 patients were randomized. The Desflurane consumption in Perseus Vaporview® group was 13.71 ml.hr⁻¹ (95% CI: 13.02-14.41) versus 13.27 ml.hr⁻¹ (95% CI: 12.30-14.24) in reference Aisys Etcontrol® group, satisfying statistical criteria for non-inferiority. There were no significant differences in time to reach MAC 1, and in number of Fd/FetDes adjustments per hour. This study is the first one which measured the exact halogenated consumption comparing Vaporview® and Etcontrol® mode in clinical situation.

Conclusion(s): Within clinical daily practice conditions, consumption of Desflurane with manual-assisted delivery (Dräger Perseus Vaporview®) was not statistically different from automated control delivery (General Electric Aisys EtControl®), with the same Fe kinetic profiles and ventilator adjustment requirements.

References:

1. Tay S, Weinberg L, Peyton P, Story D, Briedis J. Financial and environmental costs of manual versus automated control of end-tidal gas concentrations. *Anaesth Intensive Care* 2013; **41**: 95-101
2. Singaravelu S, Barclay P. Automated control of end-tidal inhalation anaesthetic concentration using the GE Aisys Carestation. *Br J Anaesth* 2013; **110**: 561-6

01AP10-4

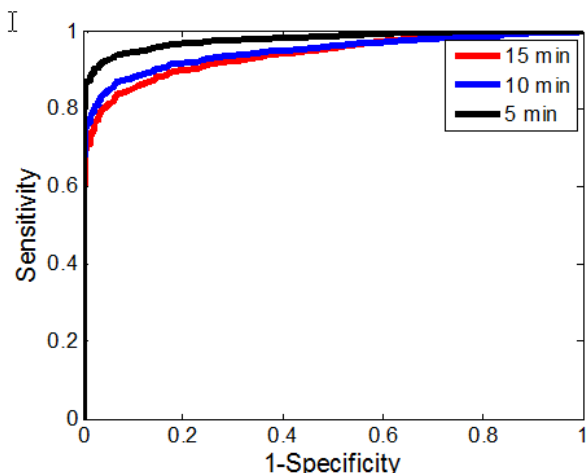
Validity of predicting intraoperative hypotension with machine-learning and pulse wave analysis of the noninvasive continuous blood pressure signal

Wijnberge M.¹, Emal D.¹, Lee C.², Janssen J.J.², Geerts B.F.¹, Veelo D.P.¹

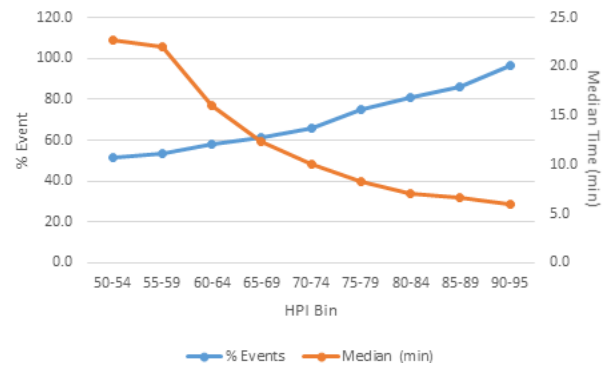
¹Academic Medical Center, University of Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands, ²Edwards Lifesciences, Research and Development Department, Irvine, United States

Background and Goal of Study: Intraoperative hypotension occurs in more than 75% of the general surgical population. Even short durations of hypotension are suggested to be associated with increased risk for renal insufficiency and myocardial ischemia. Currently treatment of these hypotensive episodes is not proactive. Early instability typically manifests as subtle complexity changes of physiological parameters not easily detectable with the human eye. However machine-learning algorithms may predict hypotensive events based on pressure pulse wave characteristics. Aim of this study was to train a machine learning algorithm to predict hypotension minutes before it occurs and to test the validity of this algorithm.

Materials and Methods: 278 adult patients were studied undergoing anaesthesia for a wide range of procedures. A Nexfin® device was connected to the patients prior to induction. The non-invasive arterial waveform was recorded. Hypotension was defined as a MAP < 65 mmHg for more than 1 minute. Machine learning was used to construct a mathematical model for predicting hypotension expressed as a hypotension probability indicator (HPI).



[Figure 1. ROC curve illustrating the reliability of the HPI]



[Figure 2. Median time to hypotension per HPI range]

Results and Discussion: In 278 patients studied 211 (75.9%) had at least one hypotensive event. Our algorithm was able to predict hypotension with a sensitivity of 93.5%, and 88.5%, and 86.7% and a specificity of 93.6%, 89.0%, 87.4% after 5 min, 10 mins and 15 mins prior to the event respectively (figure 1). A hypotension probability index of 85-89% translates to a chance of 85.9% a hypotensive event is to occur within a median time of 6.7 minutes (IQR 3.7-12), figure 2.

Conclusion: Our machine learning algorithm predicts hypotension with good reliability minutes before it occurs. Future studies are needed to assess whether clinical use of HPI results in preventing intraoperative hypotension.

01AP10-5

Fully automated anesthesia, analgesia and fluid management using physiologic closed-loop systems in high risk patients: a pilot study

Jame V.¹, Joosten A.¹, Van Obbergh L.¹, Cannesson M.², Barvais L.¹

¹Université Libre de Bruxelles - Erasme, Dept of Anaesthesiology, Brussels, Belgium, ²University of California Los Angeles, Dept of Anaesthesiology, Los Angeles, United States

Background: Automated delivery of anaesthesia guided by processed EEG monitoring using a physiologic closed-loop system (PCLS) is no longer a novel concept. The aim of this study was to evaluate the feasibility of fully automated anaesthesia, analgesia, and fluid management based on a combination of physiological variables [bispectral index (BIS), stroke volume (SV) and stroke volume variations (SVV)] using two independent PCLS in 13 patients undergoing high risk surgery.

Methods: After IRB approval, informed and written consent, patients having major peripheral vascular surgery were enrolled in this prospective observational pilot study. In addition to standard ASA monitoring, we added cardiac output (CO) and SVV monitoring (EV-1000, Edwards Lifesciences, USA) to guide fluid administration, processed EEG (BIS, Covidien, Ireland) to optimize depth of anaesthesia and titrate opioid administration. We also recorded the ANI values independently (MDoloris, Lille, France). Propofol (Prop) and Remifentanyl (RF) were used throughout induction and maintenance of anaesthesia using target control infusion (TCI) pumps (Base Primea, Fresenius Kabi, Belgium). Prop and RF concentrations were coadministered by a PCLS (Infusion Toolbox) guided by a BIS monitor. All patients received a baseline 3 ml/kg/h of Plasmalyte® (Baxter, Belgium). Additional fluid requirements were administered using the information from EV-1000 and consisted in 100 ml boluses (3% modified gelatin, Baxter, Belgium) delivered by a PCLS using a Q-Core Sapphire Infusion Pump (Q-Core, Netanya, Israel).

The primary objective was to reach a BIS target between 40 and 60, a SVV < 13% and/or a cardiac index (CI) > 2.4 L/min/m² and a mean arterial pressure (MAP) > 70 mmHg for > 85% of the maintenance surgical time.

Results: To date, ten patients have been recruited (Table 1). On average, patients spent 82% of the surgical time with a BIS value within the target 40-60, 83% with a SVV < 13%, 86% with a CI > 2.4 L/min and 91% with a MAP > 70 mmHg. No manual intervention over both PCLS was ever needed.

Conclusions: This study demonstrates the feasibility to combine two independent PCLS for anaesthesia and fluid management in order to provide adequate levels of anaesthesia and hemodynamics in high risk surgical patients. Additional research will be required to demonstrate the true benefits of this strategy on patient outcome. In the future, coordination of both PCLS must be envisaged.

01AP10-7**Low flow anesthesia using "equilibration time" and three different volatile inhalational agents- desflurane, sevoflurane and isoflurane-a randomized prospective clinical study**

Patel V.

The Maharaja Sayajirao Unviversity of Vadodara, Dept of Anaesthesiology, Vadodara, India

Background and Goal of Study: Low flow anaesthesia involves an initial period of high fresh gas flow (FGF) followed by low FGF. The changeover from high to low flow is usually done at 10 minutes of high flow. Presently a new method has come in which equilibration time, where the ratio of expired (Fe) and inspired (Fi) inhalation agent concentration become 0.8, is used for change over instead of fix time.

Materials and Methods: After ethical committee permission, study was conducted on 63 patients of 18-60 years and ASA I & II who were randomized using "envelop" method into three groups of 21 each.

Group D patients received Desflurane,

Group S patients received Sevoflurane and

Group I patients received Isoflurane.

All the patients received initial high FGF (6L/min- O₂ 2L/min + N₂O 4L/min) till the equilibration time was achieved and then low FGF (1L/min- O₂ 0.5L/min + N₂O 0.5 L/min) was started. Parameters monitored were equilibration time, vital parameters, end tidal CO₂ concentration, FiO₂, end tidal N₂O concentration, MAC and BIS value. Recovery time was noted at end of surgery. During postoperative period, all patients were enquired about awareness.

Results and Discussion: The mean equilibration time in group I was 12.23±2.34, group D was 4.19±0.81 and group S was 6±1.612 and Intergroup p values were very highly significant (<0.0001). Equilibration time and recovery time was quite early in case of Desflurane followed by Sevoflurane and then by Isoflurane group. None of the patient complained of awareness.

Conclusion(s): Desflurane and Sevoflurane are better agents for low flow anesthesia compared to Isoflurane.

References:

1. Tanuja Malik et al, JOACP 2012 volume 28(4)
2. M R Nel et al Anesthesia, 1997, 52.

01AP10-8**Crystalloid vs colloid for intraoperative resuscitation using a closed-loop system for unbiased treatment: a randomized double blinded controlled trial**Delaporte A.¹, Joosten A.², Ickx B.², Van Obbergh L.², Cannesson M.³, Van der Linden P.¹*¹Université Libre de Bruxelles - Brugmann University Hospital, Dept of Anaesthesiology, Brussels, Belgium, ²Erasme ULB Bruxelles, Dept of Anaesthesiology, Brussels, Belgium, ³UCLA, Dept of Anaesthesiology, Los Angeles, United States*

Background: Fluids' choice & volume could impact patient's outcome after major surgery (1). This prospective, randomized double blinded study tested the hypothesis that when using a closed-loop assisted goal directed fluid therapy (GDFT), balanced colloids are associated with fewer postoperative complications compared to balanced crystalloids in patients undergoing major abdominal surgery.

Methods: After IRB approval and written consent, 150 patients undergoing elective surgery were included in the study. All patients received a baseline crystalloid infusion of 3ml/kg/h. A closed-loop (CL) system delivered additional 100 ml fluid boluses according to a predefined GDFT strategy, based on the measure of SV and SVV. Fluid boluses consisted of either a balanced-crystalloid or-colloid solution & patients were randomized according to the type of fluid used by the CL system. The primary outcome was the Post-Operative Morbidity Survey (POMS) score at 2nd postoperative day. Secondary outcomes included all major & minor complications. Tertiary outcomes included intraoperative amount of fluid given & fluid balance.

Results and discussion: Baseline characteristics were not different between groups. Patients randomized in the colloid group had a lower POMS score and a lower incidence of postoperative complications (table 1). Total volume of fluid administered and net fluid balance were significantly lower in the colloid group.

Conclusion: Under our study conditions, where fluid administration was standardized and guided by a CL system for unbiased treatment, a colloid based GDFT was associated with fewer postoperative complications. This beneficial effect might be related to a significantly lower intraoperative fluid balance related to a lower fluid volume administration.

Reference: 1. *J Intern Med* 2015; **277**: 58-68

Variables	Crystalloids n = 74	Colloids n = 76	p-value
POMS Score	3 [1,8 - 3,3]	2 [1 - 2,8]	0,001
Major Complications (%)	23%	5%	0,002
Minor complications (%)	42%	18%	0,002
LOS fit for discharge (days)	10 [7 -15]	9 [6 -12]	0,097
Maintenance fluid (ml/kg/h)	3,8 [3,5 - 4,2]	3,8 [3,4 - 4,1]	0,239
Study Solution (ml/kg/h)	4 [2,6 - 6,2]	2,9 [1,9 - 3,8]	0,001
Total IN (ml/kg/h)	8,8 [6,7 - 10,8]	7,1 [5,6 - 8,3]	<0,001
Fluid balance (ml/kg/h)	5,0 [3,1 - 7,3]	2,7 [1,3 - 4,2]	<0,001
Need for Vasopressors (%)	89%	57%	<0,001

[Table 1]

01AP10-9**NT-proBNP as a marker of intraoperative fluid balance**Kamnev S.¹, Malakhova A.¹, Kopycheva N.², Noskova K.², Subbotin V.¹*¹Moscow Clinical Scientific Center, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation, ²Moscow Clinical Scientific Center, Clinical Laboratory, Moscow, Russian Federation*

Background and Goal of Study: It is important periodically to calculate actual fluid volume status during surgery. Knowledge of actual fluid volume status could influence on management of fluid and vasopressor therapy, especially in case of instable hemodynamics and ongoing bleeding. Many studies presented that fluid loading increases NT-proBNP (1,2). We have a hypothesis that NT-proBNP could be a biomarker of fluid loading and its changes could correlate with changes of fluid balance.

Materials and Methods: Our study was powered to reveal only strong correlation ($r > 0.7$). A total of 21 patients without significant heart diseases undergoing abdominal surgery were enrolled. NT-proBNP was obtained in the operation room before any infusion and at the end of the 4th hour of anesthesia (this was usually the main stage of the surgery). At that moment total intravenous infusion, diuresis, blood loss and fluid volume status were calculated. Blood loss was calculated based on gravimetric method.

Results and Discussion: Median and [interquartile range, IQR] of NT-proBNP was 88,9 pg/mL [25,3;165] at the beginning and 74,7 pg/mL [24,3;164] at the end of the 4th hour. The difference between measurements was insignificant ($p = 0.3$) and underpowered (calculated power = 13%). Change of NT-proBNP (Δ NT-proBNP) was -1,7 pg/mL [-21,3;7,7].

After 4 hours total intravenous infusion was 1100 mL [900;1300], diuresis was 300 mL [240;500] and blood loss was 100 mL [70;150]. Fluid volume balance after 4 hours was 650 mL [350;990]. Rate of infusion was 3,8 mL/kg/h [2,6;4,7].

Spearman correlation coefficients between Δ NT-proBNP and total intravenous infusion, fluid volume balance and rate of infusion were -0,176, 0,136 and -0,233 respectively (all insignificant). Actual power for this correlations was low.

Obtained data may be explained by using mainly restrictive fluid strategy during abdominal surgery in our hospital. So there is no volume loading and big volume shift during surgery.

Conclusion: NT-proBNP failed to show significant correlation with changes of fluid volume status during abdominal surgery in case of restrictive fluid strategy.

References:

1. Berri RN et al. Serum brain natriuretic peptide measurements reflect fluid balance after pancreatectomy. *J Am Coll Surg.* 2012 May; 214(5):778-87.
2. Mekontso-Dessap A et al. B-type natriuretic peptide to assess haemodynamic status after cardiac surgery. *Br J Anaesth.* 2006 Dec; 97(6):777-82. Epub 2006 Oct 17.

01AP11-1**The total intravenous anesthesia with sufentanil induces the similar incidence of postoperative shivering compared with remifentanil. A prospective, double-blinded, randomized control study**

Jung K.T., Kim S.H., Kim D.J., So K.Y.

Chosun University Medical School, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Postoperative shivering is a common uncomfortable post-anesthetic side effect. There was still debate whether postoperative shivering was more developed after general anesthesia with remifentanil compared with other opioid analgesics. There is insufficient published paper on the incidence of sufentanil-related postoperative shivering. We hypothesized that sufentanil would not increase the incidence of postoperative shivering than remifentanil. Therefore, we investigated the incidence of postoperative shivering related with either sufentanil or remifentanil in patients underwent elective surgery.

Materials and Methods: After Institutional Review Board approval, patients, aged between 20 to 65 years old, ASA I or II, were enrolled. We excluded the patients with preoperative hypothermia, endocrine disease, and thyroid disease. Sixty six patients were randomly allocated to one of two groups. They received propofol and either remifentanil (group RP, n=32) or sufentanil (group SP, n=32) with a target site concentration infusion device. The infusion rates of propofol and remifentanil was adjusted to maintain the 40-60 of bispectral index score and within $\pm 20\%$ of mean blood pressure.

After anesthesia induction, the core body temperature and the tympanic membrane temperature were recorded at 30 minutes after induction of anesthesia and the end of surgery. For one hour after the recovery room entrance, the incidence and degree of postoperative shivering were evaluated using a table defined it in four steps.

All values were presented as mean (95% confidential intervals) or number of patients (%). The statistical analysis was performed by t-test, or the χ^2 test. $P < 0.05$ was considered to indicate statistical significance.

Results and Discussion: The incidence of postoperative shivering was not significantly different between group RP (12.5%) and SP (9.4%) ($P = 0.689$). There were no significant differences in the core body temperature [$35.4(35.2-35.6)^\circ\text{C}$ vs. $35.6(35.3-35.9)^\circ\text{C}$, $P = 0.368$] and tympanic membrane temperature [$35.7(35.5-35.8)^\circ\text{C}$ vs. $35.7(35.5-36)^\circ\text{C}$, $P = 0.706$] between group RP and SP.

Conclusion: The total intravenous anesthesia with sufentanil induces the similar incidence of postoperative shivering compared with remifentanil. However, even though there was non-significant difference, total intravenous anesthesia with sufentanil seems to be effective to reduce the postoperative shivering than remifentanil.

01AP11-2**The impact of the use of general anesthesia on the results of endoscopic transpapillary interventions**Kuchynska I.¹, Dronov O.², Nastashenko I.², Khinich H.³, Khrisanfov D.³*¹Shupic National Medical Academy, Dept of Anaesthesiology & Intensive Care, Kyiv, Ukraine, ²Bogomolets National Medical University, Dept of Surgery, Kyiv, Ukraine, ³Kyiv City Clinical Hospital № 10, Surgery Center of Liver Disease, Biliary tract and Pancreas named by Zemskov VS., Dept of Anaesthesiology & Intensive Care, Kyiv, Ukraine*

Background and Goal of Study: The high diagnostic value of Transpapillary endoscopic interventions (TEI) largely due to their invasiveness, which may contribute to adverse reactions and complications. We analyzed the influence of general anesthesia on the results of TEI and patient satisfaction.

Materials and Methods: In 2015, ETI were conducted in 697 patients: 315 (45.2%) were diagnostic, in 382 (54.8%) - treatment. In 631 (90.5%) patients was used local anesthesia of the pharynx and superficial sedation (benzodiazepine) by gastroenterologist (GDS group), in 66 (9.5%) -general anesthesia (propofol, phentanyl, rocuronium) - ADS group. In 2015 the proportion of patients with ADS increased by 6 times compared to the previous year: 11 (1.86%) in 2014 to 66 (9.5%) in 2015. To evaluate patient's satisfaction with the

endoscopy, we developed a questionnaire (Q=15) and asked the patients to fill it within 72 hours after the procedure. Response options were presented on a 7-point Likert scale. The degree of postoperative pain was evaluated by numerical pain scale (NPS) of 0 to 10.

Results and Discussion: In GDS group duration of surgery was $61,50 \pm 4,01$ min, and in ADS group - $36,50 \pm 2,84$ min, $p < 0.05$. NPS in ADS group - $1,89 \pm 0,36$ points, in GDS - $4,78 \pm 0,65$ ($p < 0.05$). The level of satisfaction manipulations by The Likert Scale in ADS - $6,100 \pm 0,189$ points, in the GDS group - $2,600 \pm 0,281$ p. Number of complications in GDS: bleeding after papillotomy - 2.4%, the progression of suppurative cholangitis - 1.6%, postoperative acute pancreatitis - 1.4%, duodenal perforation - 0.3%, the syndrome of "discharge" - 0.3%. In ADS 1 cases of bleeding after papillotomy (1.5%).

Conclusion(s): According to the our data, the use of general anesthesia in ETI provides patient satisfaction, reduces surgery duration almost twice (1.7 times), accelerates early activation of patients due to the minimum level of pain in the postoperative period (NPS 2 or less) and improves the technical conditions to perform ETI with affect the level of postoperative complications and significantly minimizes them.

References: Bannert C et al. *Am J Gastroenterol*.2012; 107:1837-1848.

Acknowledgements: Areshnikov D, chief of Department of Anesthesiology, died in July 2016.

01AP11-3**Combining ADL status and ASA III classification to predict postoperative outcomes after major surgery (PROFS study NCT02626546)**Bertilsson M.¹, Bartha E.², Kalman S.², PROFS Study Group
¹Karolinska Universitetssjukhuset, Dept of Anaesthesiology & Intensive Care, Huddinge, Sweden, ²Karolinska Institutet, Dept of Anaesthesiology & Intensive Care, Huddinge, Sweden

Background and Goal of Study: Previous reports suggest that addition of activities of daily living (ADL) to ASA classification is a strong predictor for mortality. Using data from postoperative outcome study following major surgery (PROFS) our aim is to assess the value of adding ADL status to ASA 3 class to predict adverse events.

Materials and Methods: An observational cohort study between 2015 Nov1st and 2016 Feb15th. The inclusion criteria were: age ≥ 18 years, ASA ≥ 3 , major or xmajor/complex¹ abdominal, urogenital and orthopedic surgery. The ADL status was classified as independent (class a) or dependent (class b), if there was need of assistance for ADL. The outcome measures were postoperative complications screened by Postoperative Morbidity Survey (POMS)² (days 3, 7 and 10) and 30-day mortality. The POMS includes 10 domains, here we collapsed these into one composite outcome. The predictive value of adding the ADL status to ASA 3 was tested by uni-and multivariate logistic regression analyses.

Results and Discussion: Number of included patients was 1089, 13 were excluded due to violation of inclusion criteria, 3 were lost to follow up and 1073 were analyzed. Results are given in *Table 1*.

	ASA 3a n=764 n(%)	ASA 3b n=183 n(%)	Relative risk (95% CI) ASA 3b vs 3a	ASA 4 n=126 n(%)	Relative risk (95% CI) ASA 4 vs 3a
Age (years) mean (SD)	68 (14.5)	76 (15)		74 (15.7)	
Urgent	229 (30)	114 (62)		91 (72)	
Elective	535 (70)	69 (38)		35 (28)	
POMS day 3	576 (79)	159 (91)	1.16 (1.09-1.23)	112 (90)	1.14 (1.06-1.22)
POMS day 7	341 (47)	118 (67)	1.42 (1.25-1.62)	84 (71)	1.50 (1.30-1.72)
POMS day 10	333 (45)	115 (64)	1.44 (1.26-1.65)	81 (66)	1.49 (1.28-1.73)
Death 30 days	23 (3)	12 (7)	2.18 (1.10-4.30)	25 (20)	6.59 (3.86-11.2)

[Table 1. Patient characteristics and results]

Univariate analyses confirm previous findings³ on the value of adding ADL status to ASA 3 class to predict 30-day mortality. When age was added to multivariate models, significant differences were still found between groups considering postoperative complications (days 3, 7 and 10) but not for 30-day

mortality. The loss of significance for mortality might be attributed to the limited numbers of observations; nevertheless the effect size is comparable with previous reports³. The urgent procedures were dominating in ASA3b/ASA4 which could be a confounder.

Conclusion(s): We suggest classification of ASA 3 patients by ADL status in clinical practice as it may predict early postoperative complications and could be used to assign level of care.

References:

1. K. L. Protopapa, 2014
2. M.PW Grocott 2007
3. O. Visnjevac 2015

01AP11-4

Enhanced recovery after colorectal surgery implementation in the University Hospital of Guadalajara (Spain)

Cabellos Olivares M.¹, Labalde Martínez M.², Martínez-Meco Ortiz L.M.¹, Atance Martínez J.C.³, Ramia Ángel J.M.², Rodríguez Fraile J.R.¹

¹Guadalajara University Hospital, Dept of Anaesthesiology, Guadalajara, Spain, ²Guadalajara University Hospital, Dept of Surgery, Guadalajara, Spain, ³Guadalajara University Hospital, Research and Development Department, Guadalajara, Spain

Background: Enhanced recovery after surgery (ERAS) programme has been widely adopted in colorectal surgery bringing short-term patient benefit. It has proven to reduce complication rate and length or hospital stay. The aim of this study is to assess the implementation and outcomes of an ERAS program for colorectal surgery based in the RICA (enhanced recovery for abdominal surgery) program published in 2014 by the Ministry of health, social services and equality of Spain.

Materials and Methods: This is an observational cohort study. It started in May 2016 in my hospital. The inclusion criteria are: elective colorectal surgery, over 18 years of age, appropriate cognitive state and ASA (American Society of Anaesthesiology) I-II-III. The exclusion criteria are: urgent surgery and existence of higher concomitant surgical processes.

From May to November of 2016 we have collected 86 patients. The compliance was measure. Complication rates were evaluated according to Clavien-Dindo classification. Data of length of stay and readmission rates were analyzed. In this moment, we are collecting these same variables in patients operated from January to December of 2015 with the same criteria of inclusion and exclusion to compare the results of both groups.

Results: The median age of our patients was 68 years. 52 (60.5 %) were men and 34 (39.5 %) were women. 9 (10.5 %) were ASA I, 49 (57%) ASA II and 28 (32.5 %) ASA III. 66% underwent adequate preoperative optimization. There was a global compliance rate of 60 % patients of whom compliance was achieved with all measured interventions. The median hospital length of stay was 9.0 days (range 7-14 days), including the day before surgery and the day of the surgery. The average stay of patients undergoing colon surgery in 2015 was 12 days; the average stay was reduced by at least 3 days compared to the previous year. According to the Clavien Dindo Classification of Surgical Complications, 69.6% of the patients had a grade 0, 3.6% a grade I, 12.5% of II, 10.7% of III, 1.8% of IV, and 1.8% of V. 4 patients were reoperated. The readmission rate 30 days after discharge was 7,1%.

Conclusion: ERAS after colorectal surgery presents as safe and feasible based on good reported outcomes of compliance rates, complications, readmissions and needs for reoperation. This requires a great effort in the patient education, an intensive plan of pre and postoperative care, and sometimes a change in the surgical management.

01AP11-5

Network meta-analysis to compare outcomes from multiple studies. Synthetizing evidence from randomized controlled intubation trials as an example

Fallah L.¹, Uwimpuhwe G.², Vanlinthout L.¹, Hens N.², Van de Velde M.¹, Booij L.³

¹University of Leuven, Dept of Anaesthesiology, Leuven, Belgium,

²UHasselt, Interuniversity Institute for Biostatistics and statistical

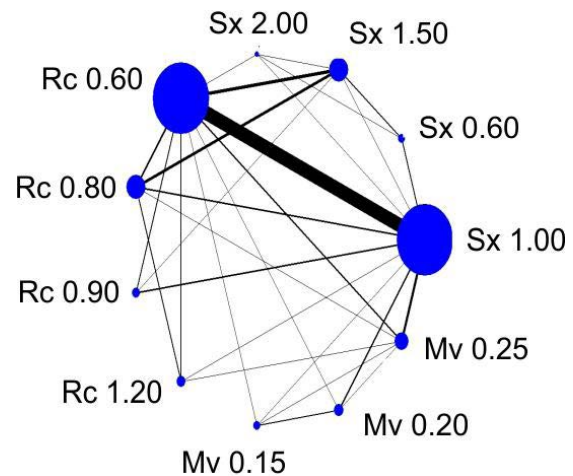
Bioinformatics, Leuven-Hasselt, Belgium, ³Universitary Medical

Center Nijmegen, Dept of Anaesthesiology, Nijmegen, Netherlands

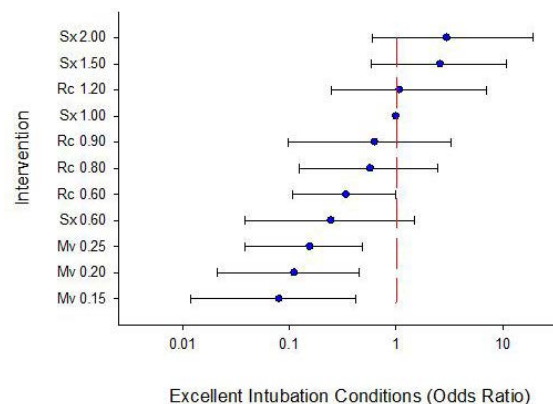
Background and Goal of Study: Suxamethonium (Sx) has been the cornerstone for rapid sequence induction and intubation. However its use is associated with serious side effects. Nondepolarizing neuromuscular blocking agents (NMBA) have been proposed as safer alternatives. Significant research scrutiny was attracted to look at their equivalence with Sx. Randomized controlled trials (RCT) may vary in design, participants and exposures. Network meta-analysis offers a set of methods to interpret the wider picture of the evidence and to understand the relative merits of different interventions.

Materials and Methods: We followed PRISMA, GRADE [1] and their extensions for guidance. Electronic databases were searched for RCTs relating to the use of Sx, Rocuronium (Rc) and Mivacurium (Mv) to facilitate tracheal intubation. Excellent intubation conditions (EIC) were selected as the primary outcome. Network analysis was performed using multivariate random-effect meta-regression models. Odds ratios (OR) of EICs were used to calculate a hierarchy of treatments. Potential characteristics associated with variation in study outcomes were explored, ie. age, time to intubation and opiate use.

Results and Discussion: A total of 74 eligible RCTs (11 treatments, 168 treatment arms, 4938 participants) was identified (Fig 1). Treatments are represented by the NMBA/dose used. ORs of EICs (median, 95%CI) can be found in Fig 2. The results of current study are in agreement with those of previous pair-wise meta-analyses [2]. Furthermore, time to intubation was significantly associated with EICs.



[Figure 1.]



[Figure 2.]

Conclusion(s): Network meta-analysis expands the scope of conventional pair-wise meta-analysis by simultaneously comparing alternative treatment options, even when two of the treatments have not been directly compared.

References:

1. BMJ 2014;349:g5630.
2. Cochrane Database Syst Rev 2015 (10) CD002788

01AP11-6

Gender differences in Bispectral Index monitoring for reduction of postoperative nausea and vomiting

Chiang M.-H., Wang C.-H., Lee H.-Y., Hou S.-Y., Chin J.-C., Wu S.-C.

Chang Gung Memorial Hospital, Kaohsiung, Taiwan, Dept of Anaesthesiology, Kaohsiung, Taiwan, Republic of China

Background and Goal of Study: Anesthesia with BIS can reduce anesthetic consumption by 19-35%, postoperative nausea and vomiting (PONV) by 6% , recovery time, and length of stay in postanesthetic unit[1]. Female gender was the strongest known risk factors (OR=2.57, 95%CI=2.32-2.84) of PONV[2] rather than volatile anesthetic (OR=1.82, 95%CI=1.56-2.13). We hypothesize that the benefit of reduction of PONV might be attenuated by female. The retrospective cohort analysis aims to clarify the impact of gender in reducing PONV by BIS.

Materials and Methods: This study is approved by Institutional review board (IRB No.: 201601419B0). From March, 2016 to June, 2016, adult patients who visited preanesthesia evaluation center (PAEC) before general anesthesia in KCGMH were enrolled. By the implement of SDM in PAEC, the application of BIS monitor during general anesthesia depended on patients' choice after discussion of evidence-based recommendation.

Patients who were included were divided into two groups by genders. A propensity score-matched by age and body weight was performed in both groups. Characteristics data, preanesthetic questionnaires, perianesthetic records, postanesthetic records, and postoperative visit questionnaires were collected and statistically analyzed.

Results and Discussion: After propensity score matched, 4260 patients were enrolled including 2424 female and 1836 male. The ratio of BIS monitoring was similar in female (52%, N=1250) and male (51%,N=936) groups, $p=0.772$. Among female, the incidence of postoperative nausea was statistically lower in BIS group (4.1%) than standard group (6.1%) ($p<0.001$).

The incidence of postoperative vomiting was similar 10.2%. Among male, the incidence of postoperative nausea was the same 7.4% in both BIS and standard groups, and the incidence of postoperative vomiting was statistically lower in BIS group (0.0%) than standard group (11.1%) ($p<0.001$).

Conclusion: In our study, BIS decreased postoperative nausea in female and postoperative vomiting in male. The degree of reduction is larger in male if POV is defined more severe than PON. In the other word, gender plays a more important role than volatile anesthetic in PONV.

References:

1. Effects of Bispectral Index monitoring on ambulatory anesthesia: a meta-analysis of randomized controlled trials and a cost analysis. *Anesthesiology*, 2004.
2. Evidence-based analysis of risk factors for postoperative nausea and vomiting. *Br J Anaesth*, 2012.

01AP11-7

predictors of postoperative complications in patients submitted to laparoscopic gastric bypass surgery in a portuguese tertiary hospital

Miguel D.¹, Ramos P.¹, Pereira A.C.¹, Ferreira C.¹, Oliveira J.², Aguiar J.G.¹

¹Centro Hospitalar do Porto, Dept of Anaesthesiology & Intensive Care, Porto, Portugal, ²Centre for the Study of Education, Technologies and Health, Polytechnic Institute of Viseu, Health, Viseu, Portugal

Background and Goal of Study: Postoperative complications can have serious consequences in terms of severe morbidity. Identification of potential predictors is useful for further reduction of these numbers. The aim of our study was to identify predictors of postoperative complications in patients submitted to laparoscopic gastric bypass surgery in a Portuguese Tertiary Centre.

Materials and Methods: After approval by the institutional review board, clinical records of 450 patients submitted to laparoscopic gastric bypass surgery were audited between January 2010 and August 2016. Clinical and demographic data, such as age, gender, ASA Classification, Body Mass Index (BMI), OS-MRS score, duration of surgery and hospital length of stay were collected. Evaluated comorbidities were hypertension, diabetes, dyslipidemia, hepatic steatosis, hypothyroidism, chronic pulmonary obstructive disease, sleep obstructive apnea, ischemic cardiac disease and Smoking. Complications until 90 days after surgery were observed and divided into surgical, cardiovascular, respiratory, thromboembolic, hospital readmission, re-intervention, intensive care admission and death and classified according to Clavien-Dindo Classification. Statistical analysis performed using SPSS® version 23. Chi-Square test was used for categorical variables. T-Student test was used for continuous variables. Statistical significance with $p<0,05$.

Results and Discussion: A total of 450 (81,1% female) patients were included. Average age was 44,4($\pm 10,7$) years old. ASA 2 - 23%; ASA 3 - 76%; ASA 4 - 1%. Average BMI was 43,7 Kg/m² ($\pm 5,7$) and duration of surgery 123,7($\pm 43,7$) minutes. Hospital length of stay was 3,9($\pm 5,7$) days. There were a total of 9,9% of complications (n= 42), classified as I (0,9%), II (3,3%), IIIa (0,9%), IIIb (2,7%), IVa (0,2%), IVb (1,1%). No relationship was observed between Sex ($p=0,331$), ASA Classification ($p=0,804$), BMI ($p=0,756$), and previous comorbidities and the development of complications. Both older age and longer surgeries were related to more complications ($p=0,05$ and $p=0,005$, respectively).

Conclusion(s): In patients submitted to gastric bypass surgery in a Portuguese tertiary hospital, patient's age and duration of surgery could predict the presence of postoperative complications. The evaluated comorbidities had no relationship with the development of complications. A larger sample would be useful to improve these results and increase the power of the study.

01AP11-8

Relationship of the cigarette smoking habit and the carbonmonoxide concentration in the expirium with the perioperative respiratory complications during laparoscopic cholecystectomy

Ozgunay S.E.¹, Karasu D.¹, Dulger S.², Yilmaz C.¹, Tabur Z.¹

¹University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Dept of Anaesthesiology & Intensive Care, Bursa, Turkey, ²University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Department of Pulmonary Diseases, Bursa, Turkey

Background and Goal of Study: Incidence of respiratory complications such as hypoxia, coughing, apnea, and bronchospasm are known to increase in cigarette smoking patients when under general anaesthesia. It has been aimed in this study to investigate prospectively the effects of the preoperative status of c smoking and the carbonmonoxide level in the expirium (COexp) on the perioperative respiratory complications in patients undergoing elective laparoscopic cholecystectomy.

Materials and Methods: This study included a total of 152 patients, consisting of smokers (Group S) and nonsmokers (Group NS), treated with laparoscopic cholecystectomy under general anaesthesia. Patients completed

the Fagerstrom Test for Nicotine Dependence (FTND); and the preoperative COexp levels were determined by means of the piCO+ Smokerlyzer 12 hours before the surgery. Respiratory complications were recorded during induction, intraoperatively and during extubation and at the recovery room.

Results and Discussion: Statistically significant increases were observed in the cigarette smoking group of patients in the incidences of hypoxia at the stage of anaesthesia induction, of bronchospams intraoperatively, intraoperative bronchodilator need and bronchospams at extubation. The modified Alderete score (MAS) was found to be significantly higher in the Group NS. Logistic regression analyses showed that the increases in the preoperative COexp levels were associated with the incidences of hypoxia during induction and with the intraoperative bronchospams as well as the bronchospams at extubation ($p=0.037$, $p=0.026$, $p=0.031$, respectively).

The number of cigarettes smoked during the 12 hours before the surgery was seen to increase the incidence of hypoxia during recovery ($p=0.026$). The increase in the FTND score was significantly low for MAS at 15 minutes ($p=0.025$).

Conclusion(s): It has been concluded that cigarette smoking increases the incidence of respiratory complications during operations under general anaesthesia and that preoperatively estimated COexp may be indicative of the potential risks of perioperative respiratory complications.

References:

1. Krzych-Falta E, Modzelewska D, Samolinski B. Levels of carbon monoxide in healthy active and passive smokers. *Przegl Lek* 2015; 72(3) 99-102.
2. Neto JY, Thomson JC, Cardosa JR. Postoperative respiratory complications from elective and urgent/emergency surgery performed at a university hospital. *J Bras Pneumol* 2005; 31(1): 41-7.

01AP11-9

Effect of total intravenous anesthesia and prophylactic 5-HT3 receptor antagonist on postoperative nausea and vomiting after gynecologic laparoscopic surgery: a prospective, randomized controlled study

Oh B.J., Jung J.-W.

Haundae Paik Hospital, College of Medicine, Inje University, Dept of Anaesthesiology & Pain Medicine, Busan, Korea, Republic of

Background and Goal of Study: Postoperative nausea and vomiting (PONV) is a common postoperative complication. Selective 5-hydroxytryptamine type 3 (5-HT₃) receptor antagonists have been reported to be effective in preventing PONV. The objective of this study is to evaluate the efficacy of palonosetron and ramosetron for the prevention of PONV in high risk patients undergoing gynecologic laparoscopic surgery.

Materials and Methods: In this randomized, double-blind, placebo-controlled study, a total of 87 female patients who were undergoing elective gynecologic laparoscopic surgery under general anesthesia were included. Patients were randomly divided into the following three groups: palonosetron group (0.075 mg i.v.; $n=29$), ramosetron group (0.3 mg i.v.; $n=29$), and control group (0.9 % normal saline i.v.; $n=29$). The occurrence of nausea and vomiting, and the severity of nausea were evaluated using visual analogue scale, and administration of rescue anti-emetics was monitored during 48 hours after the end of surgery.

Results and Discussion: The incidence of nausea was significantly lower in the palonosetron and ramosetron groups compared with the control group (34.5% vs 31.0% vs 65.5%, $p=0.014$) during 2 hours postoperatively, but not during 48 hours postoperatively. There were no significant differences in the incidence of vomiting and overall PONV, and the administration of rescue anti-emetics among the 3 groups.

Conclusion(s): Prophylaxis with ramosetron or palonosetron effectively decreases the incidence of PONV during the early postoperative period.

01AP11-10

The impact of high-sensitive troponin levels during liver transplantation on postoperative course: preliminary results

Vilchez Monge A.L., Hernández I., Garutti I., Olmedilla L., Jimenez de la Fuente C., Perez-Peña J.M.

Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Liver transplantation (LT) is associated with high rate of postoperative complications. Although recent studies have demonstrated that an increase of perioperative biomarkers of myocardial injury such as troponin T (TnT) is related with poor postoperative outcome, there are no studies analyzing intraoperative values of such markers in the population of liver transplant recipients.

The goal of our study was to investigate what is the impact of intraoperative elevation of TnT on early postoperative course after liver transplantation.

Materials and Methods: 184 adult patients undergoing LT were enrolled in the study. Patients undergoing retransplantation and those with elevated basal troponins were excluded. Anesthesia delivery and monitoring according to the hospital protocol included analysis of cardiac biomarkers such as high-sensitivity troponin T (HS-TnT) and hemodynamic measurements with PiCCO₂ (Pulsion Medical Systems) in at least 3 key moments of the surgery (hepatic dissection, anhepatic phase and after graft implantation).

Troponin level above 42 ng/L is considered highly suggestive of underlying myocardial injury in our center. Patients were divided into 2 groups according to HS-TnT level above or below 42 ng/L measured 60 minutes after graft reperfusion and its association with poorer immediate postoperative outcomes was analyzed retrospectively. Statistical study was performed with U-Mann-Whitney.

Results and Discussion: 33.8% of patients presented HS-TnT >42 ng/L at 60 minutes after graft reperfusion. No clinical findings suggesting myocardial injury were found in the intraoperative and early postoperative course (Cardiac Index, CFI and ECGs showed no significant changes). Postoperative mechanical ventilation and ICU stay were prolonged in the group of patients with elevated troponin level and it was clinically and statistically significant.

HS-TnT (ng/L)	Mechanical ventilation (hours)- mean(CI _{95%})	ICU stay (days)- mean(CI _{95%})
>42	32.64(12.73-52.55)	4.4(3.42-5.38)
<42	18.77(12.95-24.59)	3.54(3.17-3.91)
sig.	0.028	0.036

[Post-operative outcomes (CI95% confidence interval)]

Conclusions: Troponin elevation during liver transplantation predicts early complicated postoperative course. It seems to have a relevant prognostic value enabling prediction of clinical deterioration before other measurable derangements occur and allows for earlier adaptation of anaesthetic management to patient individual requirements.

01AP11-11

Prediction of postoperative nausea vomiting, using Japanese traditional Kampo medicine, "Water Stagnation Score"

Kasuya Y.¹, Frui I.¹, Fukushima R.¹, Kume K.², Ozaki M.¹

¹Tokyo Women's Medical University, Dept of Anaesthesiology, Tokyo, Japan, ²Osaka University, Dept of Anaesthesiology, Osaka, Japan

Background and Goal of Study: Apfel score is widely used for predicting postoperative nausea and vomiting (PONV). However gynecological major surgery patients are already scored more than Apfel score of 2 (female and postoperative opioid use). In these PONV high risk patient population, more effective prediction method is required. Japanese traditional Kampo medicine has a unique methodology of human body constitution classification. Kampo medicine specific concept, "Water stagnation" is considered as a status of abnormal fluid distribution state with the body feature tendency of accumulating unnecessary body fluid and blunting fluid elimination function, and has been reported to be a high risk for nausea and vomiting. The purpose of this study was to clarify whether water stagnation score (WSS), which is calculated using a self-assessed questionnaire, was useful to predict PONV for the gynecological patients.

Questionnaire	Score
Heaviness of the body	3
Throbbing headache	4
Heaviness of the head	3
Motion sickness	5
Dizziness	5
Lightheadedness upon standing	5
Watery nasal discharge	3
Excessive salivary	3
Foamy sputum	4
Nausea / vomiting	3
Hyperdynamic bowel sound	3
Morning stiffness	7
Splashing sound in epigastric region, edematous	15
Pleural effusion, cardiac effusion, ascites	15
Brisk pulsation in the supra-umbilical region	5
Watery diarrhea	5
Oliguria	7
Polyuria	5

The sum total of each component score was calculated as the Water stagnation score. If the extent of each symptom is slight, half of the score is given. Water stagnation score ≥ 13 is considered as the positive water stagnation state.

[Water Stagnation Score]

Materials and Methods: With IRB approval and written informed consent, WSS was preoperatively assessed. Inclusion criteria were

1. Elective gynecological surgery and;
2. Aged 20 to 50 years.

Intraoperative fentanyl total dose was intended to be 8-12 mcg/kg.

Postoperatively patient-controlled fentanyl infusion pump was used. PONV incidence during first 6 hours after general anesthesia was assessed, and patients were divided into PONV group or control group (no PONV). Patient demographics, intraoperative factors and WSS were compared between groups. The unpaired t-test or Mann-Whitney U-test was applied.

Results and Discussion: Eighty three patients were studied, and 53 patients developed PONV in the first 6 hour postoperatively and 30 did not develop PONV. WSS was 7.3 ± 7.8 in control group, and 10.4 ± 7.0 in PONV group ($p=0.073$). Incidence of water stagnation state ($WSS \geq 13$), was 3.4% in control group and 20.1% in PONV group ($p=0.01$). In ROC analysis, sensitivity was 0.86 and specificity was 0.32, and area under curve was 0.68 with cut off WSS value of 13.

Conclusion: As WSS can classify the human physical constitution more precisely than Apfel score, WSS is a useful predictor of PONV for gynecological surgical patients.

01AP12-1

10-year trends in non-operating room anaesthesia case volumes at an American academic medical center

Phelps M., Bradley W.

Johns Hopkins University, Dept of Anaesthesiology & Intensive Care, Baltimore, United States

Background and Goal of Study: Non-operating room anaesthesia (NORA) represents a growing trend in anaesthetic practice. Few studies, however, have quantified this trend, either overall or for subgroups of NORA.

Materials and Methods: We queried anaesthesia billing records from July 1, 2005 to June 30, 2015 at the Johns Hopkins Hospital which were labeled as a NORA service. Each billed anaesthetic was categorized into a specific NORA service, such as gastrointestinal (GI) endoscopy or interventional pulmonology (IP), using a combination of billing labels and Current Procedural Terminology (CPT) anaesthesia descriptors. These billing records were subsequently analyzed to determine the NORA case volumes and trends over the 10-year period studied.

Results and Discussion: A total of 134,718 NORA anaesthetics were performed at the Johns Hopkins Hospital from July 1, 2005 to June 30, 2015. The total number of NORA cases increased by over 156% from the 2005-2006 academic year (July 1, 2005 to June 30, 2006) to the 2014-2015 academic

year (July 1, 2014 to June 30, 2015), reaching a total of 18,546 total NORA cases in the 2014-15 academic year. The largest case volume increase was the GI service, increasing from 3,024 to 9,725 cases per year from 2005-6 to 2014-15, a 221% increase.

The greatest percentage increase were in cardiac electrophysiology (EP) cases, which climbed a staggering 2,905% (52 cases in 2005-6 to 1563 cases in 2014-15). Interventional Pulmonology (IP) volumes grew by 681%. Interventional Radiology (IR) cases increased by 272%, electroconvulsive therapy (ECT) increased by 58%, and anaesthesia for percutaneous tracheostomies in Intensive Care Units (ICU's) were up 226%. Pediatric NORA volumes were relatively flat, declining slightly by 11%.

Conclusion: NORA case volume at the Johns Hopkins Hospital increased substantially over the 10-year period from 2005 to 2015.

NORA Service	2005-6 Academic Year	2014-15 Academic Year	Percentage Change
Gastrointestinal Endoscopy	3024	9725	221.6%
Interventional Radiology	209	778	272.2%
Pediatric NORA	2153	1915	-11.1%
Interventional Pulmonology	123	961	681.3%
Percutaneous Tracheostomies	38	124	226.3%
Intubations	155	810	422.6%
Cardiac Electrophysiology	52	1563	2905.8%
Electroconvulsive Therapy	1192	1890	58.6%
Other NORA	279	780	179.6%

[Annual NORA Case Volume (2005-6 vs 2014-15)]

01AP12-2

ASA classification audit do we speak the same language?

Katary A., Haroun A., Sarna K.

Queens Hospital, Dept of Anaesthesiology, Burton-upon-Trent, United Kingdom

Background and Goal of Study: ASA physical status classification system is a universal risk stratification tool. It has been updated in October 2014, however many anaesthetists were found not to be aware of this new update. In addition to anaesthetists, in our hospital, ASA grade is communicated between anaesthetists, surgeons and other health care professionals providing perioperative care including scrub nurses, operation department physicians and recovery staff. many of them did not seem to properly understand neither the meaning nor the value of these different grades.

Materials and Methods: A questionnaire including six different patient scenarios has been circulated among anaesthetists, surgeons and theatre and recovery nurses, and asking them to fill in the ASA grade for each scenario. they were also requested to fill in their role and grade. Data was collected and analysed, looking for both over and under estimation as well as as how skewed the value was.

Results and Discussion: 71 questionnaires were returned between 1st and 13th July 2016. 2 were excluded due to missing role and grade. 24 anaesthetists (including 12 consultants), 15 Surgeons (8 of which are consultants), 4 junior doctors (FY), 11 ODPs (operation department physicians), 3 ODSs (operation department supporters), 8 Scrub nurses and 4 recovery nurses. 34% of the answers were correct, 1.5% over estimated the ASA PS grade, while the remaining majority of 64.5% underestimated the sample ASA PS grade. There was no specific pattern between anaesthetists, surgeons or nurses, neither there was a specific pattern between consultants and trainees.

Conclusion(s): Around two thirds of answers were not correct. This can jeopardize the ability of prelist meetings (group hugs) to identify high risk patients. Underplaying the ASA PS classification, especially when coding may have significant financial implications on the trust.

01AP12-3**Effects of music therapy under general anesthesia in patients undergoing abdominal surgery**

Nakhli M.S., Kahloul M., Chakroun A., Harrathi M.A., Mhamdi S.
Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse,
Tunisia

Background and Goal of Study: Music therapy, an innovative approach that has proven effectiveness in many medical conditions, seems beneficial also in managing surgical patients. The aim of this study is to evaluate its effects, under general anesthesia, on perioperative patient satisfaction, stress, pain, and awareness.

Materials and Methods: This is a prospective, randomized, double-blind study conducted in the operating theatre of visceral surgery at Sahloul Teaching Hospital over a period of 4 months. Patients aged more than 18 undergoing a scheduled surgery under general anesthesia were included. Patients undergoing urgent surgery or presenting hearing or cognitive disorders were excluded.

Before induction, patients wore headphones linked to an MP3 player. They were randomly allocated into 2 groups: Group M (with music during surgery) and group C (without music). Hemodynamic parameters, quality of arousal, pain experienced, patient's satisfaction, and awareness incidence during anesthesia were recorded.

Results and Discussion: One hundred and forty patients were included and allocated into 2 groups that were comparable in demographic characteristics, surgical intervention type and anesthesia duration. Comparison of these two groups regarding the hemodynamic profile found more stability in group M for systolic arterial blood pressure. A calm recovery was more often noted in group M (77.1% versus 44%, $p < 10^{-3}$). The average Visual Analog Scale (VAS) score was lower in the intervention group (33.8 ± 13.63 versus 45.1 ± 16.2 ; $p < 10^{-3}$). The satisfaction rate was significantly higher among the experimental group (81.4% versus 51.4%; $p < 10^{-3}$). The incidence of intra-operative awareness was higher in group C (8 cases versus 3 cases) but the difference was not statistically significant.

Conclusion(s): Music therapy is a non-pharmacological, inexpensive, and non-invasive technique that can significantly enhance patient satisfaction and decrease patients' embarrassing experiences related to perioperative stress, pain, and awareness.

01AP12-4**Evaluation of the performance of the operating room by the real time of room occupancy**

Nakhli M.S., Kahloul M., Harrathi M.A., Chakroun A., Mhamdi S.
Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse,
Tunisia

Background and Goal of Study: The operating room is the most cost consuming area of hospitals. However, it still suffers from the problem of non-optimized organization. The aim of this study is to evaluate the performance of our operating rooms by the real room occupancy time (RROT). We will also try to identify the main causes that could alter it and to study the problem of deprogramming.

Materials and Methods: This is a prospective and observational study conducted in two operating rooms of different specialties during the month of August 2016. For the two studied rooms, a pre-established data sheet was filled during the days of scheduled activity. The parameters collected consist essentially of calculating total RROT and broken down into periods, room occupancy rate, room overflow rate, incidence and causes of non-compliance with the surgical program and causes of RROT alteration.

Results and Discussion: The month of August included 23 days of programmed activities for the two studied rooms. The mean start time of the activity was $41.93 \text{ min} / \text{day} \pm 16.5$. The mean overflow time was $11.51 \text{ min} / \text{day} \pm 26.26$. The actual time of occupancy of the room was $246.56 \text{ min} / \text{day}$. This RROT corresponds to an average occupancy rate of $68.49\% \pm 28.19$. The mean time lost per room and per day with a patient in the room was $13.54 \text{ min} / \text{day} \pm 19.7$.

On average 1.86 ± 1.24 acts are performed per room and per morning with a total of 86 interventions. The deprogramming rate is 30.64%. Its main causes are the overshoot of the vacation time offered to surgeons (36.84%), the emergencies (18.42%) and the non respect of the anesthesia instructions (15.78%).

Conclusion(s): The occupancy rate in our structures is relatively acceptable but should not hide the need to optimize the use of available resources. Corrective actions should focus primarily on delayed start-up. Periodic reassessments ideally through computerized systems are essential.

01AP12-5**Influence of individual sociodemographics and past anaesthetic experiences on patients' fears and misconceptions of anaesthesia**

Gonçalves G., Pereira C., Mota A., Sobreira Fernandes D.,
Pinho S., Cavaleiro C.
Centro Hospitalar do Porto, Dept of Anaesthesiology, Porto,
Portugal

Background and Goal of Study: Fears and misconceptions concerning anaesthesia might be due to a lack of information by the general population. The main purpose of this study was to assess patients' fears concerning anaesthesia in a Portuguese population, and to evaluate possible predictors.

Materials and Methods: A questionnaire was delivered to patients that would undergo elective surgery during the anaesthetic consultation or the pre-anaesthetic visit. It contained 17 questions using a Likert scale (1-5) about patients fears and a question about their preferred anaesthesia technique (general or regional). Sociodemographic data was also collected. SPSS was used for statistical analysis. The study was approved by the Ethics Committee.

Results and Discussion: A total of 153 patients answered the questionnaire. The mean age was 58 years old, mainly women (61.4%) and employed (59.5%). Most of the patients were having Urologic (41.2%) or Abdominal surgery (24.2%), and 49.7% were ASA II and were proposed for general anaesthesia. Most had had previous surgical (78.4%) and anaesthetic experience (81.7%), but only 47.1% had been to an anaesthesia consultation. Fourteen percent had had regional anaesthesia before.

The least relevant fears (Likert 1) were "having nightmares" (82.4%), "fasting incapacity" (85%) and "speaking of personal matters" (77.8%). The fear of "fasting incapacity" had least significance for those who had a previous anaesthesia experience ($p=0.026$), and "speaking of personal matters" wasn't as important to the younger ($p=0.004$) and employed ($p=0.04$).

Fears classified with more extreme concern (Likert 5) were "not waking up" (32%), "being paralysed because of anaesthesia" (30.7%) and "feeling pain after surgery" (10.3%). Patients with previous anaesthesia had less concerns about this last fear ($p=0.039$). Overall, 72.5% preferred general to regional anaesthesia.

Patients with previous experience of regional anaesthesia opted for the same technique more often than those with no experience ($p < 0.001$).

Conclusion: "Not waking up", "being paralysed because of anaesthesia" and "feeling pain after surgery" were the most relevant fears. The latter was influenced by a previous anaesthesia experience. New educational strategies must be created to inform both patients, in the pre-anaesthetic visit, and the general population.

01AP12-6**Influence of patients' characteristics on the anesthesiologist's roles perception**

Pereira C., Gonçalves G., Sobreira Fernandes D., Mota A.,
Araujo M., Machado H.
Centro Hospitalar do Porto, Dept of Anaesthesiology, Porto,
Portugal

Background and Goal of Study: There seems to be a lack of information in the population regarding the functions of the Anesthesiologist. Our aim was to evaluate the patients' perceptions about the Anesthesiologist and to determine whether the answers are affected by patients' sex, age, education, previous experience of anaesthesia and a prior consultation with anaesthesia.

Materials and Methods: With the approval of the Ethics Committee, questionnaires with 13 fixed questions (using a Likert scale from 0 to 10) were distributed to consenting surgical patients, during the pre-anaesthetic visit and/or anaesthesia consultation. The questionnaires included patients' demographics and questions related to their perception of anesthesiologists'

roles. Descriptive statistics (frequency distributions) were used for patients' demographics and responses to all questions. The chi-square test was used to compare proportions and to investigate associations among variables.

Results and Discussion: 133 questionnaires were collected and analyzed. 69% identified the anesthesiologist as a specialized physician.

Anesthesiologist's roles were mostly associated (Likert 10) with loss of consciousness (88,7%), vital sign monitoring (39,9%) and remaining present in the operating room during surgery (61,7%). Patients associated less the anesthesiologist with pain relief (21,2%), pain relief at childbirth (23,3%) and puncturing (23,3%). In response to the question "what are anesthesiologists?", the percentage of correct answer tended to be smaller among patients of lower educational level ($p=0.031$). We did not identify any statistically significant relationship between patient's demographics and the percentage of correct answer regarding the knowledge of the role of anesthesiologists ($p>0.05$). However, we found that the training of anesthesiologists and his role in pain relief were more correctly identify by patients with previous anesthesia consultation ($p=0.059$ and $p=0.064$, respectively).

Conclusion(s): The perception of anesthesiologist's roles was not influenced by patients characteristics. Most of the patients identified the anesthesiologist as a specialized physician, with a lower percentage of correct answer related to a lower educational level. Further clarification regarding the specialty of anesthesiology seems to be necessary.

01AP12-7

Large scale quality improvement in emergency general surgery. Reducing mortality and improving quality of care

Geeta A., Nial Q.

Royal Surrey County Hospital, Dept of Anaesthesiology, Guildford, United Kingdom

Outcomes from emergency laparotomy are poor both in Europe and the USA with reported mortality rates of 15-19%. Higher risk patients such as the elderly patients have significantly higher mortality rates up to 50% in the over 85 years of age patients.

Not only is high mortality observed but also prolonged length of stay, post operative complications and patient morbidity which all consume valuable hospital resources.

Several publications have suggested use of a quality improvement approach together with the implementation of specific clinical standards of care (care bundle) can significantly reduce mortality in this group of patients.

Our study builds on these findings, to implement a quality improvement, evidence based care bundle across a group of 30 hospitals over a two year period in the south of England. The study runs for 2 years and we will present data from the first 15 months of the project. We will have data on over 6000 patients undergoing emergency laparotomy.

Early data shows a 25% reduction in crude in hospital mortality, a 37% reduction in hospital P POSSUM risk adjusted mortality and a 20% reduction in length of stay.

The best performing hospitals have managed to halve both crude mortality rate and length of stay. Many hospitals are now consistently reporting in hospital crude mortality rates of 5% and length of stays of significantly less than 10 days.

The methodology of our quality improvement project will be presented together with the use of run charts, driver diagrams, regional dashboards and CUSUM charts.

01AP12-9

Re-evaluation of scheduling at the pre-operative assessment clinic

Oei G.T.M.L., Donkers A.A., Smeenk H.F., Meijer R.P., Hesselink E.M., Preckel B.

Academic Medical Centre, University of Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands

Background and Goal: Hospital mortality among surgical patients is estimated to be 0.5% to 4% and is related to certain pre-operative risk factors.[1] The increasing amount of complex cases stretches perioperative healthcare including anaesthesia pre-operative assessment clinics (PAC).[2]

The optimal PAC has quick access times and allows for optimization of American Society Anesthesiologist (ASA) physical status III-IV patients in time before an operation takes place. This requires smart planning of patients and personnel. In 2008, our PAC was first evaluated. It led to an estimation of the optimal amount of consultations per week and consultation time [3].

After facing a more challenging case mix, a new electronic patient record and a general increasing work load secondary to external law and legislation we re-evaluated some aspects of our scheduling at the PAC.

Materials and Methods: Analysis of the electronic patient data system of a large university hospital (17000 anesthesia procedures per year).

Results: Over a time period of 8 weeks (Oct-Nov 2016) the number of anaesthesia consultations was 254 patients a week (vs. 224 patients/week in 2008). Two residents and one specialized nurse handled these cases, with a staff anesthesiologist available for consultation. Efficiency of planning was 92% and 89% for residents, respectively, and 73% for nurses; 6% of appointments were cancelled because of no show or physician-related reasons. About 5% of patients did not see an anaesthesia caregiver within 24 hours before operation. Scheduled consultation time was 20 min for ASA1-2 and 30 min for ASA3-4, based on a pre-operative patient filled-in questionnaire. Actual consultation time was estimated to be longer due to personal variation and invisible hours working over-time. 20% of patients had to be assessed in the week before scheduled surgery and were therefore not available for pre-operative optimization.

Conclusion: In comparison to 2008, we currently see more patients with comparable amounts of scheduled work-hours but unknown amount of extra hours. Efficiency of planning needs improvement for timely consultation to allow pre-operative optimization, as well as for reduction of late cancellations (including no show) and use of nurses' consultation time.

References:

1. Pearse RM, Lancet 2012;380:1059-1065;
2. Levett DZ, Best Pract Res Clin Anaesthesiol 2016;30:145-157;
3. Edward GM, Br J Anaesth 2008;100:195-202

01AP12-10

Are all the "blues" the same?

Lijnzaat L., Pelicano Paulos J., Carneiro A., Romão C., Fragata I.

Central Lisbon Hospitalar Centre, Dept of Anaesthesiology, Lisbon, Portugal

Background: Nowadays, dyes are widely used in medical practice. Patent blue (PB) is frequently used subcutaneously as part of the staging procedure in patients with early breast cancer. However, there are a few cases reporting its use intravenously, instead of methylene blue (MB).^{1,2,3} This case demonstrates the repercussions of the administration of PB instead of MB in a distal portal vein branch.

Case report: Male, 70 years, admitted for hepatic resection (S8 segmentectomy) classified as ASA PS II, with no significant functional impairments. One hour after the incision, PB was injected in a distal branch of the portal vein. Immediately after, he presented hypotension (60/40mmHg) and desaturation (SpO₂ 100% to 95%). Crystalloid boluses were given and a noradrenalin perfusion was started with no satisfactory response. There was no repercussion in the ventilation and arterial blood gas was normal. Arterial pressure stabilized around 85/50 mmHg. The surgery was over after an hour. When the drapes were removed it was noticed that the patient had a blue skin discoloration. Pulmonary auscultation was normal, and he was extubated and transferred to the intensive care unit. After 8 hours, the patient was stable and noradrenaline was suspended; 48 hours later, the discoloration of the skin disappeared. Posteriorly, we concluded that the dye that should have been used was MB but instead PB was given.

Discussion: Even though dyes are frequently used, it's important to notice that they have different indications, contra-indications and administration methods. It's mandatory that all of the staff is aware of these differences. Certain drugs seem to belong to no specialty in particular, which may contribute to a less rigorous check between all the parts involved. Avoidance of vague terms such as 'blue' is crucial to avoid errors. It would be important to educate the staff about the differences of these agents, and also to create a protocol to avoid errors like this.

References:

1. Haque RA, Wagner A, Whisken JA, et al. Allergy. 2010;65:396-400
2. Laukaityte E, Bruyère M, Bull A, et al. Crit Care Pain Med 34 (2015) 57-60
3. Gurung AM, Tomlinson AA. Anaesthesia, 2004, 59, pages 822-836

Learning points: Knowledge of all agents given to the patient is extremely important, even if it's not an "anesthesiologist's drug". Also, communication between the staff including the pharmacy is key for the wellbeing of the patient.

01AP12-11

Feasibility, reliability and validity of the Japanese version of the 12-item World Health Organization Disability Assessment Schedule-2 in preoperative patients: a prospective observational cohort study

Ida M., Naito Y., Tanaka Y., Matsunari Y., Inoue S., Kawaguchi M.
Nara Medical University, Dept of Anaesthesiology, Kashihara, Japan

Background: Along with the aging of the population, the number of patients with complications who require surgery has been increasing, and in such patients, daily living appears to be limited. To evaluate functional disability, the World Health Organization proposed WHODAS-2. The aim of our study was to evaluate the feasibility, reliability, and validity of the Japanese version of the 12-item WHODAS-2 in preoperative patients.

Materials and Methods: The clinical research ethics committee of our hospital approved this study. Individuals aged ≥ 55 years and were scheduled to undergo surgery in our hospital between April 2016 and September 2016 were eligible. The WHODAS-2, Short Form-8 questionnaire (SF-8), and Tokyo Metropolitan Institute of Gerontology Index (TMIG-Index) were preoperatively assessed by researchers who were not involved in the analysis after all patients signed an informed consent form. The WHODAS-2 is a new tool to evaluate functional disability and consists of six domains (cognition, mobility, self-care, fellowship, living, and participation) and 12 items. The SF-8 is one of the assessment tools for quality of life and involves the physical component score (PCS) and mental component score (MCS). The TMIG-Index is one of the assessment tools for instrumental activity of daily living (IADL), particularly among the elderly, and involves IADL, intellectual activity (IA), and social role (SR). The feasibility, reliability, and construct validity of the WHODAS-2 were evaluated on the basis of the response rate, Cronbach's alpha, and correlation between the WHODAS-2 and the SF-8 and TMIG-Index.

Results and Discussion: There were 1201 eligible patients, and 934 patients were finally included. Of these, 916 completed the preoperative WHODAS-2 (response rate, 98%). Cronbach's alpha was 0.92. The validity was assessed in 898 patients who completed the WHODAS-2, SF-8, and TMIG-Index and had all demographic data required for the assessment. The total score of the WHODAS-2 was moderately correlated with the SF-8 PCS ($r = -0.63$) and MCS ($r = -0.47$). Similarly, the total score in the WHODAS-2 was moderately correlated with the TMIG IADL ($r = -0.63$) and SR ($r = -0.53$) but was mildly correlated with the TMIG IA ($r = -0.34$).

Conclusion: The WHODAS-2 is a feasible, reliable, and valid tool for evaluating functional disability preoperatively. However, its ability to evaluate mental conditions and IA was lesser than that to evaluate physical conditions.

01AP13-1

Is age a covariate of pharmacodynamic interaction model for propofol and opioid?

Sugawara A.¹, Masui K.², Kunisawa T.¹

¹Asahikawa Medical University, Dept of Anaesthesiology, Asahikawa, Japan, ²National Defense Medical College, Dept of Anaesthesiology, Tokorozawa, Japan

Background and Goal of Study: Pharmacodynamic interaction model between anaesthetic and opioid is currently involved in drug information display. Published interaction models excluded age as a covariate. The hypothesis of the study was that age is a covariate in a pharmacodynamic interaction model.

Materials and Methods: After the institutional review board approval, we included 91 patients (71 females and 20 males) who were anesthetized with propofol, remifentanyl, and fentanyl for elective surgery with SmartPilot® View (Drägerwerk AG & Co. KGaA, Lübeck). Inclusion criteria were American Society of Anesthesiologists physical status I or II, age ≥ 18 year-old, noxious stimulation response index ≤ 20 . Effect-site concentrations of propofol and opioid were collected from the SmartPilot® View.

Hierarchical interaction model¹ was developed for tolerance of tracheal intubation. A 15% increase of heart rate at tracheal intubation was define as intolerant. The following model parameters were obtained from a published study²: opioid effect-site concentration (Ce) associated with a 50% reduction for intensities, and propofol Ce associated with 50% probability of tolerating shake and shout. We estimated propofol Ce associated with 50% probability for tolerance of tracheal intubation ($Ce50_{propTOT}$) and preopoid intensity of tra-

cheal intubation (PI_{TI}). A dichotomous variable of age with its threshold was evaluated as potential covariates for $Ce50_{propTOT}$. NONMEM 7.3 was used for the estimation. The significance of this dichotomous variable was assessed using objective function value (OFV), which is $-2 \log$ likelihood, calculated by NONMEM. P value < 0.05 was regarded as significant.

Results and Discussion: Age, body weight, and height were 53 ± 17 (18-89), 57 ± 9 (40-80), and 158 ± 6 (146-175), mean \pm SD (range), respectively. In the final model without a covariate dichotomous variable, $Ce50_{propTOT}$ and PI_{TI} were estimated as $8.55 \mu\text{g/ml}$ and 1.31, respectively. In the final model including a dichotomous variable of age, $Ce50_{propTOT}$ for younger age, $Ce50_{propTOT}$ for older age, threshold of age, and PI_{TI} were estimated as $11.4 \mu\text{g/ml}$, $9.14 \mu\text{g/ml}$, 71.7 years-old and 0.798, respectively. The latter final model resulted in a better fit ($P = 0.047$).

Conclusion(s): Age may be a covariate in the pharmacodynamic interaction model. Prospective development of a model with age is desired.

References:

1. Anesthesiology 2004; 100:1353-72,
2. Anesthesiology 2010; 112:872-80

01AP13-2

Lipid emulsion facilitates reversal from sevoflurane anaesthesia in a rodent model

Hino H., Matsuura T., Hori K., Tsujikawa S., Mori T., Nishikawa K.
Osaka City University Graduate School of Medicine, Dept of Anaesthesiology, Osaka, Japan

Background and Goal of Study: The volatile anaesthetics that are currently used for general anaesthesia have favorable pharmacokinetic properties, and provide excellent hypnosis and high-quality anaesthesia management. But, the functional mechanism is complicated with several potential sites of action, and effective antagonizing agents have yet to be developed. Lipid emulsion infusion has been reported to reverse some hypnotics, therefore we investigated the reversal effect of lipid emulsion on sevoflurane anaesthesia using a rodent model.

Materials and Methods: Using adult rats, we first tested the effect of intravenous lipid emulsion on time to emergence after discontinuation of sevoflurane anaesthesia. Lipid emulsion or normal saline (NS) was administered in a randomized manner at 9 ml kg^{-1} over 1 min, followed by a continuous infusion at $1.5 \text{ ml kg}^{-1} \text{ min}^{-1}$. We determined the threshold sevoflurane concentration for loss of righting reflex and then evaluated the effect of lipid emulsion on the restoration of righting reflex at the threshold concentration. Along with the behavioral experiments, we recorded electroencephalograms with electrodes placed at left frontal lobe under 2% sevoflurane anaesthesia and analyzed changes upon lipid infusion. The effect on respiration was also tested under continuous sevoflurane anaesthesia.

Results and Discussion: Intravenous lipid emulsion significantly decreased the time to emergence from sevoflurane anaesthesia, compared with NS infusion (131 ± 53 vs. 237 ± 69 s, $p = 0.004$, $n = 6$). The threshold concentration of sevoflurane for loss of righting reflex was determined to be $1.3 \pm 0.3\%$. Under sevoflurane anaesthesia of the threshold concentration, lipid emulsion significantly restored the righting reflex ($p = 0.02$, $n = 6$). The power of the δ bands ($< 4\text{Hz}$) on electroencephalogram under 2% sevoflurane anaesthesia was decreased by lipid emulsion infusion, compared with NS infusion ($p = 0.04$, $n = 6$). Lipid emulsion also recovered the respiratory depression under sevoflurane anaesthesia.

Conclusion(s): We found that lipid emulsion facilitated the reversal in several parameters even under continuous sevoflurane anaesthesia. Our findings suggest that lipid emulsion may contribute to active reversal from sevoflurane anaesthesia as well as respiratory depression, leading to improved general anaesthesia.

01AP13-3

The MAC-BIS50-tetanus of desflurane decreases by aging

Fujita M.¹, Inomata S.², Tanaka M.²

¹Tsukuba University Hospital, Dept of Anaesthesiology, Tsukuba city, Japan, ²Tsukuba University, Dept of Anaesthesiology & Intensive Care, Tsukuba city, Japan

Background: Intraoperative awakening is one of the complications which should be avoided. The minimum alveolar concentration of volatile anesthetics is an important factor in the suppression of biological response to nociceptive stimulation. A bispectral index (BIS) monitor is valuable for the maintenance of appropriate sedation; previously we have reported the minimum alveolar concentration (MAC) of desflurane at which the BIS index does not exceed 50 during nociceptive stimulation (MAC-BIS50-tetanus) was 4.27 % (95%CI: 4.15 - 4.39 %) in the adult patients (aged from 31 to 65 years). In this study, we investigated MAC-BIS50-tetanus in the elder patients (aged over 65 years).

Method: This study was approved by the ethics committee at Tsukuba University Hospital. The patients undergoing scheduled operation were recruited to this study, and written informed consent was obtained from all of them. The patients who had psychological disease and received sedatives were excluded. Anesthesia was induced with sevoflurane and 60% of nitrous oxide in 40% of oxygen and air. After the administration of rocuronium (0.6 mg/kg), a supra-glottic device (LMA or igel) was introduced. Then, administration of nitrous oxide and sevoflurane was then terminated, and we confirmed that the pre-determined end-tidal concentration of desflurane maintained for 10 minutes. The neuromuscular monitoring was used as a nociceptive stimulator; the altitude of the stimulation was 80 mA for 10 seconds, which is reported to be equal to skin incisional pain in the ulnar nerve. The BIS index was recorded every 10 seconds for 1 minute from beginning 1 minute after the stimulation. We defined the average of 6 BIS values as the BIS index for each patient. The MAC-BIS50-tetanus was determined using Dixon's up-and-down method.

Result: A total of 19 elder patients were registered in this study. The MAC-BIS50-tetanus of desflurane was 3.53% (95%CI: 3.38- 3.69 %) in adult patients.

Conclusion: The MAC-BIS50-tetanus of desflurane was 3.53% (95%CI: 3.38 - 3.69 %) in the elder patients. It was significantly lower than that of middle aged patients group. In elder patients, when the end-tidal concentration of desflurane is 3.53 %, the BIS index is suggested to exceed 50 in half of the patients during nociceptive stimulation.

01AP13-4

Fentanyl-Propofol versus Dexmedetomidine-Propofol for procedural sedation during gastrointestinal endoscopies in children

Galante D.¹, Badii F.², Melai E.³, Pedrotti D.⁴, Lambo M.S.⁵, Cococcia L.⁶

¹University Hospital 'Ospedali Riuniti' of Foggia, Dept of Anaesthesiology & Intensive Care, Foggia, Italy, ²Hospital of Vittorio Veneto, Dept of Anaesthesiology & Intensive Care, Vittorio Veneto, Italy, ³Ospedale Unico della Versilia, Dept of Anaesthesiology & Intensive Care, Lido di Camaiore, Italy, ⁴S. Chiara Hospital, Dept of Anaesthesiology & Intensive Care, Trento, Italy, ⁵Spirito Santo Hospital, Dept of Anaesthesiology & Intensive Care, Pescara, Italy, ⁶SS Annunziata Hospital, Dept of Anaesthesiology & Intensive Care, Sulmona, Italy

Background and Goal of Study: The objective of our research is to evaluate pediatric patient anxiety and discomfort during gastrointestinal (GI) endoscopies comparing the clinical efficacy and safety of Fentanyl + Propofol (FentP) and Dexmedetomidine + Propofol (DexP) when procedural sedation in pediatric patients is performed.

Materials and Methods: A systematic multicentric review of our recorded data was analyzed. ASA I-II children, aged between 4 to 14 years were enrolled to 2 groups: Dexmedetomidine and Propofol (DexP) or Fentanyl and Propofol (FentP) groups. The DexP group received Dexmedetomidine 1µg/kg over 10 minutes and Propofol (50µg/kg/min); the FentP group received IV bolus Fentanyl 1µg/kg followed by Propofol (50µg/kg/min) for maintenance. Propofol rescue doses 0.5-1 mg/kg were administered if patients showed discomfort in both groups.

Results and Discussion: Both groups were homogeneous in ASA class, age, demographics, cardiorespiratory and hemodynamic parameters. The mean heart rate, systolic and diastolic noninvasive arterial pressure during surgical and anesthesia procedures were lower in the DexP group as compared to FentP group and difference was statically significant (P<0.05). Respiratory rate and SpO₂ were lower in FentP group. Sedation scores, evaluated with Ramsay scale, were observed in DexP group. The mean recovery time (DexP vs FentP, 8.7 vs 10.56 mins) and length of stay in recovery (DexP vs FentP, 12.9 vs 15.14 mins) was lesser in DP group and the difference was statically significant (P<0.05). The average number of rescue doses of Propofol used during the procedure were significantly less in DexP group as compared to the FentP group (DexP vs FentP, 1.84 ± 0.76 vs 3.72 ± 1.16, P Value <0.0001) (Figure1).

The efficacy of analgesia in patients of both groups was assessed by Wong Baker Faces Pain Rating Scale and was comparable.

Conclusions: Dexmedetomidine in association with Propofol is considered preferable because it is associated with shorter recovery time, efficacy of analgesia, without complications and adverse effects on hemodynamic and respiratory parameters.

Time	Parameters	Group DexP		Group FentP		P Value
		Mean	S.D	Mean	S.D	
Baseline	HR	88.07	5.987	91.42	5.322	0.2153
	SABP	102.2	3.918	99.56	5.123	0.091
	DABP	59.84	4.653	56.06	3.22	0.362
	RR	14.21	1.297	15.00	0.78	0.26
	SPO ₂	96.60	0.678	96.40	0.789	0.58
	RSS	1	26	61	24	50
10 Minutes	HR	74.80	5.675	85.44	4.890	<0.00055
	SABP	87.80	5.032	94.32	4.33	<0.0001
	DABP	53.36	2.99	52.03	3.33	<0.0001
	RR	13.38	1.1	13.22	1.654	0.15
	Spo2	98.34	0.498	92.128	2.9	0.0011
	RSS	3	4	5	13	29
20 Minutes	HR	75.54	6.897	82.43	4.55	<0.0007
	SABP	95.55	4.334	92.94	3.666	<0.0001
	DABP	55.66	3.754	52.742	3.888	<0.0001
	RR	15.56	1.11	13.54	0.567	0.26
	SPO ₂	95.34	0.44	94.58	0.33	0.36
	RSS	3	5	7	16	33
30 Minutes	HR	79.45	4.454	85.55	5.023	<0.0001
	SABP	86.42	3.44	95.55	2.41	<0.0001
	DABP	56.00	3.14	56	2.56	<0.0001
	RR	13.33	1.44	13.66	1.123	0.26
	SPO ₂	93.45	0.44	95.50	0.44	0.65
	RSS	3	3	7.9	11	25.94
	4-5	39	93.5	29	75.55	0.0199
	4-5	11	99	12	94.44	

[Figure 1. Heart Rate (HR), Systolic Arterial Blood Pressure (SABP), Diastolic Arterial Blood Pressure (DABP), Respiratory Rate (RR), Peripheral Oxygen Saturation (SPO₂) and Ramsay Sedation Score (RSS) (Mean±S.D) in the DexP (Dexmedetomidine-Propofol) and FentP (Fentanyl-Propofol) groups during procedure.]

01AP13-5

Insulin minimises cell injury in an ex vivo perfused rat liver model

Cuttaia H., Nuyens V., Boogaerts J.G., Papegay B.

University Hospital Centre of Charleroi, Laboratory of Experimental Medicine, Lodelinsart, Belgium

Introduction: In the field of organ preservation, various solutions exist according to the composition of electrolytes, buffers, antioxidants and energy precursors. Insulin is added to University of Wisconsin preservation solution with the aim of stimulating glycolysis (1). Nevertheless, previous studies have shown that insulin exacerbates the ischemic injury in rat liver transplantation (2,3). The value of insulin in preservation solution therefore remains unclear. The aim of this study was to determine the effect of insulin on preservation of an ex vivo glucose-free perfused rat liver.

Materials and Methods: After Animal Care Committee approval, Wistar rats were fasted for 16 hrs. After they were anaesthetised, the portal vein was cannulated, the liver removed and perfused in a closed ex vivo system with HBSS supplemented with O₂ for 135 min. The animals were divided into 3 groups (n = 5): control and insulin groups in which medium contains respectively 35 and 70 IU/L insulin. Glucose, lactate, potassium, and enzymes were analysed in perfusate samples at different time-points. The proportion of glycogen in hepatocytes and energy charge (EC= [ATP]+1.2[ADP]/ [ATP]+[ADP]+[AMP]) were determined in tissue biopsies. Mean ± SD. ANOVA and Chi² tests.

Results: Variables at 135 min are displayed in Table 1. The concentrations of potassium and enzymes were lower in both insulin groups ($P < 0.01$).

Variable	Control	Insulin 35 IU/L	Insulin 70 IU/L	P-Value
Glucose (mg/dl)	7.50 ± 1.91	11.20 ± 7.33	25.40 ± 18.09	0.092
Lactate (mmol/L)	0.38 ± 0.17	0.46 ± 0.19	1.06 ± 0.96	0.14
Potassium (mEq/L)	8.88 ± 1.34	8.28 ± 0.57	5.38 ± 1.31	<0.001
GOT (IU/L)	687.75 ± 787.02	324.80 ± 234.69	57.00 ± 51.49	0.007
GPT (IU/L)	413.75 ± 354.37	219.60 ± 213.81	23.60 ± 39.35	0.002
LDH (IU/L)	4,065.3 ± 4,533.1	2,421.8 ± 1,839.6	277.80 ± 290.87	0.004
Glycogen (%)	7.58 ± 1.43	10.47 ± 4.77	21.22 ± 27.80	0.19
EC	0.10 ± 0.04	0.15 ± 0.04	0.17 ± 0.08	0.69

[Table 1]

Discussion: Results of the present experiment show that insulin minimises rat liver injury during *ex vivo* perfusion. In essence, insulin accelerates glycolysis, a source of ATP, and stimulates glycogen synthesis (1). We observed a slight but not significant increase in EC and glycogen concentration in hepatocytes. Such findings seem to indicate that livers perfused with insulin in a glucose-free buffer solution were metabolically more active at the end of the preservation period.

References:

1. Biguzas et al. Transplantation 1990;49:1051-5;
2. Yu et al Transplantation 1990;49:1060-6;
3. Li et al. Transplantation 2003;76:44-9.

01AP13-6

Lidocaine may contribute to general anesthesia by different mechanisms comparing to bupivacaine and ropivacaine in mammalian central nervous system

Chen G.¹, Shi M.², Ke B.³

¹West China Hospital, Sichuan University, Dept of Anaesthesiology, Chengdu, China, ²School of Life Science and Technology, University of Electronic Science and Technology of China, Research and Development Department, Chengdu, China, ³West China Second Hospital, Sichuan University, Dept of Anaesthesiology, Chengdu, China

Background and Goal of Study: It has been well established that systemic administration of local anesthetics also produces systemic actions. And local anesthetics have synergistic interactions between general anesthetics. However, the detail mechanisms are still unclear. In the present study, we investigate the systemic actions of three clinical used local anesthetics and explore the underlying mechanisms.

Materials and Methods: Lidocaine, bupivacaine, and ropivacaine were intravenously injected through the tail vein of C57BL/6 mouse. Reversible loss of righting reflexes was used to evaluate systemic effects of these drugs.

Results and Discussion: Lidocaine, bupivacaine, and ropivacaine produced reversible loss of righting reflexes with ED₅₀ of 19.0±2.4, 4.3±0.2 and 4.2±0.4 mg/kg, respectively. By blocking hyperpolarization-activated cyclic nucleotide-gated channels with ZD7288, the ED₅₀ for lidocaine-induced reversible loss of righting reflexes decreased to 14.1±1.0 mg/kg ($P < 0.01$).

N-methyl-D-aspartic acid receptor blocker MK801 also enhanced the reversible loss of righting reflexes effect of lidocaine by decreasing ED₅₀ to 13.1±0.8 mg/kg ($P < 0.01$).

Both ZD7288 and MK801 were observed to decrease the reversible loss of righting reflexes effect of ropivacaine with ED₅₀ at 6.9±0.3 mg/kg ($P < 0.01$) and 6.7±0.2 mg/kg ($P < 0.01$), respectively, and ZD7288 reduced the bupivacaine (ED₅₀ = 5.6±0.4 mg/kg, $P < 0.01$).

However, MK-801 had no influence on the hypnotic action of bupivacaine (4.5±0.5 mg/kg, $P > 0.05$).

Conclusion(s): These data indicate that the mechanisms of lidocaine might be different to bupivacaine and ropivacaine in the mammalian central nervous system. Hyperpolarization-activated cyclic nucleotide-gated channels and N-methyl-D-aspartic acid receptors may play a role in the local anesthetics synergistic interactions between general anesthetics.

References:

1. Zhou, C., et al., *Hyperpolarization-activated cyclic nucleotide-gated channels may contribute to regional anesthetic effects of lidocaine*. Anesthesiology, 2015. 122(3): p. 606- 18
2. Brummett, C.M., et al., *Perineural dexmedetomidine added to ropivacaine for sciatic nerve block in rats prolongs the duration of analgesia by blocking the hyperpolarization-activated cation current*. Anesthesiology, 2011. 115(4): p. 836-43.

Acknowledgements: This study was financially supported by the Fundamental Research Funds for the Central University (ZYGX2010J102).

01AP13-7

The intravenous oxycodone is effective to attenuate intubation-associated hemodynamic changes than fentanyl. A prospective, double-blinded, randomized control study

Jung K.T., Kim S.H., So K.Y.

Chosun University Medical School, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Lidocaine or opioids were commonly used to attenuate intubation-associated hemodynamic changes (IAHCs) in operating room. Recently, we calculated the effective dose for 95% prevention of hemodynamic changes (ED₉₅) of intravenous oxycodone (0.09 mg/kg) in male patients on the hypothesis that oxycodone may be effective to attenuate IAHCs. Therefore, we investigated the effect of the multiple ED₉₅ of intravenous oxycodone to attenuate IAHCs compared with fentanyl.

Materials and Methods: After Institutional Review Board approval, 118 male patients, aged between 20 to 65 years old, ASA I or II, were randomly allocated to one of 4 groups. Patients received 0.09 mg/kg (group O1, n=30) or 0.18 mg/kg (group O2, n=27) of intravenous oxycodone 20 min pre-induction, and 15 min later normal saline was injected. Patients received normal saline 20 min pre-induction, and 15 min later 2 µg/kg of fentanyl (group F, n=30) or normal saline (group C, n=31) was injected. Anesthesia induction was performed 3 minute later, and 2 min later endotracheal intubation was performed. We recorded IAHCs (arterial pressures, heart rate) at first injection (baseline), anesthesia induction, intubation, and 1, 3, 5 min post-intubation. The incidences of success were also recorded. If a patient shows within 20 % changes of either arterial pressures or heart rate at 1 min post-intubation compared with baseline values, it is regarded as 'success'. All measured values are presented as mean(95% confidential intervals) or number of patients (%). The statistical analysis was performed by ANOVA test with the Scheffe's post-hoc test, or χ^2 test. $P < 0.05$ was considered to indicate statistical significance.

Results and Discussion: The incidence of success was highest in group O2 with 81.5%, and followed with group O1 with 70.0%, group F with 53.3%, group C with 16.1% ($P < 0.001$). The mean arterial pressure (mmHg) at 1 min post-intubation was significantly less in group F [103.2(95.5-110.9), $P = 0.019$], O1 [97.3(91.9-102.7), $P < 0.001$], O2 [94.0(89.3-98.8), $P < 0.001$] than that in group C [116.1(110.9-121.4)], heart rate was not. The differences of hemodynamic values of between baseline and 1 min post-intubation were significantly less in group F, O1, O2 (lowest) than that in group C ($P < 0.001$).

Conclusion: The injection of 0.18 mg/kg of intravenous oxycodone 20 min pre-induction is more effective to attenuate IAHCs with more stable hemodynamics than 2 µg/kg fentanyl.

01AP13-8

An etomidate analogue with less adrenocortical suppression, stable hemodynamics and improved behavioral recovery in rats

Wang B., Yang J., Yang L., Zhao W., Liu J., Zhang W.

West China Hospital of Sichuan University, Dept of Anaesthesiology & Intensive Care, Chengdu, China

Background and Goal of Study: ET-26 hydrochloride (ET-26HCl) is a novel etomidate analogue designed to alleviate the adrenocortical suppression caused by etomidate while retaining the rapid sedative-hypnotic onset and stable hemodynamic features of etomidate. This study compared the anesthetic effect, hemodynamic stability and recovery profiles of ET-26HCl, etomidate, and the sedative-hypnotic drug propofol in rats.

Materials and Methods: The metabolic characteristics of ET-26HCl were investigated *in vitro* using chromatography in rat plasma and liver homogenates. Anesthesia effect and mean arterial pressure (MAP) was estimated at equivalent doses in the rats. Serum concentration of corticosterone, an adrenocortical hormone, was analyzed. The ability of rats to recover from the sedative-hypnotic effects of the drugs was evaluated using open field and Morris water Maze tests.

Results and Discussion: The *in vitro* metabolic experiments showed that the percentage of unmetabolized ET-26HCl remained at $70.2\% \pm 3.3\%$ in rat liver homogenates and $59.6\% \pm 3.0\%$ in rat plasma, and that for unmetabolized etomidate remained at $79.9\% \pm 2.6\%$ in rat liver homogenates and $83.0\% \pm 12.4\%$ in rat plasma after 60 min.

In vivo experiments showed that the potency of ET-26HCl to cause a loss of righting reflex in rats was three times lower than that of etomidate in the rats. Propofol caused a greater decrease in MAP relative to the baseline than did ET-26HCl or etomidate.

Serum corticosterone levels following drug administration were significantly higher in the ET-26HCl group than in the etomidate group when measured 15 ($P < 0.001$), 30 ($P < 0.001$), and 60 ($P = 0.002$) min after stimulation with ACTH1~24.

Recovery of spatial orientation from anesthesia induced by an intravenous bolus injection was faster with ET-26HCl than with propofol, but recovery of spontaneous activity was slower.

Conclusion(s): ET-26HCl has anesthetic potency and hemodynamic stability similar to etomidate, but it caused less adrenocortical hormone synthesis suppression than etomidate and faster spatial orientation recovery from anesthesia than propofol, which was similar to etomidate.

01AP13-9

Comparison of total blood loss between volatile agents and total intravenous anesthesia for posterior spinal fusion in adolescents with idiopathic scoliosis

Yagmur Ateser R.¹, Yanik H.S.², Subası F.D.¹, Batan S.¹, Ekinci O.¹, Bekiroglu G.N.³

¹Haydarpaşa Numune Training and Research Hospital, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ²Haydarpaşa Numune Training and Research Hospital, Dept. of Orthopedics and Traumatology Surgery, Istanbul, Turkey, ³Marmara University School of Medicine, Dept. of Biostatistics, Istanbul, Turkey

Background and Goal of Study: The purpose of this study was to prospectively compare the amount of total blood loss (intraoperatively and postoperative) during general anesthesia with either a total intravenous technique or with the volatile anesthetic agent in scoliosis surgery. According to our knowledge, there are no studies about anesthesia techniques and their effects on blood loss in scoliosis surgery.

Materials and Methods: Patients with 18-65 ages, ASA (I-III) and scheduled for elective all segmental pedicle screw and posterior instrumentation surgery (long fusion > 10 levels) were included into the study. Patients were randomly allocated to the general anesthesia groups with either a total intravenous technique (TIVA) ($n=17$) or with the volatile anesthetic agent (VA) ($n=11$), desflurane. Total blood loss (ml) (intraoperatively and postoperative 12hr, 24hr and 48 hr), hemodynamic variables (Arterial blood pressure, SPO₂, Heart rate) laboratory values (Hemoglobin, Hemotocrit, Bleeding time, post-operatively 12hr, 24hr, 48hr) and amount of red blood cell transfusion (unit) were used to compare between two groups. Unpaired t-test and correlation coefficient was calculated between two variables in each group. $P < 0.05$ was considered as significant.

Results and Discussion: The age and duration of surgery for the patients in TIVA and VA groups were found respectively as (20-40yrs) and (18-43yrs); (4-7,6hrs) and (4-6,5hrs). There was no statistically significant difference between groups for the duration of surgery, spinal fusion level, hemodynamic variables and laboratory values in both groups.

Although the amount of intraoperative blood loss, and intraoperative and post-operative blood transfusions were found statistically insignificant ($p=0,098$, $p=0,909$, $p=0,580$), there was a slight decreasing tendency in TIVA group ($600,00 \pm 355,43$ ml, $1,57 \pm 0,65$ units, $2,47 \pm 0,87$ units) than the VA group ($8836,36 \pm 345,75$ ml, $1,60 \pm 0,51$ units and $2,7 \pm 1,2$ units). There was statistical significant difference between groups for blood loss at 12hr which is less for TIVA group ($303,23 \pm 87,44$ ml) when compared with VA group ($410 \pm 143,17$ ml) ($p < 0.05$).

Conclusion: Our data demonstrate that a total intravenous technique is better than the volatile anesthetic agent group regarding the amount of intraoperative and postoperative blood loss, but we could not find significant mean difference with intraoperative blood loss.

01AP13-11

Etomidate suppresses cancer cell invasion and migration in A549 human lung adenocarcinoma cells

Wu R.S.-C.

China Medical University Hospital, Dept of Anaesthesiology, Taichung, Taiwan, Republic of China

Background and Goal of Study: Numerous studies have shown that some intravenous anesthetics have anticancer effects. We have previously reported that etomidate induced cell cycle arrest and apoptosis in murine leukemia cell line (RAW264.7). However, there are no reports about the effects of etomidate on human lung adenocarcinoma cells. [1, 2, 3, 4]

Materials and Methods: The wound healing assay was used to examine the migration. Western blotting was used to examine the levels of proteins associated with migration and invasion, and gelatin zymography was used to examine the secretion levels of matrix metalloproteinases-2 (MMP-2) from RAW264.7 cells following exposure to etomidate.

Results and Discussion: Our results from wound healing and Boyden chamber assays indicated that etomidate inhibited the migration and invasion of A549 cells *in vitro*. Activation of MMP-2 expression was shown to be suppressed by 48 h of etomidate treatment from our gelatin zymographic analysis. Western blot analysis indicated that etomidate down-regulated protein expression of b-catenin, p-p38, PKC, MMP-1, MMP-7 and MMP-9 and up-regulate expression of p-ERK1/2, TIMP-1, p-JNK1/2, PI3K, Snail, SOS-1, Ras, p-c-Jun, p-FAK in A549 cells.

Conclusion(s): In summary, our data showed that etomidate suppressed lung adenocarcinoma cell invasion and migration *in vitro* via inhibition of MMP-1, MMP-2, MMP-7 and -9 protein expressions.

References:

1. Wu KC, Yang ST, Hsu SC, et al. Propofol induces DNA damage in mouse leukemic monocyte macrophage RAW264.7 cells. *Oncol Rep* 2013; **30**: 2304-10
2. Wu RS, Liu KC, Tang NY, et al. cDNA microarray analysis of the gene expression of murine leukemia RAW 264.7 cells after exposure to propofol. *Environ Toxicol* 2013; **28**: 471-8
3. Wu RS, Wu KC, Yang JS, et al. Etomidate induces cytotoxic effects and gene expression in a murine leukemia macrophage cell line (RAW264.7). *Anticancer Res* 2011; **31**: 2203-8
4. Wu RS, Yu CS, Liu KC, et al. Cytosol (thiamylal sodium) triggers apoptosis and affects gene expressions of murine leukemia RAW 264.7 cells. *Hum Exp Toxicol* 2012; **31**: 771-9

Acknowledgements: This work was supported by grant CMU102-ASIA-20 from China Medical University, Taichung, Taiwan.

01AP14-1

Management of perioperative hypothermia in major surgery: the efficacy of prewarming with Barrier Easy warm blanket and validation of the Spot on thermometry

Van Gerven E., Coppens S., Neyrinck A.

UZ Gasthuisberg Leuven, Dept of Anaesthesiology, Leuven, Belgium

Background and Goal of the Study: Perioperative hypothermia (core temperature < 36°C) is a common but preventable complication during surgery and is associated with increased risk of infections, bleeding, postoperative shivering and cardiovascular complications. After induction of general anesthesia, the body temperature initially drops due to a redistribution of blood from the cold body surface to the body core. Previous studies showed that preoperative skin warming (prewarming) may be very effective in minimizing this redistribution hypothermia. Also, less invasive temperature assessment is needed in case of a prewarming strategy. Recently a disposable self-warming blanket was developed (Easy warm). with chemical powder that becomes activated in contact with room air (40-42°C for 10-12 hours) - In addition, the Spot on thermometry provides a noninvasive temperature assessment (Forehead).

The goal of our study was to evaluate the prewarming strategy combining the Easy warm blanket with the Spot on device in patients scheduled for a esophagectomy.

Material and methods: 40 adult patients included scheduled for a total esophagectomy under general anesthesia were randomized in two groups. Group 1 (intervention) received the Easy warmer 30 minutes before induction of general anesthesia, and group 2 (control) was covered with normal blankets. Patient core temperature was measured with 2 devices (bladder, Spot On) at regular intervals during the pre-, per- and postoperative period. All patients got rescue warming with a bair hugger if bladder temperature dropped below 35°C.

Result and discussion: No difference in temperature was seen between group 1 and group 2 during the pre-, per and postoperative period, both with the bladder and Spot on measurements. Noninvasive thermometry gives an average fault -0.4 °C compared to bladder temperature.

Conclusion: A prewarming strategy with the easy warm did not reduce the incidence of hypothermia. The new Spot On devices was less accurate compared with gold standard bladder temperature measurement to access core temperature.

01AP14-2

Intraoperative factors affecting the core body temperature in admission and at discharge of post-anesthesia care unit

Chalari E.¹, Intas G.², Stergiannis P.³, Fildissis G.³, Panoutsopoulos G.⁴

¹University of Peloponese, Dept of Intensive Care, Athens, Greece, ²National and Kapodistrian University of Athens, Medical Department, Athens, Greece, ³Oncology Hospital of Athens Agioi Anargyroi, Dept of Intensive Care, Athens, Greece, ⁴University of Peloponese, Assistant Professor, Spartan, Greece

Background and Goal of Study: The perioperative hypothermia is a common perioperative complication of surgery, as the incidence of perioperative hypothermia ranges from 44% to 60%. Furthermore, intraoperative hypothermia often leads to postoperative hypothermia in the Post-Anesthesia Care Unit (PACU) with a rate of approximately 60%. The aim of the study was to explore the factors that affects the core body temperature in admission and at discharge of Post-Anesthesia Care Unit.

Materials and Methods: This was a prospective, randomized and controlled clinical trial conducted in a large general hospital of Athens, Greece. The sample of the study consisted of 952 patients who underwent different type of surgeries. Hypothermia was defined when the tympanic temperature of patients was under 36°C. The temperature of patients was measured at the middle of the surgery (intraoperative), at the admission in the PACU and before the discharge of the PACU. The statistical analysis of the results was performed by χ^2 test and Student t test using the statistical package SPSS for Windows (version 21) and the statistical significance was set to $p=0.05$.

Results and Discussion: Hypothermia rate of patients when admitted in PACU was 62.8%. Factors affecting the hypothermia (vs normothermia) rate in PACU were female gender (59.7 vs 27.2%, $p=0.001$), low weight (74.6±12.7 vs 86.7±21.4 kg, $p=0.004$), duration of surgery (134.7±58.7 vs 119.7±49.7 min, $p=0.021$), the subarachnoid anaesthetic technique (21.1 vs 5.7%, $p=0.034$), and the perioperative temperature of patients (35.2 vs 35.9%, $p=0.004$). The hypothermia on discharge from PACU was affected by low weight (74.6±12.7 vs 86.7±21.4 kg, $p=0.004$), major surgery (79.6 vs 58.7%, $p=0.008$), prolonged surgery (139.4±61.7 vs 119.1±51.1 min, $p=0.016$), administration of propofol (76.9 vs 87.2%, $p=0.012$), and muscle relaxants (70.9 vs 79.5%, $p=0.007$), subarachnoid anaesthetic technique (19.3 vs 4.8%, $p=0.001$) and systolic blood pressure on discharge from PACU (131.9±24.5 vs 129.4±14.9 mmHg, $p=0.014$).

Conclusion(s): Female gender, low weight, duration of surgery, the anaesthetic technique, and the perioperative temperature of patients influences the body temperature of surgical patients in the PACU. All patients should be actively warmed both PACU and surgery, in order to avoid hypothermia and achieve normothermia.

References: Kim et al., 2014, Cobb et al., 2016, Stewart et al., 2016

01AP14-3

How do fluids from warming cabinet compare with warming fluids with a Ranger fluid warmer?

Naitilath S.¹, Evans B.²

¹Glasgow & Clyde NHS, Dept of Anaesthesiology, Glasgow, United Kingdom, ²Glasgow Royal Infirmary, Dept of Anaesthesiology, Glasgow, United Kingdom

Background and Goal of Study: NICE recommends that all intravenous fluid (500 ml or more) and blood products should be warmed to 37 °C using fluid warming device and not a warming cabinet¹. There is no evidence to suggest whether fluids from warming cabinet or fluid warmers like Ranger is more effective in perioperative use. There is also the cost versus benefit aspect that anaesthetists consider when choosing between them. The aim of this project was to compare fluid from warming cabinet with fluid warmed with Ranger when used in theatre.

Materials and Methods: 1L warm Hartmann's solution which was in warmer for >12 hours was compared with 1L Hartmann's solution (which was not prewarmed) run through the Ranger warming system. The usual giving set with 100 cm extension was used in both cases. Tests were done in Gynaecology theatres. The infusion was set to run over around 2 hours (~160 drops/minute) and rate was checked every 15 minutes. Infusion set stated 20 drops is 1 ml. Equipment was designed to continuously measure temperature of flowing IV fluid.

The warming cabinet was set at 38.7 °C. The temperature of fluid measured directly from warming cabinet using temperature probe was 37.7 °C.

Ranger was switched on when fluid was started and temperature was set at 42 °C.

Theatre temperature was between 23.1 °C and 23.3 °C.

Results and Discussion: With the fluid from warming cabinet, the temperature peaked at 29.4°C at 5 minutes. In 30 minutes it came down to 25.3°C and in 1 hour 15 minutes came down to 23.3 °C (room temperature).

With Ranger, the temperature stabilised at 28 +/- 0.2 °C less than 10 minutes. The temperature of fluid delivered to the patient was 14° less than what was set on the Ranger. Fluctuations in temperature seen were very small and possibly caused by thermostat. When 100 cm extension was removed and same experiment repeated the temperature was 32.7 °C.

Conclusion(s): If giving fluids rapidly (in our experiment 1L over <30 minutes), the warming cabinet is as effective as the Ranger (maybe even better) and also cheaper and simpler. But if giving fluids slowly the warming cabinet is not useful. The Ranger is very useful in giving warm fluids in long cases. The temperature suggested in other studies using Ranger is achieved without 100 cm extension.

References: 1. NICE (National Institute for Health and Care Excellence) clinical guideline 65

01AP14-4

Impact of active warming in perioperative heat loss in laparoscopic cholecystectomy

Gonçalves G., Couto C., Pacheco M., Sá A., Cavaleiro C., Machado H.

Centro Hospitalar do Porto, EPE., Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Perioperative heat loss (PHL) is common in patients undergoing surgical procedures, which is associated with many adverse outcomes. Active warming techniques are effective measures for PHL prevention. Some studies conclude that short duration surgeries don't seem to benefit with active warming. The aim of our work was to evaluate the effect of active warming in PHL during laparoscopic cholecystectomy.

Materials and Methods: We conducted a prospective audit including patients undergoing elective laparoscopic cholecystectomy. Procedures done under active warming technique (WT) with forced-air warming blankets. Tympanic temperature was monitored at five moments: Operating room arrival (T1), after anaesthetic induction (T2), end of surgery (T3), Post Anaesthesia Care Unit (PACU) arrival (T4) and PACU discharge (T5). The time intervals (Δ) T3-T2, Δ T5-T1 and Δ T5-T4 were calculated. Gender, age, American Society of Anaesthesia Physical Status (ASA), Body Mass Index (BMI), type of anaesthesia and surgery length were collected. Descriptive statistical analysis and Fisher's Test was runned ($p < 0,05$) (SPSS®v.22).

Results and Discussion: Our study included 94 patients (WT: n=27; nWT: n=67). We found statistically significant differences during $\Delta T5-T1$, between WT group and nWT group ($p=0,03$). The differences are not statistically significant between the groups in the PACU ($\Delta T5-T4$ $p=0,5$) and the intra-operative period ($\Delta T3-T2$ $p=0,344$). We didn't find significant differences between the groups regarding gender (WT 70% females; nWT 79% females), age (WT median 62 [31-88]; nWT median 58 [26-87]), ASA (WT 59% ASA2; nWT 70% ASA 2), BMI (WT $26,67 \pm 5,3 \text{ kg/m}^2$; nWT $28,25 \pm 4,39 \text{ kg/m}^2$), type of anaesthesia (WT and nWT 100% general anaesthesia), surgery length (WT $48,48 \pm 24,10 \text{ min}$; nWT $48,85 \pm 31,12 \text{ min}$) and length of hospital stay (WT $3,35 \pm 4,58$; nWT $3,10 \pm 4,66$).

Conclusion(s): Active warming for elective laparoscopic cholecistectomy seems to influence the heat loss associated with surgical procedure, suggesting that forced air warming may be beneficial. The findings underline the importance of developing new strategies and methods to minimize PHL.

01AP14-5

Internal jugular vein cannulation - freehand versus navigation-technique

Maecken T., Schulze L., Zahn P.K., Litz R.J., Wolf B.

BG University Hospital Bergmannsheil, Dept of Anaesthesiology & Intensive Care, Bochum, Germany

Background and Goal of Study: Exact needle-visualization is a major key-stone in ultrasound guided vascular access (USGVA). A needle tracking technique for vascular access on phantoms has recently been published [1]. This trial examined the effect of the navigation technique on patients. We hypothesized that the new technique would reduce access time and decrease the rate of safety and quality compromising errors (SQCE) of USGVA.

Materials and Methods: Approval of the prospective randomized trial by the local ethics committee (Ruhr-University-Bochum, Germany). Patients gave their written informed consent. 120 patients scheduled for surgery with the need of a central venous catheter (CVC) were included. In both groups an out-of-plane-ultrasound-guided technique for internal jugular vein cannulation (IJV) was used. In the control-group IJV- cannulation was carried out by freehand-technique. In the study group the navigation-technique was used. A cannula was magnetized (SeldiSafe 18G, 70mm, Vygon, France) for the use within a magnetic field from the ultrasound probe (eZono, Jena, Germany; Fig. 1). 7 anaesthetists with different degrees of experience in CVC-placement participated in the study (3 low, 3 medium and one with high experience). Videos of the cannulation were analyzed SQCE-types. Power analysis was based on access time (30% reduction): total sample size 106 patients (power 0,8; alpha error 0,05; effect size 0,5). Non-parametric tests, chi-squares test and logistic regression with random effects were applied when appropriate. A level of $p < 0,05$ was considered as significant.

Results and Discussion: Access time did not decrease in study group (median, IQR [range]): freehand 12 s (6.5-15.75 [2-293]) vs navigation 12.7 s (8.25 -23.75 [2.5-223]). Regression analysis with random effects was not able to detect statistical but visible difference on the physicians level of experience (Figure 3). The navigation technique had a significant impact on SQCEs (Figure 2). 118 of 120 catheters were successfully placed (98,3%). No arterial punctures occurred.

Conclusion(s): This is the first prospective randomized study of the needle-tracking technique for vascular access on patients. Safety and quality compromising errors of ultrasound guided internal jugular cannulation do frequently occur. The guidance technique significantly reduced these errors but did not eliminate them nor decreased time for cannulation.

References:

1. Auyong D.B. *Anesthesiology* 2015

01AP14-6

Ultrasound-guided brachiocephalic vein cannulation - comparison of two in-plane-techniques

Maecken T., Avila Gonzalez C., Zahn P.K., Litz R.J., Wolf B.

BG University Hospital Bergmannsheil, Dept of Anaesthesiology & Intensive Care, Bochum, Germany

Background and Goal of Study: The brachiocephalic vein is a suitable central vein for central venous catheter (CVC) placements because of its anatomical properties. The ultrasound probe needs to be markedly tilted to depict the vein (Figure 1, Figure 2). Alignment of cannula and ultrasound plane is difficult and could be simplified by an in-plane-needle-guide. Goal of this study was to compare the freehand versus the needle-guide technique for CVC placement in the brachiocephalic vein with regard to efficiency and safety.

Materials and Methods: Approval of the local ethics committee and patient's written informed consent. In this prospective randomized trial 132 patients scheduled for surgery and the need of a CVC were assigned to one of two study groups: freehand (FH) or needle-guidance (NG) group. In both groups an echogenic cannula (VascularSono, Pajunk Medical Produkte, Germany) and an in-plane-technique was used. Needle-guide: Civco Medical Solution, Iowa, USA, (Figure 3). Success rates, time to cannulation and CVC placement, complications and visibility of the cannula were recorded (Figure 3). Power analysis was based on needle-visibility (data from [1]): power 0,95; effect size 0,5; total sample size: 128. Chi-Square-Tests were used for categorical data, parametric or non-parametric tests to compare continuous variables between groups. A significance level of $p < 0,05$ was considered as significant.

Results and Discussion: Data of 128 cannulations were analysed (no reliable sonography by the participating physician $n=3$, no cannulation performed $n=1$). After sonographic depiction of the brachiocephalic vein, successful cannulation was 100% in both groups. The success rate of CVC-placement was 99,2 % (1 in group NG). Time to cannulation was shorter in the needle-guide group (Figure 3) and the percentage of needle-visibility higher (Figure 3). No arterial punctures occurred. In the freehand group air was aspirated in 2 cases during the procedure: in the first case a pneumothorax could not be ruled out, in the second case a pneumothorax could not be proven.

Conclusion(s): The ultrasound-guided in-plane-cannulation of the brachiocephalic vein is a technique with high success and low complications rates. In this trial the needle-guide significantly reduced access-times and significantly increased needle visibility.

References:

1. Maecken et al. *Anaesthesia* 70(11) 2015

01AP14-8

Combined anaesthesia in patients undergoing surgery for ischemic heart disease

Volchikov V.¹, Boyarkina A.¹, Sizov O.², Malshakov V.², Balandina E.¹, Volchkova E.³

¹St. Petersburg State University, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation, ²City Multifield Hospital №2, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation, ³Pavlov First Saint Petersburg Medical University, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation

Background and Goal of Study: In recent years appeared a large number of works devoted to the cardioprotective effect of inhalation anaesthetics and epidural anaesthesia. The goal of study was to compare the effects of different types of anaesthetic management of cardiovascular operations for close outcome results.

Materials and Methods: The study involved 122 patients (aged 63 ± 8) who underwent surgical treatment for ischemic heart disease under conditions of artificial circulation. Patients were randomized into two comparable groups depending on the type of anaesthesia. First group included 56 patients, who were operated on under combined anaesthesia (thoracic epidural anaesthesia with intravenous infusion of propofol controlled by the target concentration). Second group included 66 patients who were operated on under multicomponent general anaesthesia (sevoflurane inhalation with intravenous infusion of fentanyl and propofol controlled by the target concentration). Evaluated indices: volume load during the operation and in early postoperative period,

the dose of used inotropic support, the level of troponin I and brain natriuretic peptide (BNP) in patients after surgery. The frequency of development of complications and the duration of inpatient stay in hospital were analyzed.

Results and Discussion: The infusion therapy total demand during the operation in the two compared groups did not differ significantly. Preload indices in both groups were comparable before operation and declined slightly postoperatively. Along with this no statistically significant differences between groups were detected. Inotropic support was used unreliably more often in the group of combined epidural-intravenous anaesthesia. The concentration of troponin I in the postoperative period increased in the interval of time from 1 to 24 hours after surgery in both groups ($p > 0,05$). BNP also increased after the intervention in both groups. There were no substantial differences in the frequency of development of cardiovascular disorders. Patients with epidural anaesthesia were extubated earlier and had less pronounced pain syndrome. However, the average time of postoperative stay in the intensive care unit and in hospital in both groups did not differ significantly.

Conclusions: Both methods of anaesthetic management can be used successfully in coronary artery bypass surgery in conditions of artificial blood circulation.

01AP14-9

Does increasing the arterial blood pressure at the end of a laparoscopic gastric bypass reduces the number of postoperative haemorrhages?

Teney C.¹, Mulier J.¹, Dillemans B.², Van Dyck M.³

¹AZ Sint-Jan Brugge-Oostende, Dept of Anaesthesiology, Brugge, Belgium, ²AZ Sint-Jan Brugge, Dept of Surgery, Brugge, Belgium, ³Université Catholique de Louvain, Cliniques Universitaires Saint Luc, Dept of Anaesthesiology, Brussels, Belgium

Introduction: From 2004 till 2008 (1) a large number of gastric bypass patients had postoperative haemorrhages (92 haemorrhages on 2903 pt or 3,2%) requiring frequent surgical revision (29 revisions or 0,9%) In 2009 we instructed too increase the systolic arterial blood pressure (SAP) to 140 mmHg in every patient and reduced dramatically the number of haemorrhages (1%) and surgical revisions (0,1%) in 2010.

The following years some postoperative haemorrhages remained. Did these patients with haemorrhage have an insufficient increase in blood pressure intraoperative or did we not treat their postoperative hypertension sufficiently?

Methods: We investigated the haemorrhages in all patients who got a laparoscopic gastric bypass from 2011 till mid 2015 and noted the highest SAP reached before ending surgery and the highest SAP reached in the PACU. The ethical committee accepted retrospective analysis. Logistic regression is used to found factors having effect on haemorrhage and having effect on achieving blood pressure increase intraoperative and postoperative.

Results: 54 patients on 5237 had a haemorrhage (1%) with 11 revisions (0,2%). There is a difference between patients bleeding and those not bleeding for age and gender, not for BMI, OSAS, hypertension or diabetes. More opioids given intraoperative and postoperative increases the risk for haemorrhage.

The patients bleeding post operative had a mean maximum SAP at end of operation of 122 mmHg, significant lower than 130 mmHg for patients not bleeding and had a mean maximum SAP in the PACU of 145 mmHg significant higher than 132 mmHg. Only 30% of the patients reached 140 mmHg or more and 20 % did not reach 120 mmHg!

Intra operative pressure increase is easier reached in younger patients ($p=0,013$), or hypertensive patients ($p < 0,001$) or when opioid free anaesthesia ($p < 0,001$) or a lower dose of Sufentanyl ($p=0,017$) is used intraoperative or with increasing number of procedures done.

Blood pressures are higher in older ($p=0,046$) or male ($p=0,040$) patients, or having hypertension ($p=0,047$), getting more opioids intra ($p < 0,001$) or post operative ($p=0,007$) while anaesthesia experience is not significant ($p=0,067$).

Conclusion: The protocol to increase the SAP to 140 mmHg at the end of a lap bypass is not achieved in every patient. More haemorrhages are found when intra operative blood pressure remains low and when postoperative blood pressure is higher.

References: 1. B Dillemans et al. *Obes Surg* 2009; 19:1355

01AP14-10

Effects of acute normovolemic hemodilution (ANH) with crystalloids or starches on coagulation as determined with thrombelastogram (TEG): preliminary results

Vanhulle L.¹, van Limmen J.¹, De Baerdemaeker L.¹, Troisi R.², De Hert S.¹

¹Ghent University Hospital, Dept of Anaesthesiology, Gent, Belgium,

²Ghent University Hospital, Dept of Surgery, Gent, Belgium

Background and Goal of Study: ANH is one of the strategies to reduce allogenic blood transfusion requirements. However, the reduction of red blood cell mass with ANH may be associated with dilutional coagulopathy. Moreover, conflicting results have been reported on the potential different effects on coagulation of various types of fluid used during ANH. We hypothesized that the use of crystalloids or colloids would yield similar effects on variables of coagulation.

Materials and Methods: After approval of the local Ethics Committee, 12 patients undergoing major hepatobiliary surgery, were randomized to receive either crystalloids (Plasma-Lyte) (group 1, n =6) or hydroxyethyl starch (HES) 130/0.4 (Volulyte 6%) (group 2, n = 6) as replacement fluid during ANH with a target hematocrit of 25%. Crystalloids were administered at a 3/1 ratio whereas the amount of HES 130/0.4 was set at a 1/1 ratio. After surgical resection, the autologous blood was retransfused. Samples for coagulation testing were taken before (T0) and after hemodilution (T1), after completion of resection (T2) and at the end of the procedure (T3). Coagulation was assessed by analysis of reaction time (R), time from R to 20 mm amplitude (K), the angle of coagulation (α), and the maximal amplitude (MA). Data are expressed as mean \pm SD and were statistically analyzed using a two-way analysis of variance for repeated measurements. Significance was set at $p < 0.05$.

Results and Discussion: Measured variables did not change over time in neither of both groups.

		T0	T1	T2	T3
R (min)	group 1	5.2 \pm 1.7	5.6 \pm 1.9	3.7 \pm 2.2	4.1 \pm 1.9
R (min)	group 2	4.7 \pm 1.7	5.5 \pm 1.7	3.3 \pm 2.2	4.5 \pm 1.7
K (min)	group 1	1.2 \pm 0.7	1.6 \pm 0.8	1.9 \pm 0.9	1.4 \pm 0.8
K (min)	group 2	1.1 \pm 0.8	1.2 \pm 0.8	0.9 \pm 0.7	4.5 \pm 1.7
α (°)	group 1	69 \pm 9	65 \pm 10	67 \pm 12	70 \pm 11
α (°)	group 2	74 \pm 8	64 \pm 9	72 \pm 11	63 \pm 11
MA (mm)	group 1	66 \pm 4	65 \pm 4	68 \pm 6	69 \pm 6
MA (mm)	group 2	69 \pm 5	64 \pm 6	65 \pm 5	69 \pm 5

[Results]

Conclusion(s): The results of the present study indicate that ANH does not significantly alter TEG variables of coagulation independently from the use of either crystalloid or HES 130/0.4. Further observations are ongoing to control whether these preliminary observations can be confirmed.

01AP14-11

Intraocular pressure changes during colorectal laparoscopic surgery: propofol total intravenous anesthesia versus desflurane anesthesia

Kim Y.-S., Han D.-K., Ryu H.-S., Seo K.-H.

Catholic University, St. Vincent Hospital, Dept of Anaesthesiology & Pain Medicine, Suwon, Korea, Republic of

Background and Goal of Study: Although steep Trendelenburg position increases intraocular pressure (IOP), there was no report regarding the fluctuations of IOP following repeated position changes (Trendelenburg vs. Reverse Trendelenburg with right tilting) during laparoscopic surgery. IOP increase following Trendelenburg position is less with total intravenous propofol anesthesia (TIVA) than with inhalation anesthesia. We hypothesize that TIVA can alleviate the increase of IOP caused from positioning and keep the fluctuations of IOP more stable during repeated position changes compared to desflurane anesthesia.

Materials and Methods: A total of 40 patients scheduled for laparoscopic colorectal surgery were enrolled. They were randomly allocated into the TIVA group or the desflurane group. IOP (left, right), mean blood pressure, EtCO₂, and peak airway pressure were measured at the following time points: awake-supine position (baseline), after intubation, after pneumoperitoneum, 30 minutes after 1st Trendelenburg position with right tilting, 10 minutes after Reverse-T position with right tilting, 30 minutes after 2nd Trendelenburg position with right tilting, 5 minutes before end of surgery. IOP was measured with the handheld tonometer (Tono-pen AVIA®).

Demographic data were compared using the Chi square test and t-test. For comparison of IOP within and between the groups, data were first analyzed by repeated measures analysis of variance, and differences were then calculated by t-test and post hoc testing (Bonferroni's method). The association between IOP and Paw, MAP, EtCO₂ over the time period were tested for by Pearson's coefficient of correlation.

Results and Discussion: The results showed that IOP values were significantly differed throughout the whole period except baseline values between the two groups ($P < 0.05$).

Trendelenburg positioning raised the IOP highly in the desflurane group (24.25 mmHg; $P < 0.001$ vs. baseline) and the average IOP value was over the normal limit. In contrast, TIVA kept IOP within the normal range during Trendelenburg position (18, 20 mmHg). There was a correlation between IOP and peak airway pressure ($r = 0.6$).

Conclusions: TIVA can alleviate the increase of IOP caused from positioning and keep the fluctuations of IOP more stable during repeated positioning changes compared to desflurane anesthesia. TIVA may be a better choice for colorectal laparoscopic surgery in terms of IOP changes following frequent positional changes.

01AP14-12

Effects of rocuronium and sugammadex on human platelet functions *in vitro*

Kawamoto S., Fukuda K.

Kyoto University Hospital, Dept of Anaesthesiology, Kyoto, Japan

Background: Rocuronium (RN), an aminosteroidal non-depolarizing neuromuscular agent, and sugammadex (SG), a selective relaxant binding agent for RN, have been widely used in general anesthesia.

In this study, we examined the effects of RN and SG on platelet aggregation, and expression of P-selectin (PS), an adhesion molecule on the surface of activated platelets.

Methods: Informed consent was given and the protocol was approved by the ethical committee. Venous blood was taken with 10% volume of 3.8% tri-sodium citrate from healthy volunteers. Platelet-rich plasma (PRP) was prepared by centrifugation at 160g for 10 min.

1. Aggregation study PRP containing RN, SG, or RN + equimolar SG was incubated at 37°C for 3 min. Adenosine diphosphate (ADP)-induced aggregation was measured for 7 min as a change in light transmission using aggregometer.

2. Flow cytometry (FCM) analysis for PS expression PRP was stimulated by ADP with RN or RN + equimolar SG at room temperature for 30 min. PerCP-labeled anti-CD61 antibody and PE-labeled anti-CD62P (PS) antibody were co-incubated. PS expression levels were assessed by FCM.

All data were compared with one-way ANOVA, followed by Dunnett's *post hoc* test.

Results: RN suppressed ADP-induced platelet aggregation ($>310 \mu\text{g/ml}$) and PS expression ($>3.1 \mu\text{g/ml}$), but this effect was not abolished by equimolar SG (Fig. 1A, 1B and 2). SG (100 mg/ml) suppressed ADP-induced platelet aggregation (Fig. 1B).

Discussion: SG forms tight complexes at a 1:1 ratio with RN by encapsulating. Our results demonstrate that RN and RN-SG complex suppressed platelet functions within the usual therapeutic concentration range ($<10 \mu\text{g/ml}$). Therefore, it might be possible that RN and RN-SG complex affect platelet functions in the clinical setting.

Conclusion: RN and RN-SG complex suppressed platelet functions. SG did not abolish this suppressive effects of RN.

Fig. 1

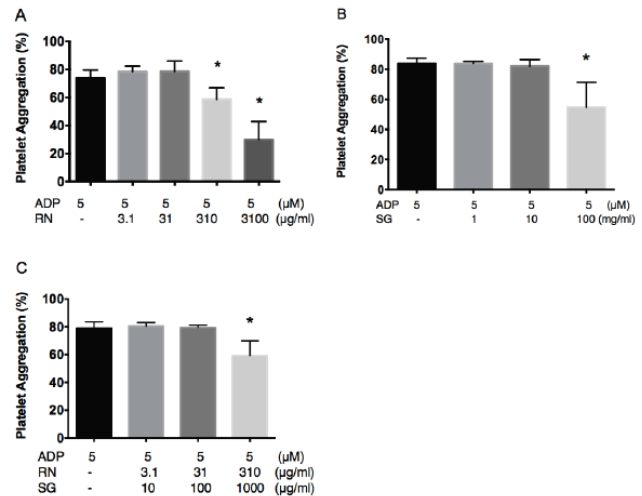


Fig. 1. Effects of rocuronium and sugammadex on human platelet aggregation. (A) Effects of rocuronium (RN; 3.1–3100 $\mu\text{g/ml}$) on platelet aggregation induced by 5 μM ADP. The data are expressed as mean \pm S.D. ($n=5$). * $P < 0.05$ vs. RN(-). (B) Effects of sugammadex (SG; 1–100 mg/ml) on platelet aggregation induced by 5 μM ADP. The data are expressed as mean \pm S.D. ($n=5$). * $P < 0.05$ vs. SG (-). (C) Effects of rocuronium (RN; 3.1–310 $\mu\text{g/ml}$) on platelet aggregation in the absence and presence of sugammadex (SG; 10–1000 $\mu\text{g/ml}$). The data are expressed as mean \pm S.D. ($n=5$). * $P < 0.05$ vs. RN (-), SG (-).

[Figure 1]

Fig. 2

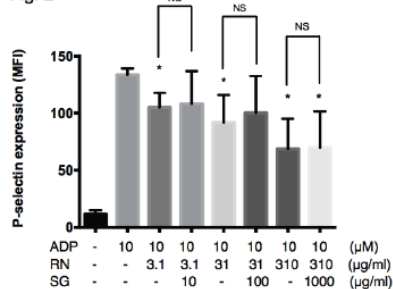


Fig. 2. Effects of rocuronium (RN; 3.1–310 $\mu\text{g/ml}$) on surface P-selectin expression in platelets. Experiments were performed with stimulation by 10 μM ADP in the presence and absence of sugammadex (SG; 10–1000 $\mu\text{g/ml}$). MFI, mean fluorescence intensity. The data are expressed as mean \pm S.D. ($n=5$). * $P < 0.05$ vs. RN (-), SG (-), ADP (+). NS, not significant.

[Figure 2]

01AP15-1

A sudden increase in delayed graft function in living donor kidney transplantation and a changed perioperative fluid regimen

Nieuwenhuijs-Moeke G.J.¹, Huijnk T.M.², Pol R.A.², El Moumni M.², Struys M.M.¹, Berger S.P.³

¹University Medical Center Groningen, Dept of Anaesthesiology, Groningen, Netherlands, ²University Medical Center Groningen, Dept of Surgery, Groningen, Netherlands, ³University Medical Center Groningen, Nephrology, Groningen, Netherlands

Background and Goal of Study: First half of 2016 an increase in delayed graft function (DGF) in our living donor kidney transplantation (LDKT) population was noticed. The incidence of DGF (need for dialysis 1st week after transplantation) and functional DGF (fDGF, defined as failure of a fall in serum creatinine of 10% on 3 consecutive days in the 1st week after transplantation) had increased from respectively 1.4%-4.4% (DGF) and 8.4%-8.9% (fDGF) in 2014-2015 up to 11.3% and 26.4% in the first half of 2016. During 2015 we changed our perioperative fluid regimen from a standard amount of 4-5 liter

balanced crystalloids to a goal directed fluid therapy approach. The goal was set to a stroke volume variation (SVV) <10% at time of reperfusion. We questioned whether this adjustment in fluid regimen was related to the increase in fDGF.

Materials and Methods: From January 2014 to June 2016 214 LDKT were performed in our center. Donor and recipient characteristics were obtained from hospital records. Intraoperative data were retrieved from our digital patient data monitoring system. Analysis comprised an univariable analysis, analysis over time and multivariable logistic regression. Two groups were made: fDGF (n=26, also including patients meeting DGF criteria) and noDGF (n=188).

Results and Discussion: Demographics of donors were comparable with the exception of age and length. Recipients on dialysis were more likely to develop fDGF after transplantation compared to preemptively transplanted patients (P<0.001). Univariable analyses detected various risk factors for fDGF. Recipients developing fDGF received less perioperative fluid, 34.3 (25.3-41.5) ml/kg vs 43.7 (34.2-53.6) ml/kg (P=0.006) and were treated more frequently with noradrenaline, 79% vs 52% (P 0.010). Sacrifice of an artery occurred more frequently in fDGF (P 0.043). In the unadjusted analysis, the effect of the amount of fluid on developing fDGF was 0.962 (B-0,039, 95% CI 0.932-0.993 P=0.016). When adjusted for dialysis, sacrifice of an artery and the use of noradrenaline, the amount of fluid remained independently associated with DGF (OR=0.96, 95%CI 0.931-0.997, P=0.032).

Conclusion(s): Goal-directed fluid management towards an SVV of 10% has led to reduced perioperative fluid administration. This seems to be an independent risk factor for development of fDGF in living donor kidney transplantation. A more liberal fluid management using other goals might be more appropriate.

01AP15-2

Comparison of Acute Kidney Injury between open and Laparoscopic pylorus-preserving pancreaticoduodenectomy: propensity score analysis

Jun I.G., Kim S.G., Joung K.W., Shin W.J., Song J.G., Hwang G.S. *Asan Medical Center, University of Ulsan, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of*

Background and Aims : Recently, owing to advances in technology, the Laparoscopic pylorus-preserving pancreaticoduodenectomy (LPPPD) has been increasing rapidly compared with open pylorus-preserving pancreaticoduodenectomy (OPPPD). Although several studies have advocated the safety and efficacy of LPPPD compared to OPPPD, these studies focused not on the development of postoperative acute kidney injury (AKI) but on the surgical outcomes.

Because of several potential risk factors for developing postoperative AKI during LPPPD, this study aimed to compare the prevalence and risk factors of AKI between LPPPD and OPPPD.

Methods: We retrospectively collected and analyzed the data of 457 patients who underwent PPPD surgery between February 2012 to November 2015 at Asan Medical Center. Patients were divided into 2 groups according to the surgery procedure [OPPPD group (n=355) vs LPPPD group (n=102)]. Risk factors for AKI defined using the Kidney Disease: Improving Global Outcomes criteria were investigated using multivariate logistic regression analysis. Propensity score (PS) matching analysis and inverse probability of treatment weighting (IPTW) were used to compare outcomes between 2 groups to reduce the potential for bias.

Results: After a 1:1 propensity score matching, 100 patients were included in each group. The LPPPD group showed lower incidence of AKI than OPPPD group without statistical significance (1.0% vs. 4.8%, $p=0.116$). The hospital stay was significantly prolonged in the OPPPD group compared with LPPPD group ($p < 0.001$). Even after PS & IPTW analyses, hospital stay was significantly prolonged in the OPPPD group than LPPPD group ($p=0.018$ for PS and $p=0.001$ for IPTW), and no significant difference was showed in the development of postoperative AKI ($p=0.571$ for PS and $p=0.252$ for IPTW). In multivariate analysis, LPPPD was not a independent risk factor for AKI ($p=0.327$). Older age and more albumin infusion during operation were independent predictors of the occurrence of postoperative AKI ($p < 0.05$ for all).

Conclusions: This study demonstrated that the significant difference in the incidence of postoperative AKI was not showed between two groups. Furthermore, LPPPD was not a predictor for the development of postoperative AKI.

01AP15-3

Mean arterial pressure and central venous pressure difference as a prognostic tool for postoperative acute kidney injury

Spadaro S., Fogagnolo A., Moro F., Fanni A., Dalla Corte F., Volta C.A.

University of Ferrara, Dept of Anaesthesiology & Intensive Care, Ferrara, Italy

Background and Goal of Study: Postoperative acute kidney injury (AKI) remains a serious complication of surgery. Recent findings suggest the role of venous congestion in generating AKI; indeed, it has been demonstrated that a high CVP is detrimental on the kidney function, in particular when associated with hypervolemia. Of note, also an impairment of the arterial intrarenal perfusion pressure increase the risk of AKI. Thus, it is reasonable that both low arterial pressure and high CVP contribute to renal congestion. The aim of this study in to evaluate if the difference between mean arterial pressure (MAP) and CVP can predict postoperative AKI.

Materials and Methods: This is a prospective-observational study conducted at Sant'Anna Hospital, Ferrara. All patients >18 years undergoing abdominal surgery requiring central venous catheter were enrolled. We collected clinical, demographic and laboratory data for each patient. All potentially nephrotoxic drugs were recorded. Moreover, we measured MAP-CVP difference at the end of surgery, 24h and 48h after surgery. Occurrence of AKI was defined according to KDIGO criteria.

Results and Discussion: Fifty-one patients were enrolled. Clinical and demographic variable are shown in Table 1.

Variable	Patients with AKI (n=9)	Patients without AKI (n=42)	P value
Age (y)	75 ± 9	75 ± 8	0.82
BMI	28.1 ± 8	26.2 ± 3	0.22
CKD, n (%)	6 (67)	5 (12)	0.002
Diabete, n (%)	6 (67)	15 (38)	0.10
Hypertension, n (%)	9 (100)	13 (69)	0.05
Emergency surgery, n (%)	8 (89)	15 (36)	0.007
Aminoglycosides, n (%)	2 (22)	0 (0)	0.03
NSAIDs, n (%)	8 (89)	15 (36)	0.005
Need for vasopressor, n (%)	3 (33)	8 (19)	0.38
Crystalloids, ml/kg/h	10 ± 4	8 ± 4	0.79
Colloids, yes / not	3 (33)	32 (76)	0.02
Transfusions, yes / not	0 (0)	21 (50)	0.005
MAP-CVP difference	62.5 ± 8	73 ± 7	0.017
MAP-CVP difference after 24h	76 ± 10	85 ± 9	0.029
MAP-CVP difference after 48h	74 ± 8	85 ± 8	<0.001

[Table 1]

Postoperative AKI occurs in 9 of 51 patients (18%). Patients who developed AKI had significantly lower MAP-CVP difference. Potentially modifiable risk factor for postoperative AKI were use of NSAIDs and aminoglycosides.

Conclusion(s): MAP-CVP difference at the end of surgery is a prognostic factor for postoperative AKI even in patients with a similar intraoperative fluid balance. Fluid administration and drug management during and after surgery should take into account the effect on CVP and arterial pressure.

References: Cruces, ICM 2014

01AP15-4

Perioperative dexmedetomidine improves outcomes of kidney transplant

Chen J.¹, Ji F.¹, Li Z.², Liu H.³

¹The First Affiliated Hospital of Soochow University, Dept of Anaesthesiology, Suzhou, China, ²University of California Davis, Medicine, Sacramento, United States, ³University of California Davis Health System, Dept of Anaesthesiology & Pain Medicine, Sacramento, United States

Background and Goal of Study: Graft function is crucial for successful kidney transplantation. This study was to evaluate the effect of dexmedetomidine on kidney transplantation.

Materials and Methods: A total of 780 patients underwent kidney transplantations, 315 received intravenous dexmedetomidine infusion during surgery and 465 did not. The primary outcomes are major adverse complications included delayed graft function (DGF) and acute rejection in the early post transplantation phase.

The secondary outcomes included length of hospital stay (LOS), infection, overall complication, graft functional status, post transplantation serum creatinine (SCr) values and estimate glomerular filtration rate (eGFR).

Results and Discussion: Dexmedetomidine use significantly reduced morbidity of DGF (19.37% vs. 23.66%; adjusted OR, 0.744; 95%CI, 0.564- 0.981; $P=0.036$), risk of infection (8.25% vs. 15.70%, adjusted OR, 0.489; 95% CI; 0.352 -0.678, $P<0.0001$), risk of acute rejection (1.27% vs. 2.58%; adjusted OR, 0.401; 95%CI, 0.182 - 0.887; $p=0.024$) in the early post-transplantation phase. Perioperative dexmedetomidine therapy reduced the risk of overall complications (26.67% vs. 36.34%; adjusted OR, 0.638; 95% CI, 0.509 - 0.799; $P<0.0001$) and LOS (6.4 vs. 7.1; $P<0.0001$). Use of dexmedetomidine has no marked impact on post transplantation 7 day, 30 day and 90 day SCr and eGFR.

Conclusion(s): Perioperative use of dexmedetomidine was associated with a reduced incidence of DGF, infection, graft rejection, overall complications and LOS in renal transplantation patients.

References:

1. Port FK, et al. Comparison of survival probabilities for dialysis patients vs. cadaveric renal transplant recipients. *JAMA* 270:1339-1343, 1993
2. Ji F, et al: Post-Bypass Dexmedetomidine Use and Postoperative Acute Kidney Injury in Patients Undergoing Cardiac Surgery with Cardiopulmonary Bypass. *PLOS ONE* 8: 1-9, 2013
3. Si Y, et al. Dexmedetomidine protects against renal ischemia and reperfusion injury by inhibiting the JAK/STAT signaling activation. *J Transl Med* 11: 141-152, 2013

01AP15-5

Does intraoperative administration of norepinephrine affect postoperative renal function in patients undergoing major abdominopelvic surgery? Results of a retrospective analysis

Furrer M.A.¹, Löffel L.², Fellmann A.¹, Burkhard F.C.¹, Wuethrich P.²
¹University Hospital Bern, Department of Urology, Bern, Switzerland, ²University Hospital Bern, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland

Background and Goal of Study: The use of norepinephrine intraoperatively has gained increasing acceptance in order to avoid salt and water overload and thus reduce postoperative gastrointestinal complications. The goal of this study was to determine whether the continuous intraoperative administration of norepinephrine during abdominopelvic surgery affects short-term renal function as vasopressors can impair tissue perfusion, potentially resulting in renal dysfunction.

Materials and Methods: We conducted a retrospective analysis of a consecutive series of 1175 patients undergoing cystectomy and urinary diversion between 2000 and 2015 in a single high case load centre. Acute kidney injury (AKI) was defined as an increase of serum creatinine $>50\%$ over 48 hours postoperatively. Multiple logistic regression analysis (full model) was performed to assess independent predictors of AKI.

Results and Discussion: Norepinephrine was administered in 720/1175 patients (61%) in a mean total amount of 1164 mcg \pm 846. These patients were older (mean 6 yr. \pm 11 vs. 66 yr. \pm 13, $p<0.001$), had slightly shorter surgery (387 min \pm 179 vs. 397 min \pm 81, $p=0.002$), less intraoperative blood loss (1097 ml \pm 1746 vs. 1376 ml \pm 1795, $p<0.001$), received less crystalloids (2117 ml \pm 1053 vs. 3060 ml \pm 1176, $p<0.01$), colloids (109 ml \pm 371 vs. 629 ml \pm 821, $p<0.001$) and allogenic blood (144 ml \pm 402 vs. 251 ml \pm 406, $p<0.001$).

Preoperative renal function was similar between the groups (with norepinephrine: mean creatinine serum values 97 mcg/l \pm 52 vs. not 97 mcg/l \pm 55, $p=0.30$). Overall, AKI was present in 123/1175 patients (10%) with no difference between patients receiving norepinephrine (85/720 (11.8%) vs. not 38/455 (8.4%); OR 1.47 [95% CI 0.98-2.20], $p=0.06$). Independent predictors for AKI were age (continuous, OR 1.03 [1.01-1.05], $p=0.013$), ASA classification (score, OR 1.07 [1.10-2.46], $p=0.015$), gender (male, OR 0.39 [0.24-0.65], $p<0.001$), preoperative creatinine serum values (continuous, OR 0.998 [0.97-0.99], $p<0.001$), administration of blood transfusion (no blood transfusion, OR 0.51 [0.29-0.89], $p=0.018$), but not the administration of norepinephrine (OR 1.10 [0.68-1.79], $p=0.69$).

Conclusions: These results suggest no negative influence of intraoperative administration of norepinephrine in patients undergoing cystectomy. Age, ASA score, gender, preoperative creatinine serum values and intraoperative administration of blood transfusion were independent predictors for AKI.

01AP15-7

Serum arterial lactate and outcome in hepatic resection surgery: propofol vs sevoflurane

Barrio Perez I.M., Olmedilla L., Diaz Ruano S., Cruz Pardos P., Zapatero S., Perez Peña J.

HGU Gregorio Marañón, Dept of Anaesthesiology, Madrid, Spain

Background and Goal of Study: An early raise on lactid acid (LA) after hepatic resection has been associated with hepatic and renal disfunction and increased mortality. (1,2)

Goal of the study: The aim of the study was to analyze the effect of general anaesthesia with propofol or sevoflurane in the LA levels and postoperative outcome after hepatic surgery.

Materials and Methods: A prospective, observational study was developed in 162 patients who underwent liver resection surgery. 132 patients were anesthetized with sevoflurane and 32 with propofol, depending on the anaesthesiologist choice. Both groups were homogeneous in demographic characteristics, clinical and biochemical informations and extent of the resection. Drugs titration was adjusted in order to keep a BIS between 40 and 60. Every patient had continous epidural anesthesia between T7 and T9 levels. Fluid replacement was performed with Plasmalyte (lactate free) at a dosage of 2ml/kg/h.

The levels of LA, ph and creatinine were obtained after the surgery from an arterial blood sample and posteriorly analyzed. The days of hospital stay were recorded, as well.

Results and Discussion: The levels of LA, creatinine and hospital stay days were significantly higher in the group were sevoflurane was used. See Table

	PROPOFOL	SEVOFLURANE	P
LACTATE END OF SURGERY	1.92+/-1.78	2.84+/-1.52	0.004
PH	7.37+/-0.62	7.35+/-0.53	0.07
CREATININE (mg/dl)	0.8+/-0.2	1.1+/-0.3	0.002
DAYS OF HOSPITALIZATION	9.33+/-5.7	15.84+/-15.7	0.039

[Table]

We did not find any significant differences between the two groups during the Pringle manoeuvre, mean arterial pressure, cardiac output or in the administration of vasoconstrictors.

Conclusion(s): The use of propofol in open hepatic resection surgery is associated with lower levels of LA, serum creatinine and less hospital stay days compared with sevoflurane. These results suggest a protective effect of propofol in the final outcome which needs to be confirmed with a randomized study.

References:

1. Wiggans M G et al. *Perioperative Medicine* 2013, 2: 21
2. Watanabe I et al. *Shock*, 2007, 28, (1), 35-38.

01AP15-8

Effects of N-acetylcysteine on neutrophils activity during ischemia/reperfusion injury in hepatectomies

Cacho-Asenjo E., Chiquito M.T., Martinez-Molina J., Honorato-Cia C., Monedero P., Martinez-Simon A.

Clinica Universidad de Navarra, Dept of Anaesthesiology & Intensive Care, Pamplona, Spain

Background and Goal of Study: One of the most important factors in the pathophysiology of liver dysfunction after hepatic surgery is the cellular damage derived from the interruption of blood flow with reperfusion of the organ. Ischemia/reperfusion injury is a leukocyte-mediated event and neutrophils play a major role. N-acetylcysteine (NAC) has proved beneficial in several

conditions involving oxidative damage. This clinical trial (NCT01223326) investigates the effects of NAC on neutrophils activity.

Materials and Methods: 46 ASA II-III patients scheduled to undergo liver resection were randomized to receive NAC (initial dose: 150mg/kg; and infusion of 50 mg/kg, from 30 minutes before the ischemia up to 60 min later to the reperfusion) or placebo in a phase IV clinical trial. Cytolysis enzymes and neutrophils activity was obtained at basal status and 60 min, 180 min and 24h post-reperfusion.

Results and Discussions: NAC group showed a statistically significant decrease on neutrophil activity ($p < 0.001$) vs placebo ($p > 0.1$) between 180 min and 24 hours. No difference were observed in cytolysis enzymes.

Conclusion(s): Although the administration of NAC seems to have a beneficial effect on neutrophil activity, we have not found a clinical effect on cytolysis enzymes.

01AP15-9

Impact of anaesthesia on albumin kinetics during major abdominal surgery

Peckauskas A., Jovaisa T., Traskaite V., Stankunaite J., Trepenaitis D., Macas A.

Lithuanian University of Health Sciences, Dept of Anaesthesiology, Kaunas, Lithuania

Background and Goals: It is known, that albumin concentration in plasma significantly decreases during major surgery^[1] and in critical illness mainly due to transcapillary leak and reduced synthesis^[2]. Current data on the impact of anaesthesia on albumin kinetics is limited. Goal of this study was to assess albumin kinetics during major abdominal surgery.

Materials and Methods: A prospective, non-randomized observational study was held in clinic of anaesthesiology of Lithuanian University of Health Sciences Kaunas Clinics. Blood samples of 34 patients who underwent major abdominal surgeries were examined. Assays were taken before surgery, after induction of anaesthesia, at the end of the surgery and 24 hours after the surgery. Approval of Ethical review board was obtained before study initiation. All participants gave informed signed consent to participate in the study.

Results and Discussion: 34 patients were involved in the study. Average age was 67.86 (± 15.86). Average duration of surgery was 278.11 (± 85.06) minutes whereas average fluid consumption was 2691.18 (± 1304.22) ml. Average fluid management - 7.33 ml/kg/h. There was a reduction in albumin concentration immediately following induction of anaesthesia (38.11 g/L to 33.67 g/L, $p = 0.000$), it continued to decrease during the surgery (32.43 g/L, $p = 0.000$), and 24 hours after the surgery (30.24 g/L, $p = 0.000$). Overall percentage of albumin concentration reduction from the baseline was 11.66%, 14.91% and 20.65% respectively. 56.41% of overall decrease (7.87 g/L) was noted immediately after induction.

The findings demonstrate that albumin concentration at the end of the surgery decreased by 14.91% from the baseline value. A much larger reduction of 40% was demonstrated in the recent study by Norberg and colleagues [1] in a similar patient population. The most interesting finding is that almost two thirds of overall albumin loss peri-operatively is noted immediately after the induction and it raises the question, what are the main triggers and how we can avoid them.

Conclusion: Our study shows that there is significant and gradual reduction of albumin concentration in major abdominal surgery. Most significant decrease was noted immediately after the induction of anaesthesia.

References:

- Norberg A et al. Leakage of albumin in major abdominal surgery. *Critical Care* 2016 20:113.
- Nicholson J P et al. The role of albumin in critical illness. *Br J Anaesth* 2000; 85: 599-610.

01AP15-10

Preload-related parameters and transfusion rate during liver surgery

Hernández L., Olmedilla L., Lisbona C.J., Barrio I.M., Blanco J., Pérez-Peña J.M.

Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: It has been stated that a high stroke volume variation (SVV) is related with less transfusion rate in hepatectomy(1), and it can substitute the central venous pressure (CVP) measurement during liver surgery(2). The aim of this study was to determine whether preload-related parameters [Global end-diastolic index (GEDI), SVV and CVP] are related to surgical blood loss (evaluated by intraoperative transfusion and haemoglobin (Hb) level drop) during liver surgery.

Materials and Methods: After the approval of the Local Ethics Committee, a prospective data collection was performed in 148 adult patients scheduled for liver resection surgery who signed an informed consent. Data analysed included demographic, clinical, biochemical and hemodynamic parameters. SVV and GEDI were monitored using a transpulmonary thermodilution system (PICCO, Pulsion Medical Systems, Germany). SVV, GEDI and CVP were measured at three time points: baseline, during liver resection and at the end of surgery. Intraoperative drop in haemoglobin and transfusion requirements were also recorded. Statistical analyses were performed using t-Student's test, Pearson's correlation and logistic multivariate regression. A p -value < 0.05 was considered statistically significant.

Results and Discussion: A total of 14 patients (9.5%) received intraoperative transfusions (1-5 units of red blood cells). CVP, SVV or GEDI at any time point were not different between patients receiving and those not receiving blood transfusions. Among the preload-related parameters, we could only find a significant but small correlation between Hb level drop and the SVV during resection ($r = 0.239$ $p = 0.019$). However, in a multivariate logistic regression analysis, the only independent predictive parameters for transfusion were the preoperative Hb level (OR 3, $p = 0.008$), and the length of surgery (an indicator of the complexity of the procedure)(OR 0.988, $p = 0.001$). No significant relationship was obtained between CVP, SVV or GEDI, and blood transfusion.

Conclusion: Maintaining a low CVP, SVV or GEDI during liver resection may not be effective to reduce surgical blood. The main amendable factor related to transfusion is preoperative anaemia. Greater efforts must be made to diagnose and correct anaemia before liver surgery.

References:

- Kim YK. *Transplant Proc* 2011; 43: 1407-11.
- Dunki-Jacobs EM. *Ann Surg Oncol* 2014; 21: 473-8.

01AP15-11

The effects of preoperative use of terlipressin in patients undergoing liver resections

Khoronenko V., Varvarin V., Baskakov D., Mandryka E., Malanova A. PA. Herzen Moscow Cancer Research Institute, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation

Introduction: A number of investigators have identified that terlipressin reduces portal blood flow[1]. Terlipressin, a long-acting synthetic analogue of arginine vasopressin, acts through V1 receptors mainly in the splanchnic circulation, which causes vasoconstriction with subsequent reduction in portal pressure[2]. The objective of this study was to evaluate the safety of preoperative use of terlipressin and its impact on the blood loss in patients undergoing liver resections.

Materials and Methods: 60 adult patients were randomized into 2 groups: terlipressin group (T) $n = 30$ - patients received 1 mg of terlipressin intravenously 30 min before surgery; control group (C) $n = 30$ - patients received saline solution intravenously 30 min before surgery. All the patients received conventional hemostatic therapy: ethamsylate 500 mg and tranexamic acid 5 mg/kg intravenously 30 min before surgery. Anesthesia technique was identical in both groups.

Results: No significant differences were found between two groups with respect to demographic variables, preoperative laboratory tests, anesthesia time and mean arterial pressure during surgery. The perioperative heart rate (HR) at the time of laparotomy was revealed to be lower in Group T ($62 \pm 11,2$ bpm) than in Group C ($69 \pm 12,3$ bpm, $p < 0,05$). There were no other significant dif-

ferences in HR during the surgery. Mean blood loss in Group T was found to be lower than in Group C ($648,75 \pm 841,67$ ml and $1562,5 \pm 854,88$ ml respectively, $p < 0,05$). Intraoperative urine output was increased ($p < 0,05$) in group T ($71 \pm 1,41$ ml/4 ml/h;) compared to group C ($75,12 \pm 3,02$ ml/h). But postoperatively no differences in urine output were found between the groups. Hb rate in group T was higher ($p < 0,05$) postoperatively than that in group C (Table 1). No statistical difference was shown between two groups in other laboratory tests (Table 2,3).

Conclusion: In patients undergoing liver resections preoperative use of terlipressin significantly reduces mean blood loss without significant impact on hemodynamics parameters and laboratory tests.

References:

1. Wells M, Chande N, Adams P, Beaton M, Levstik M, Boyce E, et al. Meta-analysis: Vasoactive medications for the management of acute variceal bleeds. *Aliment Pharmacol Ther.* 2012;35:1267-78.
2. Zhang LP, Li M, Yang L. Effects of different vasopressors on hemodynamics in patients undergoing orthotopic liver transplantation. // *Chin Med J.* 2005;118:1952-8

01AP16-3

Cerebral desaturation does not predict postoperative cognitive dysfunction in patients undergoing major shoulder surgery in the beach chair position

LeJeune M.¹, Jacobs T.¹, De Wilde L.², Vingerhoets G.³, De Hert S.¹

¹Ghent University Hospital, Dept of Anaesthesiology, Ghent, Belgium,

²Ghent University Hospital, Dept. of Orthopaedic Surgery, Ghent,

Belgium, ³Ghent University, Dept. of Experimental Psychology, Ghent, Belgium

Background and Goal: Major shoulder surgery in beach chair position has been associated with severe adverse neurologic events even in healthy middle-aged patients(1,2). This has been attributed to the beach chair position itself as it reduces cerebral oxygenation. The aim of the study is to identify whether intra-operative episodes of cerebral desaturation are associated with postoperative cognitive decline.

Materials and Methods: After obtaining ethics committee approval and informed consent, 25 adult patients(10 males, 15 females with mean age=63.9y, SD=11.0y) without prior neurological and psychiatric disorder were enrolled prospectively. Neurocognitive function was assessed preoperatively, at the 3rd postoperative day and at 3 months postoperatively. Memory and attention performance were evaluated by means of the Auditory Verbal Learning Test(AVLT), the Stroop Color Word Test(SCWT) and the Symbol Digit Modalities Test(SDMT). Near-infrared spectroscopy was used to determine intra-operative episodes of cerebral desaturation, defined as a decrease in rScO₂ of more than 20% compared to the baseline value. Routine anesthesia was applied.

A repeated measures multivariate analysis of variance with time as within-subject variable (pre-surgery, post-surgery, and follow up assessment) was performed.

Results: Cerebral desaturation occurred in 80% of the patients. AUC(min-%), which represents the depth and duration of the rScO₂ readings 20% below the baseline value, varied from 0 to 778 on the left frontal optode and from 0 to 1006 on the right, with a left mean AUC of 91.92 (SD=197.31) and a right mean AUC of 96.72 (SD=208.96). No significant changes in overall cognitive test performance were observed over time, neither was there any significant interaction between time and age or cerebral desaturation. A significantly increased performance was observed between the pre-operative and postoperative versus follow-up assessment on the AVLT performance ($p < 0.001$), and between the preoperative and follow-up performance on the SDMT performance ($p = 0.022$), which may be attributed to a test-retest effect.

Conclusion: These preliminary results suggest no association between episodes of cerebral desaturation and postoperative cognitive dysfunction. The current sample is yet too small to come to definite conclusions, and confirmation in an adequate sample-sized study population is mandatory.

References:

1. Pohl A, Cullen D: *J Clin Anesth*, 2005;17:463-9.
2. Friedman et al.: *Orthopedics* 2009;32:256.

01AP16-4

Effects of desflurane exposure on hippocampal learning

Asakura A.¹, Uchimoto K.², Inagawa G.³, Goto T.¹

¹Yokohama City University Graduate School of Medicine,

Dept of Anaesthesiology & Intensive Care, Yokohama, Japan,

²Yokohama City University Medical Centre, Dept of Intensive Care,

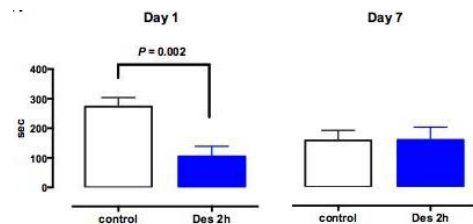
Yokohama, Japan, ³Yokohama Municipal Citizen's Hospital, Dept of Anaesthesiology, Yokohama, Japan

Background and Goal of Study: Volatile anesthetics have been postulated as a potential cause of postoperative cognitive dysfunction (POCD), however the underlying mechanism remains largely unknown. We previously reported that isoflurane impairs hippocampal learning 7 days after its exposure. Desflurane has rapid emergence due to its low blood-gas partition coefficient, and has been commonly used in our daily practice. Our objective was to elucidate the effects of desflurane exposure on hippocampal learning.

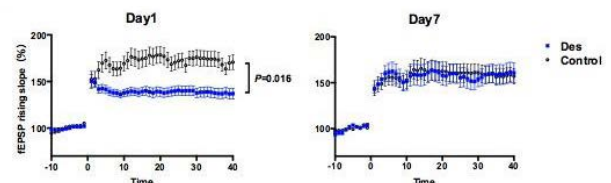
Materials and Methods: Male Sprague-Dawley rats (7 weeks old) were exposed to 9.5% desflurane for 2 hours. One or seven days after the exposure, inhibitory avoidance (IA) test were performed to evaluate hippocampus-dependent contextual learning. Next, long-term potentiation (LTP) induced in hippocampal CA1 region after high-frequency stimulation was observed. Accordingly, expression levels of GluA1 subunit of α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptor (AMPA) of the dorsal hippocampus, which is a modulator of LTP, were measured.

The data were analyzed using two-way factorial ANOVA followed by between-group *post hoc* Sidak's multiple comparison test.

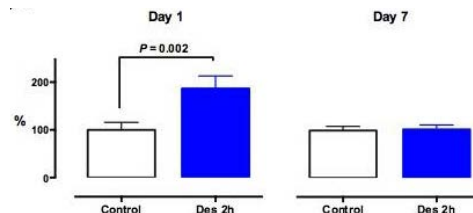
Results and Discussion: Exposure to desflurane resulted in significant impairment of learning in IA test on day 1 (control [n=17], 273 ± 31 s; desflurane [n=17], 104 ± 34 s), but not on day 7 (control [n=15], 159 ± 35 s; desflurane [n=15], 160 ± 44 s) (Fig. 1); significant suppression of hippocampal LTP on day 1 (control [n=6], $169 \pm 7\%$; desflurane [n=8], $137 \pm 6\%$), but not on day 7 (control [n=8], $157 \pm 8\%$; desflurane [n=8], $160 \pm 11\%$) (Fig. 2); and significant increase in expression of the GluA1 subunit on day 1 (control [n=6], $100 \pm 38\%$; desflurane [n=6], $187 \pm 58\%$), but not on day 7 (control [n=6], 100 ± 22 ; desflurane [n=6], $102 \pm 23\%$) (Fig. 3)



[Figure 1]



[Figure 2]



[Figure 3]

Desflurane impairs hippocampal learning and modulates synaptic plasticity maybe by the overexpression of GluA1, on a day after its exposure, but diminish on day 7.

Conclusion: Although desflurane causes learning deficit on early phase, it resolves earlier than isoflurane.

01AP16-6

Down-regulation of clock genes expression in the suprachiasmatic nuclei (SCN) after short-term propofol anesthesia

Ben-Hamouda N.¹, Poirel V.-J.², Dispersyn G.³, Pévet P.², Challet E.², Pain L.⁴

¹Centre Hospitalier Universitaire Vaudois, Service of Adult Intensive Care Medicine and Burns, Lausanne, Switzerland, ²Institute of Cellular and Integrative Neurosciences, CNRS (UPR3212), University of Strasbourg, Department of Neurobiology of Rhythms, Strasbourg, France, ³Institut de Recherche Biomédicale des Armées (IRBA), Dept of Neurosciences, Brétigny-sur-Orge, France, ⁴Hopitaux Universitaires de Strasbourg, Dept of Anaesthesiology, Strasbourg, France

Background & Goal of the Study: General anesthesia induced by propofol triggers phase-advances of circadian rhythms controlled by the master clock (Suprachiasmatic nuclei, SCN) only at certain times of the day (late resting period and early active period).¹ Moreover, anesthesia induced by propofol has been associated with a subsequent reduction of *Per2* mRNA levels in the whole brain.² The acute effects of propofol anesthesia *per se* on the SCN molecular clockwork remain unclear. Here we aim to study expression of the clock genes *Per1* and *Per2* in the SCN of rats exposed to constant darkness after a single-dose injection of propofol or vehicle when the SCN clock is shifted by propofol.

Materials and methods: Thirty 2-months old, Long-Evans rats were randomly divided into 2 groups receiving an intraperitoneal administration of single dose of either 120 mg/kg propofol 1% ($n=15$), or intralipide® 10% ($n=15$) in late day (projected circadian time (CT) 10, i.e., 10h after the expected time of lights on). Thereafter, rats were sacrificed in darkness 1h, 2h or 3h after the treatment (projected CT11, CT12 or CT13; $n=5$ per time and treatment). In 20- μ m brain coronal sections at the SCN level, we analyzed expression of *Per1* and *Per2* mRNA by radioactive *in situ* hybridization and quantification with NIH-ImageJ. The experiment was performed in accordance with the principles of laboratory animal care and the french laws. Data were analyzed with 2-way ANOVA.

Results and discussion: Propofol anesthesia induced a decrease in *Per1* expression in the SCN at CT11 and CT12 when compared to the vehicle group. For *Per1* expression ($n=27$), we found time ($p<0.001$) and treatment effects ($p=0.048$). For *Per2* expression ($n=26$), we observed a treatment effect ($p=0.002$), but no time effect. Thus, the expression of *Per2* in the SCN is decreased at CT11 and CT12 after propofol anesthesia. In the absence of light, hypothermia and concomitant surgery, such down-regulation of *Per* genes is only correlated to propofol injection. This may explain post-anesthesia symptoms reported by patients.

Conclusion: We show here for the first time that short-term propofol anesthesia leads to a transient down-regulation of *Per1* and *Per2* expression in the master SCN clock.

References:

- Challet E, Gourmelin S, Pévet P, et al. Neuropsychopharmacology 2007;32:728-35.
- Yoshida Y, Nakazato K, Takemori K, et al. Brain Res Bull 2009;79:441-4.

01AP16-7

Alpha band connectivity of the frontal EEG associates with consciousness during target controlled infusion of dexmedetomidine and propofol in healthy subjects

Scheinin H.¹, Scheinin A.², Kallionpää R.³, Rajala V.², Valli K.³, Li D.⁴

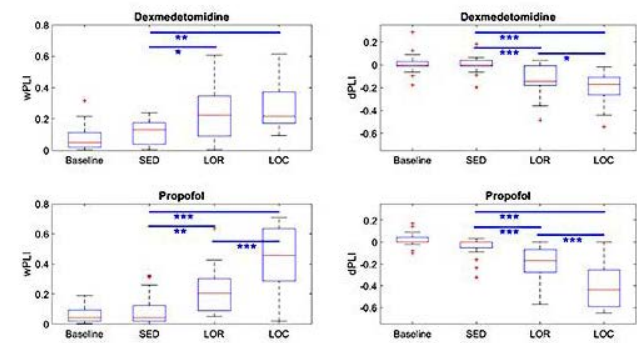
¹University of Turku, Dept of Anaesthesiology & Intensive Care, Turku, Finland, ²Turku University Hospital, Dept of Anaesthesiology & Intensive Care, Turku, Finland, ³University of Turku, Department of Psychology and Speech-Language Pathology, Turku, Finland, ⁴University of Michigan, Dept of Anaesthesiology, Ann Arbor, United States

Background and Goal of Study: Current depth-of-anesthesia monitors cannot reliably differentiate unconsciousness from deep sedation. In the search for better methods, we compared connectivity changes induced by dexme-

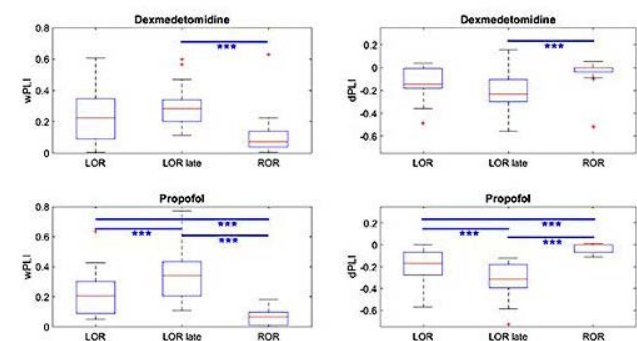
detomidine and propofol until loss of consciousness (LOC) in a highly standardized setting.

Materials and Methods: Forty-seven healthy male subjects were randomized to receive dexmedetomidine ($n=23$) or propofol ($n=24$) through TCI, starting from 1.0 ng/ml for dexmedetomidine and 1.0 μ g/ml for propofol, and then titrated with small increments at 7 min intervals until loss of responsiveness (LOR). LOR was defined as subjects' inability to press handles upon requests. After achieving LOR, an attempt was made to awaken the subjects with a loud voice or mild physical stimulation without changing the infusion. After possible awakening (return of responsiveness, ROR), the subjects were permitted to subside (or maintain if unarousable) unresponsive, and the target was increased by 50 % to achieve LOC. EEG signal was collected, and EEG spectra and weighted (wPLI) and directed phase lag index (dPLI) between different brain areas processed offline using custom-written functions in MATLAB.

Results and Discussion: The mean (SD) measured drug conc. for LOR was 2.10 (0.67) ng/ml dexmedetomidine and 1.67 (0.62) μ g/ml for propofol. Eighteen (78%) and 10 (42%) subjects were arousable from the LOR state in the dexmedetomidine and propofol groups, respectively. Apparent connectivity changes were seen in the alpha band (8-14 Hz), and topographic analysis revealed that especially in (pre)frontal areas the measures showed state dependent changes. Prefrontal-frontal wPLI increased and dPLI turned more negative (suggesting that prefrontal "lagged") towards LOC, and were reverted in subjects who could be aroused during constant infusion ($p<0.001$, Figure). These findings are intriguing as dexmedetomidine does not induce strong anteriorization or apparent hyper-coherence of the alpha band like propofol.



A Prefrontal-frontal wPLI and dPLI before and during dexmedetomidine and propofol infusion. Boxplots at baseline, deep sedation (SED), LOR and LOC states. * ($p<0.05$), ** ($p<0.01$) and *** ($p<0.001$) indicate significant differences between the SED, LOR and LOC states (RM ANOVA, Bonferroni post-hoc test).



B Prefrontal-frontal wPLI and dPLI at LOR (early and late) and ROR in arousable subjects during constant dexmedetomidine ($n=18$) and propofol ($n=10$) infusion titrated to LOR. Data as boxplots. *** ($p<0.001$) indicate significant differences between the states (RM ANOVA, Bonferroni post-hoc test).

[Figure]

Conclusion: Monitoring prefrontal-frontal alpha band connectivity of the EEG could be a viable alternative for developing depth-of-anesthesia monitoring in the future.

01AP16-8**A closer look on neural inertia during anesthesia with different drug combinations in a controlled step-up/step-down design in humans**

Kuizenga M.H., Colin P.J., Vereecke H.E.M., Struys M.M.R.F.
University Medical Center Groningen, University of Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: Neural inertia (NI) is defined as the tendency of the central nervous system to resist transitions between arousal states, potentially observable as a hysteresis in clinical signs and during neurophysiologic monitoring between induction and recovery. This phenomenon has been observed in mice and *drosophila* with volatile anesthetics by demonstrating a higher required anesthetic concentration during induction than during recovery to switch between states (induction C_{50} > recovery C_{50}). The aim of this study was to reproduce these findings in humans during propofol and sevoflurane anesthesia.

Materials and Methods: 36 healthy volunteers received four sessions of anesthesia with different drug combinations in a step-up/step-down design. During these sessions propofol or sevoflurane was administered with or without remifentanyl (0, 2 or 4 ng/ml). Serum concentrations of propofol and remifentanyl were measured from arterial blood samples in steady state conditions. Loss and return of responsiveness (LOR/ROR), response to pain (PAIN), Patient State Index (PSI) and spectral edge frequency (SEF) were recorded and modeled with NONMEM to fit a sigmoidal E_{max} dose response relationship incorporating the fit of neural inertia.

Results and Discussion: For propofol, with or without remifentanyl, the C_{50} between induction and recovery was not significantly different. For sevoflurane, this conclusion was confirmed for the SEF case only. For the other endpoints, significant differences were observed when sevoflurane was administered alone (PSI) and/or in combination with remifentanyl (LOR, PAIN, PSI). Our results nuance the earlier findings with the volatile anesthetics in mice and *drosophila*. In general, NI is important with sevoflurane anesthesia but not with propofol. Moreover, the effect is more pronounced when a hypnotic-opioid combination is administered. Nevertheless, this analysis shows that identifying whether or not NI is present, depends on the measured endpoint.

Conclusion(s): Our analysis casts doubt on the general idea that NI is important for all anesthetics. We also show that, methodological choices, such as the measured endpoint, have an effect on the possible detection of NI. A more thorough definition of NI, accompanied by a methodological framework for studying this phenomenon in clinical practice is pivotal in order to advance our insights in the interaction between neural pathways and (combinations of) anesthetic drugs.

01AP16-9**A comparison of the effects of desflurane and propofol on the Optic Nerve Sheath Diameter during robot-assisted laparoscopic radical prostatectomy**

Jo J.-H., Choi E., Jeon Y.
Seoul National University Bundang Hospital, Dept of Anaesthesiology & Pain Medicine, Seongnam-si, Korea, Republic of

Background: Use of the steep Trendelenburg position and high pressure CO₂ pneumoperitoneum in patients undergoing robot-assisted laparoscopic radical prostatectomy (RALP) increase intracranial pressure (ICP). Volatile anesthetics including desflurane and propofol have different effects on ICP, cerebral blood flow. In this study, we measured sonographic Optic Nerve Sheath Diameters (ONSD) in patients undergoing RALP to evaluate intracranial pressure and compared the effects of desflurane and propofol.

Materials and Methods: Sixty patients scheduled for RALP were randomly assigned to undergo desflurane with remifentanyl (group D) or propofol with remifentanyl (group P) anesthesia. We measured both ONSDs and recorded the average of values. Sonographic ONSDs and hemodynamic parameters were measured at specific time points: in the supine position after induction of anesthesia (T0), 10 min after the steep Trendelenburg position with pneumoperitoneum (T1), one hour after the steep Trendelenburg position combined with pneumoperitoneum (T2), two hour after the steep Trendelenburg position combined with pneumoperitoneum (T3), 10 min after in the supine position after desufflation of the pneumoperitoneum (T4) and 20 min after arrival in the post anesthetic care unit (T5).

Results and Discussion: The ONSD of T2 was significantly higher than that of T0 in both group (0.44 ± 0.02 mm vs. 0.52 ± 0.04 mm in group D, 0.45 ± 0.02 mm vs. 0.49 ± 0.02 mm in group P, both P-value <0.001). In addition, The ONSD of T3 was significantly higher than that of T2 in both group (0.56 ± 0.03 mm vs. 0.52 ± 0.04 mm in group D, P-value <0.001; 0.51 ± 0.02 mm vs. 0.49 ± 0.02 mm in group P, P-value 0.021). The ONSD of T4 was significantly lower than that of T3 in both group (0.51 ± 0.04 mm vs. 0.56 ± 0.03 mm in group D, 0.49 ± 0.02 mm vs. 0.52 ± 0.04 mm in group P, both P-value <0.001). The ONSD of T5 was still significantly higher than that of T0 in group D (0.47 ± 0.02 mm vs. 0.44 ± 0.02 mm P-value <0.001). Moreover, ONSDs of T1, T2, T3, and T4 of group D were significantly higher than those of group P (P-value, 0.024, <0.001, <0.001, and 0.035).

Conclusion(s): ONSD in desflurane group was significantly higher than that in propofol group during operation time in RALP. Through this results, propofol could be a better choice for patients with the risk of cerebral hypoperfusion or with increased intracranial pressure.

References: Kim MS et al. J Endourol. 2014;28:801-6.

01AP16-10**General anesthesia induces a reduction of cortical inhibitory interneuron activity in vivo**

Hayes S., Cichon J., Yang G.
New York University (NYU), Dept of Anesthesiology, Perioperative Care, and Pain Medicine, New York, United States

Background: Cognitive functions including sensory processing, consciousness, and memory are disrupted by anesthetics. General anesthesia is thought to be a state of suppressed net cortical activity characterized by decreased activity of excitatory pyramidal neurons and enhanced GABAergic inhibitory activity. In cortical circuits, pyramidal neuron activity is sculpted by inhibitory interneurons, which in the cortex express three, non-overlapping markers: 5HT_{3a}-receptor (5HT_{3aR}), parvalbumin (PV), and somatostatin (SST). Although interneurons play an important role in regulation of cortical function, the effect of general anesthetics on interneuron activity remains unknown. In this study, we aimed to characterize cortical interneuron activity in the living mouse brain under general anesthesia.

Methods: We expressed the ultrasensitive genetically encoded calcium indicator, GCaMP6, in layer 2/3 pyramidal cells and interneurons using transgenic (*Thy1-GCaMP6*) and knock-in (PV-Cre, SST-Cre, 5HT_{3a}-Cre) mice with adeno-associated virus encoding GCaMP6. Mice expressing GCaMP6 were anesthetized with either sevoflurane or ketamine-xylazine (KX). We used two-photon calcium imaging to record the neuronal activities of pyramidal neurons and interneurons in the primary somatosensory, motor, and visual cortices during awake, anesthetized, and recovery states. We measured the fluorescent signals of each soma over time, calculating the $\Delta F/F_0$, where F_0 is the baseline fluorescent signal. Image analysis was performed in NIH ImageJ and data was evaluated with Student's t-test in GraphPad Prism.

Results: We found that sevoflurane and ketamine-xylazine anesthesia significantly decreased the average and peak F/F_0 of both pyramidal cells and all interneurons classes (5HT_{3aR}, PV, and SST) as compared to awake animals. At the subcellular level, calcium activities of dendritic branches and dendritic spines were also reduced compared to awake state. Decreased neuronal activities under anesthesia occurred across all observed cortical areas. Moreover, suppressed neuronal activities continue into the recovery period as compared to awake state.

Conclusion: Our results suggest that general anesthesia results in not only the suppression of excitatory pyramidal cell activity, but also decreased GABAergic inhibition from interneurons. Neuronal activities continue to be suppressed into the recovery period, suggesting a persistent effect on cortical dynamics in the perioperative period.

01AP16-11**Effect of remifentanil on seizure duration and patient experience in electroconvulsive therapy**

Garth T., Nagore D., Jimeno J.P., Bilbao A., Belamaric Z.
Barts Health NHS Trust, Dept of Anaesthesiology & Intensive Care, London, United Kingdom

Background and Goal of Study: In April 1938, Ugo Cerletti and Lucio Bini pioneered the use of electricity to induce seizures in a paranoid, schizophrenic man found wandering the streets of Rome. After 11 sessions he was declared successfully cured and, proclaiming his enthusiasm for the new treatment, was able to return to work.

There have been many advances in ECT since, most notably the introduction of 'Modified ECT' incorporating the use of anaesthesia and muscle relaxants to minimise the risk of long bone fractures and dislocations.

Seizure durations of 15s to 120s are known to give the best outcomes from ECT. The use of remifentanil conveys the likely advantages of decreasing seizure threshold and increasing seizure duration. This study aims to evaluate the effects of using remifentanil in combination with thiopentone on seizure duration and patient satisfaction in ECT.

Materials and Methods: The study was conducted at the Royal London Hospital. 20 patients receiving thiopentone 3mg/kg and 20 receiving thiopentone 3mg/kg and remifentanil 1mcg/kg were surveyed. All patients received an ECT dose of 225V via bilaterally placed electrodes and succinylcholine 0.4 mg/kg.

Both visual and EEG seizure durations were recorded and patients were asked to rate their satisfaction on a scale from 1 to 10 before discharge. A student unpaired T test was used to calculate p values.

Results and Discussion: The addition of remifentanil was found to increase the mean visible seizure duration from 14.5s to 23.7s (95% confidence interval 5.71 to 12.79, $P < 0.0001$) and mean EEG seizure duration from 19.6s to 29.0s (95% confidence interval 5.81 to 13.09, $P < 0.0001$). Mean patient satisfaction score rose from 6.6 to 7.6 with the use of remifentanil (95% confidence interval -0.62 to 2.72, $P 0.2118$). 4 patients reported myalgia and 1 reported trauma to their lip when thiopentone alone was used. Fewer patients reported adverse effects when remifentanil was given with 1 reporting myalgia, 1 nausea and 1 trauma to their lip.

Conclusion: This study suggests that the addition of remifentanil does significantly increase seizure duration in ECT. Although the improvement in patient satisfaction was not significant, fewer patients complained of myalgia after receiving remifentanil. It is clear that remifentanil does have a role in anaesthesia for ECT, however, the overall effect on patient outcomes still remains to be accurately quantified.

Ambulatory Anaesthesia

02AP01-1**Dexmedetomidine: the answer for difficult cases?**

Ferreira S.P., Dias J., Alves J.
Hospital Sra Oliveira, Dept of Anaesthesiology, Guimarães, Portugal

Background: The adverse event profile of sedation with benzodiazepines, propofol and opioids leaves a window of opportunity to consider alternative agents. Dexmedetomidine (DEX) is particularly attractive in children for whom the preservation of spontaneous ventilation and airway tone is preferable.

Case report: An 18-month-old infant male (13 Kg) with macrocephaly, developmental delay, kyphoscoliosis and laryngomalacia was scheduled for brain and neuroaxial MRI. A peripheral intravenous line was secured and midazolam 0.05mg/kg administered. A loading dose of DEX 2µg/kg was given over 10 minutes and an infusion started at 1µg/kg/h, with the purpose of achieving a minimum Ramsay score of 4. Supplemental cetamine 1mg/kg was administered as rescue. Hemodynamic and respiratory profiles were maintained within baseline limits. Discharge criteria were met 60 minutes after the procedure.

Discussion: Currently DEX is not approved for use in the pediatric population, however its use in children has been described in the literature for almost a decade. It is an α_2 -adrenergic agonist that provides sedation paralleling natural sleep with minimal respiratory depression. Evidence suggests that, to provide adequate sedation, either supplemental sedatives must be administered or bolus/infusion rate of DEX must be more rapid than that reported initially. Mason KP *et al.* described an effective sedation protocol with DEX 2-3µg/kg IV loading dose followed by an infusion of 2µg/kg/h¹. Bradycardia, hypotension and sinus arrhythmia have been reported with these doses, but no treatment was required. Administration of DEX in conjunction with cetamine has been described and leads to improved quality of sedation with reduced incidence of adverse effects². This association has opposite cardiovascular effects and seems to be the key to maintain spontaneous ventilation and hemodynamic stability.

References:

1. Tamman T. Comparison of the efficacy of dexmedetomidine, ketamine and a mixture of both for pediatric MRI sedation. *Egyptian Journal of Anaesthesia*. 2013;29:241-246
2. Mahmoud M, Mason KP. Dexmedetomidine: review, update and future considerations of paediatric perioperative and procedural applications and limitations. *British Journal of Anaesthesia*. 2015;171-82

Learning points: Sedation in remote locations is a challenge. Evidence suggests that DEX can be used effectively and safely in children, with potential to be the drug of choice in cases with increased risk of airway collapse.

02AP01-2**Does intravenous midazolam induce hyperalgesia?**

Coimbra L.¹, Gouveia F.¹, Fernandes A.¹, Dahlem C.¹, Alves L.², Amaro L.¹

¹CHVNG/E, Dept of Anaesthesiology, Vila Nova de Gaia, Portugal,

²USF Santo André de Canidelo, USF Santo André de Canidelo, Vila Nova de Gaia, Portugal

Low doses of bupivacaine (B) can effectively produce spinal anaesthesia in arthroscopy knee surgery (AKS). Studies in rats have suggested a hyperalgesic effect of high doses of midazolam, a benzodiazepine largely used in the context of anaesthesia, probably through a mechanism involving GABA-A receptors and nociception modulation, but this effect is still to be proven in humans. This study aimed at assessing how IV midazolam affected patient outcome of AKS performed in our ambulatory surgery unit.

An observational, cross-sectional study was conducted: 314 records of all patients submitted to AKS under spinal anaesthesia (Jan 2011 to Dec 2015) were analysed. Demographic data, drugs administered and 24h PO pain scores and functional status were recorded. 44 patients were excluded. Association between midazolam dose and pain and limitations was estimated by logistic regression models, adjusting for age, ASA status and B dose. Significance level $p < 0.05$.

270 patients were included. Mean age was 52,2 years, 55,93% of patients were male and 95,9% ASA status 1 or 2. All spinal were performed in the lateral position with hyperbaric B (median±SD: 10±1,26). Some patients also received intrathecal or IV opioids. Variable doses of IV midazolam were administered (median±SD: 3±1,41). 94 patients had mild to moderate pain. 158 had limitations at 24h.

There was no statistical difference regarding the use of opioid and PO pain [$p=0,688$ and $p=0,845$, male (M) and female (F), respectively] or limitations ($p=0,958$ and $p=0,280$, M and F, respectively). However, trials using intrathecal opioids in AKS have shown a reduction in PO pain scores and decreased analgesic requirements. There was no statistical difference between doses of B and PO pain or limitations. Curiously, higher doses of midazolam seemed to significantly increase PO pain at 24h in M ($p=0,0115$), but not in F, and this effect was independent of other variables; higher doses of midazolam were also linked to more PO functional limitations, but without statistical significance ($p=0,0764$). Both hyperalgesic and antinociceptive effects of systemically administered midazolam have been reported. Different results may be ascribed to the action of midazolam on the spinal cord and/or brain.

Our results suggest a statistically significant association between higher midazolam doses and worse PO pain, but this effect was only in men and its causality is still to be clarified. Further studies are needed.

02AP01-3**Efficacy of conscient sedation for laser ambulatory ablation of benign thyroid nodules**

López Baamonde M.¹, Hanzu F.², Squarcia M.³, Mora M.², Valero R.¹, Carrero E.¹

¹Hospital Clínic de Barcelona, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain, ²Hospital Clínic de Barcelona, Dept of Endocrinology, Barcelona, Spain, ³Hospital Clínic de Barcelona, Dept of Diagnostic Imaging, Barcelona, Spain

Background and Goal: Laser ablation therapy (LAT) is a new and minimally invasive technique to treat benign thyroid nodules (TN). LAT has potential complications (tracheal and vascular injury, neck hematoma). Pharyngeal edema is the main immediate post-surgical risk.

In our hospital LAT is performed under sedation in supine position and cervical hyperextension. Laser protection goggles are mandatory. During sedation, it is important to maintain spontaneous respiration and patient collaboration to the verbal stimulus (Ramsay3) ensuring adequate comfort and analgesia. While LAT oxygen is stopped to avoid ignition complications and its related comorbidity.

The goal of the study is to value the efficacy of conscious sedation for LAT ambulatory procedures.

Materials and Methods: *Monitoring:* Standard noninvasive (EKG, NIBP, SpO₂, RR, HR, ETCO₂) and nasal cannula oxygen (2-3L/min). *IV premedication:* pantoprazole 40mg, ondansetron 4mg, acetaminophen 1g, metilprednisolone 0.5mg/Kg and diazepam 5mg oral. None antibiotic prophylaxis is used. *Anesthesia technique:* local infiltration (mepivacaine/lidocaine)+conscious sedation with propofol (0.5-1 mcg/mL) TCI. Ketamine 10-20mg and/or phentanyl 25-50mcg. *Post-anesthesia recuperation:* patient seated+cervical ice. 1h in specific box. Analgesia: acetaminophen/dexketoprofen alternated and tramadol rescue. 3-day descending corticoids.

Results and Discussion: 25 patients (March 2014 - December 2015). Age 62.6±16.6 years, 72%♀; weight and height 76.9±18.3Kg and 1.64±0.09m. ASA I-II-III-IV. Comorbidities: HBP (48%), COPD (16%), OSA (12%), heart-disease (12%), diabetes-mellitus (1%). Duration 83.7±19.8min.

Infiltration: Mepivacaine 88%, lidocaine 4%. Propofol-TCI 60.4±27.6min (dose 125.3±76.6mg). Ketamine 40%, phentanyl 32%.

Respiratory complications: apnea (≥10s)8%, bradypnea (RR< 10) 20%, desaturation (SpO₂<90%) 16%, Ramsay-4 12%, reinhalation 4%, cough 4%. Maneuver requirements: verbal stimulation 20%, tactile stimulation 4%. FiO₂ increasing, upper-airway opening, oropharyngeal cannula, ambu, laryngeal mask or intubation were not required (0%). Other complications: post-discharge fatigue 20% (corticoid abstinence), stridor 4%, perioral paresthesia 4%, PACU prolongation (HBP 4%), VAS 4-7 12%, EVA>7 12%, re-consultation 8% (TN inflammation).

Conclusions: Conscious sedation is an effective technique to ambulatory LAT procedures. Patient vigilance and monitoring allow for early detection and treatment of potential complications.

02AP01-4**Evaluation of quality in an ambulatory surgery center: the perianesthesia care from the patient's viewpoint**

Neiva Lemos J.¹, Dantas Cardoso Neiva Lemos L.², Fontoura Solla D.J.³, Dantas Cardoso Neiva Lemos D.², Pinheiro Módolo N.S.¹

¹Faculdade de Medicina de Botucatu, UNESP, Dept of Anaesthesiology, Botucatu, Brazil, ²BAHIANA - School of Medicine and Public Health (Escola Bahiana de Medicina e Saúde Pública - EBMS), Research and Development Department, Salvador, Brazil, ³Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HC/FMUSP), Dept of Neurosurgery, São Paulo, Brazil

Background and Goal of Study: Quality in anesthesiology is usually measured by morbidity and mortality. Nonetheless, it has been assessed by the patients' satisfaction at various stages of anesthetic care. As satisfaction is the result of care from the client's perspective, the anesthesiologist must be able to build relationships with patients, provide understandable information, involve them in decisions about their anesthesia, answer their questions and

listen to their complaints. This measurement therefore provides a basis to improve care in anesthesiology. This study aimed to evaluate peri-anesthetic care in an ambulatory surgery center based on patient's satisfaction measures.

Materials and Methods: We used the "Heidelberg Peri-anesthetic Questionnaire" to evaluate satisfaction at various stages of peri-anesthetic care in patients undergoing ambulatory surgery. Responses to each question were ranked from "1-4", corresponding to totally unsatisfied, unsatisfied, satisfied and totally satisfied. Questions with score below pool average minus one standard deviation (SD) and those with a high internal SD were selected for correlation analysis. The correlation analysis using multivariate logistic regression considered the degree of dissatisfaction with patients' characteristics (age, gender, education degree and ASA physical status), anesthesia (type, time and prior experience) and surgical specialty.

Results and Discussion: We evaluated 1,211 patients from both sexes, aged 18 to 65 years. Questions evaluated as dissatisfaction involved fear of anesthesia and surgery, feeling cold, the urgent need to urinate and pain at the surgical site, as well as the level of concern and response speed of the team in relieving the patients' pain. Younger age, women, college education and general anesthesia were variables related to a greater level of dissatisfaction. Urological and gynecological surgeries, longer surgical duration and previous experience of anesthesia were also related to dissatisfaction.

Conclusion(s): The "Heidelberg Peri-anesthetic Questionnaire" proved to be a useful tool in identifying the reasons for patient's dissatisfaction. It allows the identification of dissatisfied patient groups at the various stages of anesthetic care, and enables the establishment of priorities at the points of attention, with the goal of improving patients' satisfaction regarding anesthesia care.

Ethics committee approval registration:

CONEP/CAAE, 52457915.6.0000.5411.

02AP01-5**Measuring end-tidal ethanol concentration to detect systemic ethanol contamination in sclerotherapy**

Schena M., Pedersen T.H., Osswald M., Greif R., Theiler L.

University Hospital of Bern, Inselspital, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland

Background and Goal of Study: Acute pulmonary arterial hypertension is a major, but rare complication in ethanol sclerotherapy, following elevated ethanol blood concentrations that lead to vasospasms of the pulmonary vessels. To date we do not have a non-invasive method to monitor systemic ethanol contamination in sclerotherapy. However, in transurethral resection of the prostate, measuring end-tidal ethanol has been used for years. The goal of this study is to evaluate whether end-tidal ethanol concentration (EtEC) may be used to monitor systemic ethanol contamination, and thereby reducing the risk for pulmonary pressure during ethanol sclerotherapy.

Materials and Methods: For this non-interventional, prospective observational study we included all patients undergoing ethanol sclerotherapy. During the intervention EtECs were recorded continuously every 5 minutes and 1, 3 and 5 minutes after each ethanol-injection. EtECs were also measured in the recovery room after intervention. Primary outcome was the EtECs during and after intervention.

Results and discussion: So far, 37 patients were included (Table 1). 14% of the patients did not show any signs of relevant ethanol contamination (detection threshold of 0.05‰). In 41% of the patients the EtEC increased even after the end of anaesthesia (Table 2), indicating delayed ethanol washout from the vessels into systemic circulation. These patients were thus at risk for acute pulmonary arterial hypertension even after the end of the intervention.

Number of participants	37
Female sex	23(62%)
Age, years*	38(26-46)
BMI, kg*m-2*	23(21-25)
Total ethanol volume per patient, ml*	15(8-25)
Ethanol volume per injection, ml*	2(1-3)
Duration of intervention, min*	42(28-64)
Time between two ethanol injections, min*	4(2-7)

[Table 1: Demographics]

*Median (25th, 75th percentile)

	End-tidal ethanol concentration % Median (25th, 75th percentile)
3 min after injection	0.11(0.09-0.15)
5 min after injection	0.11(0.1-0.18)
Max. conc. during intervention	0.17(0.11-0.25)
Last measurement during intervention	0.14(0.08-0.18)
15 min after end of anaesthesia	0.11(0.09-0.2)
60 min after end of anaesthesia	0.10(0.06-0.12)

[Table 2: End-tidal ethanol concentration]

Conclusion: End-tidal ethanol measurements allow continuous non-invasive monitoring of systemic ethanol concentrations as a sensitive predictor of pulmonary hypertension in ethanol sclerotherapy.

02AP01-6

Repeated use of a novel nasal PAP mask assembly to maintain spontaneous ventilation and oxygenation in a patient with autonomic neuropathy for arthroscopic biopsy of recurrent shoulder joint infection under local anaesthesia

Tse J., McGrory M., Warfield Jr. D., Gopez O., Sison R., Kiss G.
Rutgers Robert Wood Johnson Medical School, Dept of Anaesthesiology, New Brunswick, United States

Background: Patients under regional block or local anaesthesia often receive IV sedation and nasal cannula O₂. Over-sedation or airway obstruction may cause severe desaturation, especially patients in beach chair position. A simple nasal PAP mask assembly was shown to maintain spontaneous ventilation and improve oxygenation in sedated obese patients with OSA.¹⁻³ We used it to provide nasal CPAP and N₂O for a patient with autonomic neuropathy during shoulder arthroscopy under local anaesthesia.

Case report: A 68 y/o female with autonomic neuropathy associated with severe HTN lability presented for arthroscopic biopsy of infected right shoulder resulting from two failed rotator cuff repairs. She had failed attempts at both medical antihypertensive treatment, due to profound hypotension, and two medullary decompressive surgeries in an effort to relieve her dysautonomia. She did well with recent arthroscopic I & D of the shoulder under interscalene block with a nasal CPAP mask assembly providing 50% N₂O. However, she complained of PONV. She gave consent for case report. Her pre-operative BP was in 220's/130's and HR in 130's which improved (BP 196/125, HR 112) with midazolam (2 mg). An infant mask with a fully inflated air cushion was secured over her nose with rubber head straps and connected to the anesthesia machine via a long breathing circuit. APL valve was adjusted to deliver 6 cm H₂O CPAP with 2 L O₂/min and 2 L N₂O/min. Initially, her BP briefly dropped to 90's/60's which were corrected with phenylephrine/ephedrine and decreasing propofol infusion from 100 to 25-50 mcg/kg/min. She maintained spontaneous ventilation and 100% SpO₂ throughout. She tolerated the procedure well with 2 x 25 mcg fentanyl and IV 1 gm acetaminophen. She maintained stable BP (130-170/80-110) and HR (80-100). She was elated that she had no PONV and requested again the same anaesthesiologist for her shoulder repair in the future. She was discharged home without complication.

Discussion: This simple nasal PAP mask assembly maintained spontaneous ventilation, oxygenation and stable hemodynamics in a patient with autonomic neuropathy in beach chair position under local anaesthesia and sedation. It may improve patient safety at a low cost.

References:

1. www.TSEMASK.com,
2. SAMBA 28th AM, 2013,
3. SAM AM (MC), 2014

Learning points: How to prepare a nasal mask assembly using existing anaesthesia equipment and to provide nasal CPAP to maintain spontaneous ventilation in a beach chair position.

02AP01-7

Variations of the resistance index after a peribulbar block with and without a vasoconstrictor as measured by a Colour Imaging Doppler exam

Santiago Gomez R.¹, Souza Lopes R.², Machado L.P.³,
Carvalho Vasconcelos G.¹, Bittar Nehemy M.¹

¹Universidade Federal de Minas Gerais, Research and Development Department, Belo Horizonte, Brazil, ²Felício Rocho Hospital, Dept of Vascular Surgery and Imaging Specialist, Belo Horizonte, Brazil, ³Universidade Federal de Minas Gerais, Dept of Anaesthesiology, Belo Horizonte, Brazil

Background and Goal of Study: There is controversy about the effect of anesthesia on the Resistance Index when a peribulbar block is performed with the use of a vasoconstrictor. This study set out to evaluate the influence of vasoconstrictors on the increase of the resistance index (RI) when performing peribulbar block. The RI was measured using a Colour Doppler Imaging (CDI). **Materials and Methods:** Fifty-six patients of both genders (34 women and 22 men) with an average age of 67.2 years (standard deviation=12,16) and an average ocular biometry of 22,94 mm (standard deviation=0,86). All were elected for cataract surgery by phacoemulsification and were selected and randomly assigned to be a control (wouldn't receive a vasoconstrictor) or to be a test subject (would receive a vasoconstrictor). The technique used for the anesthesia was a peribulbar block with a needle of gauge of 25. Before each block, a CDI was performed on the patients on both their eyes, the equipment used was a Sonosite Titan with a 7.5 MHz probe. Ten minutes after the peribulbar anesthesia (with or without the vasoconstrictor Adrenaline 1/200 000) a second CDI was performed on both eyes.

Results and Discussion: The group that received the block with the vasoconstrictor had a significant reduction of the RI (p=0.028) when compared to the control group. After the block the sample group that received the vasoconstrictor had a reduction of their RI (p=0.038) when compared to their own initial RI values. The controls presented an increase of their RI (p=0.022) after the block. The block with the vasoconstrictor reduced the RI values when comparing to the values before the block and to the RI values of the block without the vasoconstrictor.

Conclusion(s): The peribulbar block performed with a vasoconstrictor seemed to decrease the RI on the test subjects and when comparing them to the controls. In conclusion, the use of vasoconstrictors on a peribulbar block seems to increase the ocular blood flow contrary to previous knowledge.

02AP01-9

Why do patients miss ambulatory surgery?

Borges R., Babo N., Husson N., Portugal F., Teixeira J., Bela M.L.
Centro Hospitalar e Universitário de Coimbra, Dept of Anaesthesiology, Coimbra, Portugal

Background and Goal of Study: Surgery absenteeism by patients is a contributing factor to lower hospital productivity rates. Having internal policies to reduce the impact of this conditioner must be a worry for healthcare management.

The aim of this study is to determine the incidence and the reasons for surgery absenteeism in ambulatory ophthalmologic surgery.

Materials and Methods: Retrospective descriptive analytical study. Inclusion criterion was all the patients who missed ophthalmologic surgery on due date between January-October/2016. Data collection was made by telephonic survey. Patient related questions were: demographic and socioeconomic data, ASA, reason to miss surgery, questions about procedure in relation to intention or need to miss the surgery. Surgery related questions were: proposed surgery, day of the week, waiting time. Data were analysed with IBM SPSS Statistical v. 22[®].

Results and Discussion: Within the time interval there were 7972 ophthalmologic proposed surgeries.

Of this, 234 (2,94%) were cancelled due to patient absenteeism. Twenty-nine patients met exclusion criteria. Of the 205 included patients, 122 (59,5%) were female, median age 70.3 ± 18 (20-93). 123 (60%) were married, 50 (24,4%) widowed. The majority (150, 73,2%) were retired. 71 patients (34,6%) were ASA III, 111 (54,1%) ASA II.

The main reasons for not attending surgery were: sickness (67 patients, 32,7%), withdrawal (51, 24,9%) and economic reasons (20, 9,8%). There were

statistical difference between distance to hospital and the main absenteeism reasons ($p = 0,01$). Withdrawal and economic reasons was associated with longer distances (>90 min).

The majority of patients (118, 57,6%) did not inform the hospital about intention or need to not attend the surgery. Of those who informed (87), only 10 (11,7%) warned in useful time advance. 149 patients (72,7%) answered that they weren't informed about the correct procedure in that situation.

Conclusion: Even though we did not find a high absenteeism rate, to reduce this rate even more, we will introduce in our hospital a written form, informing patients about what to do in situation of intended or necessity to miss the surgery. Accessibility to the hospital should be a factor to be considered when patients are proposed for ambulatory surgery in our hospital.

02AP02-1

Analysis over 10 years of deaths after ambulatory surgery: 9 closed claims (SHAM insurance)

Theissen A.¹, Fuz F.², Tri N.³, Bouregba M.¹, Rouquette-Vincenti I.¹, Beaussier M.³

¹Princess Grace Hospital, Dept of Anaesthesiology & Intensive Care, Monaco, France, ²SHAM Insurance, International Risk Management, Lyon, France, ³Hopital Saint Antoine, APHP, Dept of Anaesthesiology & Intensive Care, Paris, France

Background: In ambulatory surgery (AS), the discharge of the patient from the hospital on the same day as surgery raises the problem of monitoring and supervising potential complications, with the risk of a substantial delay in medical care or even death. Published studies report a very low incidence of death after AS (1 or 2/10000 in the first month) and generally not due to ambulatory care [1]. SHAM is the biggest French provider of medical liability insurance (50% of the market).

Materials and Methods: The aim of this retrospective study was to analyse the deaths in the first month after AS. The data source was the claims database provided by SHAM between 2006 and 2015.

Results: On the study period, out of a total of 57645 registered claims, 33962 originated from surgery. 11 closed claims were for a death after AS. 2 were excluded because had occurred at 112 and 163 post-operative days. Medium age was 52,7 years (7 adults and 2 children). The surgeries were tonsilectomy ($n=3$), cataract (2), inguinal hernia under laparoscopy (2), varicose vein stripping and laparoscopy. Death occurred at 5,4 post-operative days (median=3, min=1, max=21), in intensive care (3), hospitalisation (2), with emergency mobil service, in emergency room or at home (2). Among the 9 patients, 3 patients were unable to leave ambulatory surgery and died soon after. The causes identified by the expert were a therapeutic risk (3), an absence of causal link (2), a team communication failure aggravated by a nurse post-operative surveillance error, a failure to take care of the complication in the emergency room and only in one case a too early discharge associated with a lack of information on complications requiring return. Anaesthesia in directly implicated in 3 cases: anaphylactic shock (Diamox), pneumoperitoneum by gastric dilation linked to the intranasal oxygen probe and hemoperitoneum by preoperative mismanagement of anticoagulants. One case is due to a pulmonary embolism. For the 5 other cases, the cause is surgical.

Conclusion(s): In one case, the complication was care with delay, due to a lack of information on complications requiring an emergency return. However, the patient called twice the hospital during the night to describe abdominal pain after laparoscopy. In all of the other cases, the death would probably have occurred also in conventional hospitalisation, either because inevitable or because too far from the act.

References:

- Acta Anaesthesiol Scand. 2012;56:323-31.

02AP02-2

Influence of surgical technique on pain and postoperative stay of patients subjected to ambulatory hemorrhoidectomy

Gil Bona J., Martínez Ubieta F., Gracia Roche C., Peña Calvo P., Martínez Ubieta J., Pascual Bellosta A.

Miguel Servet University Hospital, Dept of Anaesthesiology, Zaragoza, Spain

Background and Goal of Study: Up to 40% of patients subjected to an ambulatory major surgery present moderate-severe pain during the first 24 hours after the operation. This incidence remains around 20% in the first 48 hours, and in 10% at 7 days. The objective of this study is to assess its influence on the postoperative stay of patients undergoing ambulatory hemorrhoidectomy, and its incidence depending on the type of surgical technique performed.

Materials and Methods: We performed a prospective study over patients undergoing ambulatory major surgery from June 2013 to June 2016. 120 patients Undergoing hemorrhoidectomy (58 subjected to a Hemorrhoidal Laser Technique, HeLP, and 62 subjected to a Milligan-Morgan technique, MM) were introduced. All patients were subjected to a balanced general anesthesia using a laryngeal mask.

We made a comparative analysis evaluating pre, intra, and post-operative data according patients were operated under a HeLP technique or a MM technique.

To correlate different variables we used the chi square of Pearson or Fisher test for discrete variables and t-student or U Mann-Whitney test for continuous variables. Significance at $p < 0.05$.

Results and Discussion:

DATA	HeLP technique (N=58)	MM technique (N=62)	P=
PREOPERATIVE			
Age (Years)	50.7 +/-12.8	50.7 +/-12.4	0.165
ASA=1 Vs ASA=2	60,3% Vs 39,7%	59,7% Vs 40,3%	0.941
Hypertension	20,7%	35,5%	0.072
Hyperlipemia	19%	27,4%	0.274
INTRAOPERATIVE			
Hemorrhoidal grade (III Vs IV)	89,7% Vs 10,3%	80,6% Vs 19,4%	0.167
Intraoperative complications	5,1%	6,4%	0.929
Surgical time (minutes)	46.69 +/- 5.28	37.31 +/-9.4	<0.001*

[Comparative analysis. Pre and intraoperative data.]

POSTOPERATIVE DATA	HeLP technique (N=58)	MM technique (N=62)	P=
Recovery time(min)	131.9 +/-15.53	232.66 +/-34.26	<0.001*
Urine delay	2 patients(3,4%)	1 patient (1,6%)	0.941
oral intolerance	1 patient (1,7%)	1 patient (1,6%)	>0.9
VAS 12H after surgery >3	5,2%	62,9%	<0.001*
VAS 48H after surgery >3	13,8%	79%	<0.001*
VAS 7 days after surgery >3	0%	54,8%	<0.001*
NSAIDs doses 12H after surg.	2,67	4,31	<0.001*
NSAIDs doses 48H after surg.	2,78	4,37	<0.001*
NSAIDs doses 7 days after surg.	0,55	3,19	<0.001*

[Comparative analysis. Postoperative data]

Conclusion(s): Post-operative pain was the main cause of late discharge in patients undergoing ambulatory hemorrhoidectomy.

Pain and analgesic requirements in the first 7 postoperative days were significantly lower when hemorrhoidectomy was performed using HeLP technique compared to MM technique.

02AP02-3

Office based propofol sedation for Termination of Pregnancy (TOP) in ASA I and II women: mortality, serious incidents and incidents in 65.460 patients

de Jong C.J.

Bloemenhove Kliniek, Dept of Anaesthesiology, Heemstede, Netherlands

Background: Termination of pregnancy (TOP) is a medical procedure that can be done under local anesthesia. Most women prefer sedation during the procedure. In a group of 8 Dutch abortion clinics sedation is given by well-trained physicians (not by anesthesiologists but by specialized TOP physicians) and nurses.

Goal of Study: To evaluate safety and complications of the sedation method used: pre-treatment screening by physician, propofol sedation combined with low dose alfentanil (maximum 1mg), supplemented with local anesthesia by abortion physician, for TOP in 8 specialized office based abortion clinics.

Materials and Methods: Retrospective descriptive study of 87.347 patient records (2010-2015). Patients were screened prior to treatment by the physician. ASA I and II patients were accepted for sedation. Records were kept (ECG, NIBP, Breathing Rate, SaO₂). Serious incidents (lasting damage to patient) and incidents (no lasting damage to patient) due to sedation were recorded.

Results: Total number of patients: 87.347. Procedures done without sedation (abortion pill or instrumental procedure under local anesthesia only): 21.887 patients. Local anesthesia combined with sedation: 65460 patients. A total of 87 incidents were reported.

Serious incidents: deaths 0, resuscitations 0, ambulance transport to hospital 0, vomiting & aspiration 0, anaphylactic reactions 0.

Incidents: desaturation (SaO₂>80% and <5min) 19(0,03%), desaturation (SaO₂<80% or/and >5min) 9 (0,014%), desaturation and laryngeal mask used 1, desaturation and mask ventilation for few minutes 1, desaturation and intubation needed 0, laryngospasm/bronchospasm/stridor 6, coughing/excessive sputum/suction needed 5, vomiting 2, rash 7, subcutaneous propofol 18 (0,03%), bradycardia +/- atropine given 6, yawning & jaw luxation 2, hyper salivation & atropine given 1, nerve touched during insertion of IV 1, extreme restlessness at waking up 7, myoclonic movements at induction 2. No or interrupted sedation due to incident 3.

Conclusion: This review indicates that office based ambulatory propofol sedation with a maximum of 1mg alfentanil for TPO in ASA I and II women provided by TOP physicians is safe and with a very low risks of serious incidents.

02AP02-4

Risk factors of hospitalisation after outpatient shoulder surgery

Bal O.¹, Talla G.¹, Boulares S.², Seidel L.³, Boogaerts J.¹

¹University Hospital Centre of Charleroi, Dept of Anaesthesiology, Lodelinsart, Belgium, ²University Hospital Centre of Charleroi, Department of Orthopedics, Lodelinsart, Belgium, ³University of Liege, Department of Biostatistics, Liege, Belgium

Introduction: Shoulder arthroscopy is one of the most commonly performed procedures in orthopedics for a multitude of surgical indications and is now routinely performed as an outpatient procedure. (1,2)

The aim of this observational study is to evaluate the risk factors leading to hospitalisation after outpatient shoulder surgery.

Methods: We included consecutively all patients, undergoing shoulder arthroscopy under general anesthesia combined with an interscalene nerve block in a routine ambulatory setting after premedication with alprazolam. General anaesthesia was induced with propofol, sufentanil and rocuronium for endotracheal intubation. Sevoflurane was associated with reinjection of opioids and myorelaxant as required. At the end of surgery, patients received paracétamol and ketolorac.

After surgery, they were placed in PACU before leaving hospital or being hospitalised. The following variables were registered: demography, hours of induction, length of surgery, anaesthetic or analgesic consumption during and after surgery, EVA pain scores, PONV, length of stay in PACU and side effects. Patient satisfaction was rated on a five-point Likert scale. Mean SD or as percentages. Student's t, Chi² tests and logistic regression for statistical analysis.

Results: A total of 151 patients were included in the study. Among them, 27 (18%) were hospitalised. The factors related to hospitalisation are gender, BMI, ASA scores, alprazolam, time of surgery after 10 am, use of myorelaxant and duration of PACU stay. No significant difference in the other variables. Results are presented in table 1.

Variables	No hospitalisation n=124	Hospitalisation n=27	OR [IQR]	P
Gender (F/M)	68/56	7/20	5.30 [1.53-18.28]	0.008
BMI (kg/m ²)	27.4 ± 4.7	29.8 ± 7.0	1.08 [1.00-1.17]	0.040
ASA score (I/II/III)	47/74/3	2/19/6	9.06 [2.34-35.07]	0.001
Alprazolam (mg)	0.50 ± 0.97	0.93 ± 1.21	2.15 [1.18-3.92]	0.012
Patients<10 am (n)	56 (45%)	24 (88%)	13.68 [2.74-68.31]	0.004
Rocuronium (mg)	18.39 ± 14.05	30.00 ± 9.21	1.08 [1.03-1.13]	<0.001
PACU stay (min)	47.83 ± 20.15	64.44 ± 23.47	1.04 [1.01-1.07]	0.001

[Table 1]

Discussion: Results of this study show that a more deliberate use of premedication and myorelaxants is associated with a larger percentage of hospitalisation. Likewise it appears that patients who were hospitalised in a second time suffered higher ASA scores and stayed longer in UPSA.

References:

- Mather et al. J Bone Joint Surg 2013;95:1993-2000;
- Warrender et al. Am J Sports Med published online October 11,2016.

02AP02-5

Sedation for endobronchial ultrasonography: use of dexmedetomidine or propofol in combination with remifentanil. Randomized double-blind study

Bermejo S.¹, Silva-Costa T.¹, Sánchez-Font A.², Mases A.¹, Vallès J.¹, Gallart L.¹

¹Parc de Salut Mar, Dept of Anaesthesiology, Barcelona, Spain,

²Parc de Salut Mar, Department of Pneumology, Barcelona, Spain

Background and Goal of Study: Endobronchial ultrasonography (EBUS) for transbronchial needle aspiration needs sedation and analgesia. Sedation with propofol and remifentanil could cause respiratory depression. Dexmedetomidine has sedative and analgesic properties and might have better safety profile than propofol. The goal of the study was to compare the safety and effectiveness of dexmedetomidine or propofol in combination with remifentanil.

Methods: Thirty patients scheduled for EBUS were randomly assigned to receive propofol and remifentanil (P+R) or dexmedetomidine and remifentanil (D+R). Propofol and dexmedetomidine were blindly administered at fixed doses, while remifentanil was titrated to achieve adequate sedation. All patients received oxygen at 4 L/min. The primary outcome was the need of supplemental oxygen and/or airway-assist manoeuvres to treat oxygen desaturation (SpO₂<92%). Secondary outcomes were sedation score (MOAA/S), incidence of cough burst and the need for instilled lidocaine 2%, haemodynamic data, doses of remifentanil, time to recovery and satisfaction scores of patients and pneumologists.

	P+R (n= 16)	D+R (n= 14)	P
Airway maneuvers (n, %)	11(69%)	2(14%)	<0.01
MOAA/S during procedure	0	5	<0.01
Incidence of cough burst (%)	50	29	>0.05
Instilled lidocaine 2% (mg)	274±71	295±108	>0.05
Treated hypotension (n, %)	5(31%)	1(7%)	<0.05
Remifentanil (micg)	246±175	687±367	<0.001
Recovery time (min)	5.9±3.7	0.8±2.4	<0.05
Pneumologist satisfaction:			
Excellent-Good/Regular/Deficient sedation (n)	14/2/0	13/1/0	>0.05
Patient satisfaction: would repeat/would not repeat (n)	16/0	13/1	>0.05

[Main preliminary results of the study]

Data are presented as mean±standard deviation or numbers.

Results and Discussion: Age distribution and COPD severity were similar in both groups. The need of airway-assist manoeuvres was significantly lower in D+R than in P+R group (14% vs. 69%, $p < 0.01$). Level of sedation was significantly lower in D+R than in P+R group. Sedation with dexmedetomidine needed higher doses of remifentanyl than sedation with propofol, but these higher doses were well tolerated with lower respiratory depression. Bolus of vasoactive drugs to treat hypotension was more frequent in the P+R group and also recovery time was longer in this group. The other variables were similar between groups.

Conclusions: During EBUS, sedation with dexmedetomidine combined with remifentanyl is safer than sedation with propofol and remifentanyl. Both combinations provide similar sedative efficacy.

02AP02-7

Unanticipated admissions after same day surgery in a teaching hospital

Etulain Santos M.J., Monteserín C., Laura S.M., Jonathan O.A., Marcos L.M., Matilde Z.

General University Hospital Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Improvements in surgical and anaesthetic techniques in day surgery have resulted in low mortality and morbidity. The unplanned admission on same day of surgery is considered to be an important measure of the quality of ambulatory surgical units.

Our surgery centre was accredited in 2013, and then we have updated our protocols of multimodal pain management and those of prevention of postoperative nausea and vomiting. The objective of our study was to evaluate the unanticipated hospital admission rate from our day surgery unit and to analyse the reasons for admission.

Materials and Methods: A review of all unanticipated hospital admission from 2013 to march 2016 was done. The variables evaluated were: demographics, American Society of Anaesthesiologists (ASA) classification, type of anaesthesia, time of surgery, surgical speciality and reason for admission.

Results: A total of 8491 procedures were performed during the study period. The overall admission rate was 2%. Most of the admissions were related to surgical (34%) anaesthetic (30%) and medical (10%) reasons. Social reasons were present in 9% of cases. General (37%) and ENT (26%) surgeries were associated with and increasing risk of unanticipated admission. Pain (52%) and postoperative nausea and vomiting (PONV) (32%) were present as the principal anaesthetic related to admissions. The ASA status was not linked with unanticipated admission. Seventy percent of the admitted patients received general anaesthesia. Surgeries ending in the afternoon were not related with unanticipated admission (20%).

Conclusions: A large number of admissions were found to be preventable causes. Pain accounted for more than fifty percent of the anaesthetics linked admissions. Efforts to manage pain and PONV should be attempted in order to improve the efficiency of the ambulatory surgical centres. Nevertheless a contribution from unexpected scenarios is unavoidable.

02AP02-8

Unanticipated admissions following day case gynaecological surgery - a retrospective audit

Nagarajan S., Lew E.

KK Women's and Children's Hospital, Dept of Anaesthesiology, Singapore, Singapore

Background and aims: Effective pre-operative preparation and protocol-driven admission and discharge procedures are fundamental to safe and effective day case surgery. The incidence of unanticipated admission following day case procedures has been reported between 0.3%-9.5%. The KK Women's and Children's Hospital is a tertiary centre for Obstetrics and Gynaecology in Singapore that performs around 5000 day case procedures annually. We conducted a retrospective audit to identify the risk factors for unanticipated admission following day case surgery.

Methods: This is a retrospective audit with the data gathered from the "unanticipated admission audit forms" of all the patients with unanticipated admission following day surgery in the period, 2 January to 31 December, 2015 at our institution.

Results and Discussion: A total of 4079 day case procedures were performed during the study period, of which 118 unanticipated admissions occurred, giving an incidence of 2.89%. Among the admissions, high body mass index (BMI) accounted for 42 cases (35.59%) followed by anaesthesia-related causes ($n=33$; 27.97%), medical causes ($n=31$, 26.27%) and procedure-related causes ($n=10$; 8.47%). Most of the admissions for high BMI were decided preoperatively after anaesthetic review. The main reason for admission under this category is the perceived risk of obstructive sleep apnoea and requirement for postoperative respiratory monitoring. Pain is the most important reason among the anaesthesia-related admissions, related to prolonged surgery. Use of multiple doses of opioid-based analgesia and subsequent drowsiness resulted in the need for admission.

Thirty-one admissions were classified under medical causes. Most of the medical admissions were secondary to poor control of pre-existing comorbidities. These admissions could have been avoided had patients been referred to the preanaesthesia assessment clinic before the procedure.

Conclusions: There is a need to review and reinforce patient selection criteria for daysurgery, with regard to BMI cut-off, adequacy of medical optimisation and anticipated duration of surgery. Multimodal analgesia, using local anaesthetic techniques and non-opioid based protocols, is recommended to enhance effectiveness and safety.

CATEGORY	No OF ADMISSIONS(%)
HIGH BMI	42(35.59%)
ANAESTHESIA-RELATED	33(27.97%)
MEDICAL	31(26.27%)
PROCEDURE-RELATED	10(8.74%)
OTHERS	2(1.69%)
TOTAL	118(2.89%)

[Unanticipated admission following day surgery]

02AP02-9

Validation of the Dutch version of the Functional Recovery Index (FRI)

Hendrickx M.¹, Dubois J.¹, Jamaer L.¹, Evers S.², Ory J.-P.¹, Stessel B.¹

¹Jessa Hospital, Dept of Anaesthesiology & Intensive Care, Hasselt, Belgium, ²Jessa Hospital, Dept of Anaesthesiology & Pain Medicine, Hasselt, Belgium

Background and Goal of Study: Traditionally, major complications and unanticipated (re)admission rates were used to assess outcome after day surgery. Since those are scarce, the quality of recovery (QOR) should be considered the principal endpoint.

The English version of the FRI is a validated tool assessing post discharge QOR after day surgery.

We wanted to validate a Dutch version of the FRI.

Materials and Methods: We followed a 3 stage procedure. The first step was the forward translation of the English version of the FRI into Dutch. This was done by a bilingual person, a native speaker of the target language (Dutch). The second step was a separate back translation, performed by a bilingual translator, a native speaker of the source language (English). The translations coincided.

Finally a pilot study with the Dutch version of the FRI was performed in 60 patients undergoing ambulatory surgery. Before surgery and one day after surgery, the FRI was applied and patients were interrogated on the comprehensibility of the questionnaire (NRS: numerical rating scale 0 - 10).

Furthermore, cross-cultural validity was tested using confirmatory factor analysis.

Results and Discussion: Mean NRS score on the comprehensibility item was 9.08 (SD 2.04). The results of the confirmatory factor analysis show that a model that assumes the three subscales as proposed by Wong et al. would fit the data better than a model with only one general recovery scale. The three subscales are a social related recovery scale (7 items), a lower limb recovery scale (4 items) and a physical recovery scale (3 items).

Further improvement was found when allowing the factors to be correlated following their equivalence in measuring recovery. All items loaded on their respective subscales with loadings between 0.63 and 0.92. The resulting subscales showed a high internal consistency as indicated by a Cronbach α (so-

cial = 0.91 (7 items), lower limb = 0.91 (4 items), physical = 0.89 (3 items)). A similar Cronbach α was established for the same three subscales using the data obtained before surgery.

Conclusion(s): We conclude that the study population considered the Dutch version of the FRI highly understandable. Confirmatory factor analysis showed that the three factor model also better fits the data of our population than a one factor model. Therefore, we state that our Dutch version of the FRI is a valid tool to assess recovery after ambulatory surgery in a Dutch-speaking population.

02AP03-1

A novel nasal PAP mask assembly maintained spontaneous ventilation and improved oxygenation in an obese patient with OSA, difficult airway, asthma and tracheal stenosis under MAC during ambulatory OGD

Tse J., Udodi N., Barsoum S., Sison R.

Rutgers Robert Wood Johnson Medical School, Dept of Anaesthesiology, New Brunswick, United States

Background: Patients often receive IV sedation and nasal cannula O₂ during monitored anaesthesia care (MAC). Over-sedation/airway obstruction may cause severe desaturation, especially in obese patients with obstructive sleep apnoea (OSA). A novel nasal PAP mask assembly using a paediatric mask and existing anaesthesia equipment/machine was shown to maintain spontaneous respiration and improve oxygenation in sedated obese patients with OSA.^{1,3} We report its use in an obese OSA patient with difficult airway during oesophagogastroduodenoscopy (OGD).

Case report: A 68 y/o obese male (BMI 41 kg/m²) with known difficult airway, OSA, asthma, tracheal stenosis, HTN, hepatitis C, NIDDM, oesophageal varices presented for OGD. He reportedly required tracheostomy after hernia repair 14 yrs ago and forgot to bring his surgeon's note stating that he needed endotracheal intubation any time he received anaesthesia. He also had a history of post-extubation stridor after GA. He had a Class III airway, large tongue, short neck with a large tracheostomy scar, mild expiratory wheezes and room air SpO₂ of 93%. After discussing with him and the endoscopist, the procedure was to proceed under MAC with video-laryngoscopy standby. He gave consent for photography and case report. After he was pretreated with lignocaine and albuterol nebulizer, an infant mask with fully inflated air cushion was placed over his nose and secured with a hook ring and rubber head straps and connected to a breathing circuit and the anaesthesia machine. APL valve was adjusted to deliver 8 cm H₂O CPAP with 4 L/min O₂. His SpO₂ increased to 97%. He then received lignocaine (100 mg) and propofol bolus (70 mg) and infusion (120 mcg/kg/min). He maintained spontaneous ventilation and 98-100% SpO₂ throughout. He tolerated the procedure well without any complication. He was elated that intubation was avoided. He was discharged home without any problem.

Discussion: This simple nasal PAP assembly maintained spontaneous ventilation and improved oxygenation in an obese patient with a known difficult airway, OSA and tracheal stenosis under sedation. It utilizes existing anaesthesia equipment and machine and may improve patient safety at a low cost.

References:

1. www.TSEMmask.com;
2. SAMBA 28th AM, 2013;
3. IARS AM: MCC1080, 2015

Learning points: How to prepare a nasal mask assembly using existing anaesthesia equipment and to maintain spontaneous ventilation by providing nasal CPAP in obese patients with OSA.

02AP03-2

Anxiety -The Untreated component of perioperative management: an audit of quality of recovery in ocular oncology patients

Johnston J.¹, Sethuraman D.², Sidasar G.²

¹Royal Liverpool Broadgreen University Trust Hospital, Ophthalmology, Liverpool, United Kingdom, ²Royal Liverpool Broadgreen University Trust Hospital, Dept of Anaesthesiology, Liverpool, United Kingdom

Aim: To measure quality of recovery from surgery.

Methodology: Quality of recovery was prospectively assessed in a single speciality cohort of ocular oncology patients using the QoR15 questionnaire¹ administered 24-96 hrs post operatively. Their anaesthetic management consisted of a GA with or without ocular blocks done at the discretion of the anaesthetist doing the list. A single QoR15 was administered postoperatively by a person not directly involved in their anaesthetic management and the results were analysed. This protocol was approved by the Hospital Audit Committee (Audit id TA000994, Dr C Williams, Audit Lead Clinician).

Results and Discussion: A total of 57 patients were enrolled into this audit over a period of 6 months. 34 patients underwent radioactive plaque insertion & removal, 14 had enucleation and the rest had marker insertion for subsequent proton beam radiotherapy. 47 of these patients had ocular blocks. Their QoR score were 127.5+18.5 for plaque insertion, 120.1+17.9 for enucleation and 119+18.5 for marker insertion. These results were quite unexpected since marker insertion was surgically the shortest and least extensive of the three and hence were expected to recover well.

However, analysing the response to individual questions, it became obvious that marker insertion group fared worse with respect to Questions 2, 3, 5, 6, 7, 10, 13, 14 and 15 —questions which had a psychological component. We hypothesize that whilst the other two surgeries were therapeutic interventions, marker insertion was done only to aid subsequent radiotherapy which therefore did not serve to alleviate their anxiety.

Clearly, this psychological/anxiety component was not fully addressed by our team who probably underestimated its impact on these patients. The current emphasis on minimal hospital stay, quick turnover and avoidance of premedications and sedatives to accelerate discharge times probably all contributed to this anxiety. Enucleation group had an issue with moderate/severe pain.

Conclusion: We have initiated appropriate psychological interventions and anxiolytics to ensure an optimal management. Additional pain relief has also been instituted for our enucleation group to supplement ocular blocks. A re-audit of our practice has been planned to follow this intervention.

References: Stark et al. Development and Psychometric Evaluation of a Postoperative Quality of Recovery Score: The QoR-15. *Anesthesiology* 2013; 118:1332-40

02AP03-3

Can Total Joint Replacements (TJA) be performed safely in free standing ambulatory surgical centers?

Cuff G.¹, Kingery M.², Bosco J.²

¹NYU School of Medicine, Dept of Anaesthesiology, New York, United States, ²NYU School of Medicine, Department of Orthopedic Surgery, New York, United States

As the current models of health care delivery and reimbursement place an increasing emphasis on the creation of value, a growing number of orthopedic procedures are being performed at free-standing ambulatory surgery centers (ASCs), which provide a more patient-focused and cost efficient alternative to hospital outpatient departments.

In order to evaluate the potential value-adding benefits of ambulatory TJA we examined the percentage of TJA patients who would be eligible to have a procedure performed at an ASC and the distribution of comorbidities making patients ASC-ineligible.

We reviewed the charts of 3,444 patients undergoing TJA from June 2015 to May 2016 and assigned ASC eligibility based on ASA status, a set of exclusion criteria, and any existing comorbidities. Patients assigned ASA class 1 or 2 who did not meet any of the exclusion criteria were eligible for ASC. ASA class 3 patients who did not meet any of the exclusion criteria were assigned eligibility based on the severity of systemic disease and other comorbidities. ASA class 4 patients were ineligible for ASC.

70.03% of all patients undergoing TJA were eligible for ASC. 99.13% of ASA 1, 91.54% of ASA 2, and 35.71% of ASA 3 patients were eligible. While 40.62% of ASA 3 patients met one or more of the exclusion criteria and were deemed ineligible, 23.67% of ASA 3 patients did not meet any exclusion criteria but were deemed ineligible based on severity of systemic disease. Of the ASA 3 patients who did not meet any exclusion criteria but had systemic disease (51.11% of all ASA 3 patients), 53.69% were deemed ASC-eligible due to sufficiently low severity of comorbidities. The most frequent reasons for ineligibility were BMI greater than 40 (32.66%), untreated OSA (25.19%), and history of PCI (14.83%). Average BMI of ASC-eligible patients was 28.95 vs 35.53 for ineligible patients.

A large proportion of TJA patients were found to be eligible for surgery at ASC, including over one third of ASA 3 patients. While the trend toward ASCs provides an opportunity for increased patient satisfaction and decreased costs, selecting the right candidates for the ambulatory setting is critical in order to maintain patient safety. While previous studies have suggested that ASA 3 is a predictor of postoperative readmissions, using ASA class as the sole determinant of ASC eligibility fails to maximize the value-adding benefits of ASCs as evidenced by the proportion of ASA 3 patients deemed ASC eligible.

02AP03-4

Comparison between dexmedetomidine and propofol in development of paradoxical excitement response during sedation for knee joint surgery under spinal anesthesia

Yang J.¹, Chung S.-S.², Jeong S.², Lee H.G.², Choi J.I.²

¹Chonnam National University Medical School, Department of Biomedical Sciences, Gwangju, Korea, Republic of, ²Chonnam National University Medical School, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Paradoxical excitement response during sedation with benzodiazepine, propofol or inhalational anesthetics has been reported for several decades. This response is generally unexpected, but several predicting factors for this response have been suggested including chronic alcohol use. Use of propofol in heavy alcohol drinkers was reported to increase the incidence of the paradoxical response. Dexmedetomidine induces sedation by acting on alpha-2 adrenergic receptor in locus coeruleus in contrast to the other sedatives that act on GABA-A receptor. It also has shown to produce sedation without loss of patient cooperation. This study was performed to test the hypothesis that dexmedetomidine reduces the incidence of moderate to severe paradoxical excitement response in both social and heavy alcohol drinkers compared to propofol during sedation under spinal anesthesia.

Materials and Methods: After obtaining IRB approval, informed consent and AUDIT questionnaire for alcohol use screening, enrolled patients with age of 19-50 underwent spinal anesthesia in a routine manner for knee joint surgery and were sedated with dexmedetomidine (DEX) or propofol (PRO). Equal number of no hazardous (NHD; AUDIT≤7) and hazardous (HD; AUDIT>8) alcohol users were allocated in each group. Paradoxical responses were observed for 30 minutes after inducing sedation. The responses were categorized and scored into verbal (0-1) or movement(0-3). The sum of score(ranging 0-24) and the incidence of responses with a score of >3 indicating moderate to severe excitement responses were analyzed using Mann-Whitney U and Fisher's exact test. Statistical significance was set at P<0.05.

Results and Discussion: The sum of score was significantly lower in group DEX than in PRO (P<0.05) indicating lower overall incidence of the paradoxical responses in group PRO, in which HD showed significantly higher sum of scores than NHD (P<0.05). As for moderate to severe responses, there was a significant difference between DEX and PRO in the incidence of response with score of >3 (P<0.05, one-sided). In addition, neither patient of HD nor NHD showed those responses in group DEX.

Conclusion(s): Dexmedetomidine-induced sedation prevents the moderate to severe paradoxical responses in both social and heavy alcohol drinkers compared to the propofol-induced sedation with a high incidence of paradoxical responses.

References:

1. Pharmacotherapy, 2004; 24: 1177-85,
2. BJA, 2011; 107: 930-3.

02AP03-5

Comparison of Supreme™ and I-gel™ laryngeal mask airway for day-case surgery in prone position

Soliveres J.¹, Alexandre F.², Docampo C.³, Balaguer J.⁴, Puchol J.⁴, Sánchez A.²

¹University Hospital Doctor Peset, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²University Catholic Hospital Casa de Salud, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ³Catholic University of Valencia, Medicine Student, Valencia, Spain, ⁴University Hospital La Fe, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background and Goal of Study: Laryngeal mask airway in prone position is a good approach to airway management for day case surgery. The Supreme™ mask and the i-gel™ mask in prone position have not been widely studied for day-case surgery. The aim of this study is to compare the time and difficulty of their placement in prone position for day-case surgery.

Materials and Methods: After local ethics committee approval, written informed consent was obtained from 100 adult patients scheduled for any day-case surgery under prone position and randomly allocated to airway management with Proseal™ laryngeal mask (group S) or I-gel™ laryngeal mask (group I). Patients with difficult airway expected or BMI >35 mg.kg⁻¹ were excluded. All patients were self-positioned in prone position in the operating theatre with their head in lateral position. SpO₂, 3 lead ECG, and bispectral index were continuously monitored, and NIBP every 5 minutes. After iv placement and basal vital signs recorded, the patient was asked to breath 100% oxygen via a face mask and anaesthesia was induced with fentanyl (0.1 mcg.kg⁻¹) and propofol (2.5 mg kg⁻¹, given over 20 seconds). When BIS fell under 60, a number 3 or 4 laryngeal mask was inserted by an experienced anesthesiologist and connected to an anaesthesia machine (VT=6-8 mL.kg⁻¹; RR:12 r.min⁻¹. RR was adjusted to ETCO₂=30 mmHg, and spontaneous breathing was allowed). The mask was intended to be placed with the head in the lateral position (difficulty grade 1), and if not possible the head was extended and elevated in the sagittal plane, thus the mask was inserted in a "sniffing" prone position (difficulty grade 2). If more than two attempts, repositioning or help was needed, was rated as difficulty grade 3. The Supreme mask cuff was inflated to 60 mmHg. Vital signs, time to insert the mask (T_{mask}), to obtain CO₂ (T_{CO2}), induction time (T_{ind}), bleeding and sore throat were recorded. p<0,05 was considered significant.

Results and Discussion: Ventilation and gastric tube placement was successful in all patients.

	Age (yrs)	Weight (kg)	Height (cm)	Sex (M/F)	ASA (I/II/III)	T _{ind} (sec)	T _{mask} (sec)(*)	T _{CO2} (sec)
I group	43,5 ±15,3	74,7 ±13,6	158 ±8,7	28/22	35/12/3	45,1 ±9,3	9,4 ±4,5	17,1 ±7,1
S group	45,3 ±16,4	76,1 ±14,2	162 ±9,1	26/24	41/8/1	47,0 ±9,8	16,7 ±12,1	15,3 ±8,4

[Table 1 (*)p<0,05]

	Difficulty grade (1/2/3)(*)	Sore throat	Bleeding
I group	64/34/2	6,2	4,1
S group	36/52/12	7,6	8,3

[Table 2 (*)p<0,05. Data show %.]

Conclusions: It takes a longer time and it's more difficult to place the Supreme than the I-gel mask in prone position for day-case surgery.

02AP03-6

Efficacy of analgesia nociception index monitoring for procedural sedation and analgesia in adult patients

Soral M.¹, Tore Altun G.², Corman Dincer P.¹, Arslantaş M.K.², Aykac Z.¹

¹Marmara University School of Medicine, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ²Marmara University Pendik Research and Training Hospital, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey

Background and Goal of Study: Hypnosis, analgesia and immobility constitute three components of anaesthesia. To assess analgesia objectively Analgesia Nociceptive Index (ANI) monitoring can be used. Measurements are continuously done according to heart rate variability. A value between 50-70 is aimed under general anaesthesia for ideal nociception/antinociception balance.

The aim of the study was to investigate the efficacy of ANI monitoring for procedural sedation and analgesia for maintaining rational drug use and patient safety.

Materials and Methods: After ethics approval and informed consent 102 patients between 18-70 years of age, scheduled for elective colonoscopy under sedation are prospectively analysed. After induction with propofol and ketamine; infusions of propofol (2mg.kg⁻¹.h⁻¹) and remifentanyl (0.05 mcg.kg⁻¹.min⁻¹) were started. Patients were randomised according to having ANI monitored (Group A) or not (Group K). In group A remifentanyl infusions were titrated to maintain ANI value between 50-70, in group K analgesic (i.e. remifentanyl) requirements were met according to attending anaesthetist's intention. Heart rate, blood pressure, respiratory rate, SpO₂, BIS, NRS (Numeric Rating Scale), RSS (Ramsay Sedation Scale) in all patients and ANI in group A were monitored. Complications, total analgesics used, duration of the procedure, demographic information and in the recovery period NRS and MAS (Modified Aldrete Score) were evaluated. Data were analysed with Student's t test or Mann-Whitney U test depending on the normality of distribution. Qualitative data were analysed with Pearson chi-square test. A P-value of < 0.05 was considered statistically significant.

Results and Discussion: Between the groups demographic parameters were similar and no statistical difference was found in heart rate, blood pressure, recovery times and complications (p>0.05). Total remifentanyl amount used was statistically low in group A (p:0.011).

Conclusion(s): The efficacy of ANI monitoring during procedural sedation is yet to be evaluated. We demonstrated that opioid consumption was diminished when ANI monitoring was used, thus patient safety was ameliorated. Although side effects and recovery times were not significantly different between the groups, we believe further studies with longer procedure times are needed to demonstrate if a difference exists in these parameters.

02AP03-7

Evaluating criteria for surgery at free standing ambulatory surgery centers

Cuff G.¹, Kendale S.¹, Siow M.², Bosco J.²

¹NYU School of Medicine, Department of Anesthesiology, Perioperative Care and Pain Medicine, New York, United States, ²NYU School of Medicine, Department of Orthopedic Surgery, New York, United States

The value of freestanding ambulatory surgery centers (FSASCs) in terms of efficiency, safety, and patient satisfaction is well established and has led to increased FSASC utilization. However, there are comorbid conditions that disqualify certain patients from surgery at FSASCs. Understanding the percentage of patients whose comorbidities exclude them from FSASCs is important for the proper utilization of operating room assets. Our aim was to understand the percentage of patients who would not qualify for surgery done in an FSASCs.

We reviewed the records of 4,242 consecutive patients undergoing outpatient orthopaedic surgeries in our hospital system from July 2015 to February 2016. Patient characteristics, comorbidities, and procedures performed were included in our database. Eligibility was determined based on established comorbidity exclusion guidelines. Chi-square and t-tests were used to establish statistical significance.

Of 4,242 patients, 837 (19.7%) were ineligible for surgery at our FSASC based on accepted exclusionary guidelines. The most important contributors to being excluded from eligibility at the FSASC were age less than 14 years (OR 1928, 95% CI 922-4532, p<0.001), BMI >40 kg/m² (OR 334, 95% CI 176-668, p<0.001), history of obstructive sleep apnea (OR 60, 95% CI 34-110, p<0.001), ASA physical status score of 4 (OR 1542, 95% CI 240-3077, p<0.001), history of difficult airway (OR 112, 95% CI 24-608, p<0.001), ASA physical status score of 3 (OR 279, 95% CI 132-650, p<0.001), history of myocardial infarction (OR 15, 95% CI 2.9-75, p=0.001), and history of coronary artery disease (OR 4, 95% CI 1.5-11, p=0.007).

Roughly 1 in 5 patients is ineligible for surgery at a freestanding ASC due to disqualifying comorbidities. Although FSASCs offer cost effective care that satisfies patients, we must understand that certain patients cannot have their surgeries at these venues. In addition, we must use additional caution when scheduling certain procedures at a FSASC. Therefore, as the number and complexity of the surgeries performed at FSASCs increases, we must better understand the factors that make patients better candidates for surgery in a hospital setting, thus minimizing transfers and readmissions and maximizing the value proposition of FSASCs.

02AP03-8

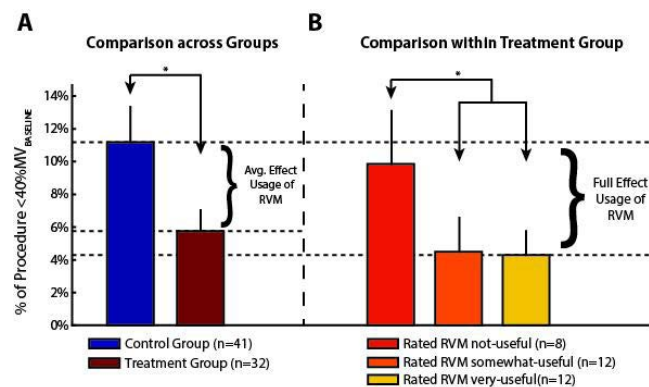
Evaluation of respiratory volume monitoring in procedural sedation

Freeman J.¹, Mathews D.², Oberding M.², Simmons E.², O'Donnell S.², Abnet K.²

¹Respiratory Motion, Inc., Management, Waltham, United States, ²University of Vermont College of Medicine, Dept of Anaesthesiology, Burlington, United States

Background and Goal of Study: Procedural sedation is increasingly common in outpatient settings, but verification of patient respiratory sufficiency can be difficult. In this randomized control trial we studied the effects of anesthesiologists using a non-invasive respiratory volume monitor (RVM), with the goal of assessing the utility of minute ventilation monitoring in upper endoscopic procedures.

Materials and Methods: Following IRB approval, an impedance-based RVM (ExSpirom, Respiratory Motion Inc.) collected data from 73 patients undergoing complex endoscopies. 41 patients were randomized into the Control group (anesthesiologist blinded to RVM), 18 males, age:52.0±15.7yrs, BMI:28.5±6.8kg/m²) and 32 patients into the Treatment group (anesthesiologist used RVM, 16 males, age:60.5±11.2yrs, BMI:26.1±4.8 kg/m²). Patients were sedated with propofol with or without ketamine, fentanyl, or midazolam. Baseline MV (MV_{BASELINE}) was defined during a 30s period of quiet breathing prior to sedation. We defined Low MV as MV < 40%MV_{BASELINE} and calculated the percentage of procedure spent with Low MV, using 2-tailed t-tests for comparisons.



[Figure 1: (A) Patients in the Control group (anesthesiologist blinded to RVM) spent more than double the amount of time with Low MV compared to Treatment group (anesthesiologist used RVM). (B) Comparison within the Treatment group showed that patients whose anesthesiologist found the RVM "Not-Useful" only had slightly less time with Low MV compared to Control, while patients whose anesthesiologists found the RVM "Somewhat-Useful" or "Very-Useful" had a 50% reduction in time with Low MV.]

Results and Discussion: Control patients experienced twice as much Low MV compared to Treatment patients (11.2%±2.2% vs. 5.8%±1.3%, p=0.02, Fig 1A). Average procedure times did not significantly differ (31.1±1.9 min vs. 37.1±3.1 min, p>0.05).

Treatment patients were stratified based on whether the anesthesiologist rated the RVM as "Not-Useful", "Somewhat-Useful", or "Very-Useful" during the case. Interestingly, the "Not-Useful" group showed no improvement over the Control group (9.9%±3.3% vs. 11.2%±2.2%, $p=0.4$). However, both the "Very-Useful" and "Somewhat-Useful" groups showed significant improvement over the "Not-Useful" group (4.3%±1.5% vs. 4.5%±3.4% vs. 9.9%±3.3%, $p<0.05$ for both comparisons, Fig 1B).

Conclusions: Patients in the Control group spent more than double the amount of time with Low MV compared to the Treatment group. This difference became more pronounced when the anesthesiologist found the RVM useful for managing care, lending credibility to the usage of minute ventilation monitoring in procedural sedation.

02AP03-9

Failed propofol sedation in a patient with somniloquy - a case report

Dziadzko M., Zekri M.-L., Rouhana K., Macabeo C., Aubrun F.
HCL Hôpital de la Croix Rousse, Dept of Anaesthesiology & Intensive Care, Lyon, France

Background: Failed propofol sedation in the outpatient setting is well known in patients with challenging behavior, addiction, or complex medication history. However, some cases remain puzzling.

Case report: ASA I, BMI 19, age 27 years woman was scheduled for an elective outpatient meniscal repair. Noteworthy medical history included non-complicated vesicoureteral surgery, and cranial trauma with skull fracture at the age of 10 with no consequences. Only medication was oral contraception. No addictive habits were reported. High level of anxiety noted at pre-anesthesia evaluation.

One hour prior to surgery, 0.25 mg of alprazolam was given orally. Upon arrival to the OR, the patient was emotionally unstable. Spinal anesthesia was

successfully given. However, the patient felt highly uncomfortable at the beginning of the surgery. Propofol TCI (Schindler model) was started with initial target of 0.6 mg/ml. This led to disruptive comments with no agitation or movements. The target concentration of anesthetic was rapidly increased up to 4 µg/ml with additional IV boluses. Yet, the patient continued to comment on the procedure and environment. We ceased increase of propofol doses as it led to apnea. Natural airways were preserved; the patient kept talking. The surgery was successfully done. The received dose of propofol was 400 mg/49 min (average rate 0.13 mg/kg/min). Upon arrival in the PACU, the patient was fully awake with no recall of these intraoperative events. Subsequent interrogation revealed the existence of parasomnia, including somniloquy, bruxism, and periodic limb movements since her childhood. Sleep-medicine specialists were never consulted. 4 hours later met criteria for outpatient surgery and was discharged.

Discussion: Parasomnias are frequent in the general population and are not always questioned during preanesthesia evaluation. Little evidence of anesthesia considerations in parasomnias exists, except those associated with specific conditions (Tourette syndrome).

However, it can affect the judgment of the anesthesia efficiency, raising safety concerns from unnecessarily increased doses of sedative drugs. Clinical implications—including dosing of hypnotics, validity of BIS findings, and probable memorization or false memory construction—should be considered and investigated.

Learning points: Presence of parasomnia history can alter outpatient sedation approach. The validity of sedation depth evaluation in these patients may be uncertain.

References:

Does pheochromocytoma mimic or cause acute myocardial infarction? *Cardiol J* 2010.

Learning Points:

- Pheochromocytoma is not often considered in the differential diagnosis of patients who present with cardiac abnormalities.

- Early diagnosis/identification of the tumour is crucial, because of the poor prognosis in these cases.

-Administration of phenoxybenzamine/doxazoxine, propranolol and labetalol is the most effective treatment prior to surgical resection of the tumor.

Regional Anaesthesia

03AP01-1

Systematic review of spinal and intracranial complications after central neuraxial blocks for perioperative and obstetric anaesthesia and analgesia. Part I: hematoma

Bos E.M.E.¹, Haumann J.², de Quelerij M.³, Kalkman C.J.⁴, Hollmann M.W.¹, Lirk P.B.¹

¹AMC Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands, ²OLVG Hospital, Dept of Anaesthesiology, Amsterdam, Netherlands, ³Sint Franciscus Gasthuis, Dept of Anaesthesiology, Rotterdam, Netherlands, ⁴UMC Utrecht, Dept of Anaesthesiology, Utrecht, Netherlands

Background and Goal of Study: Spinal and intracranial hematomas are feared complications of central neuraxial anaesthesia. As this complication occurs rarely, the characteristics of patients, symptoms, treatment and outcome are not clearly described.

Materials and Methods: Three databases (Medline, Embase and the Cochrane Library) were searched for reports of spinal and intracranial hematomas associated with central neuraxial block (CNB). Patient characteristics, symptoms, risk factors and neurological outcome were analysed.

Results and Discussion: A systematic literature search yielded 3013 articles, of which 378 articles were reviewed; 373 cases of spinal hematoma (SH) and 110 cases of intracranial hematoma (IH) were reported. SH occurred most frequently after epidural anaesthesia (60.5%) and developed predominately after catheter removal (37.7%). IH was principally seen after spinal anaesthesia (50.0%).

Overall, neurological recovery after treatment was correlated with initial neurological deficit. In patients with SH, delayed treatment was associated with worse neurological outcomes (odds ratio [OR] 2.5, 95% CI 1.3 - 5.0; $p = 0.010$ and adjusted OR 2.9, 95% CI 1.1 - 7.9; $p = 0.034$).

Conclusion(s): Patients can experience spinal or intracranial hematoma after CNB. In patients with SH or IH with neurological deficit, surgical evacuation is the preferred treatment. In patients with SH surgery should be initiated as soon as possible, at least within 12 hours after symptom onset. Benefit of intervention within 6 hours compared to intervention within 12 hours after symptom onset could not be supported by the results of this review. In patients with pain as presenting symptom, but without neurological symptoms, conservative management may be attempted, pending continuous and careful patient monitoring.

03AP01-2

Systematic review of spinal and intracranial complications after central neuraxial blocks for perioperative and obstetric anaesthesia and analgesia. Part II: abscess

Bos E.M.E.¹, Haumann J.², de Quelerij M.³, Kalkman C.J.⁴, Hollmann M.W.¹, Lirk P.B.¹

¹AMC Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands, ²OLVG Hospital, Dept of Anaesthesiology, Amsterdam, Netherlands, ³Sint Franciscus Gasthuis, Dept of Anaesthesiology, Rotterdam, Netherlands, ⁴UMC Utrecht, Dept of Anaesthesiology, Utrecht, Netherlands

Background and Goal of Study: Feared infectious complications of central neuraxial blocks (CNB) are spinal or intracranial abscess. Due to the rarity of these complications, the characteristics of patients, symptoms, treatment and outcome are not well described.

Materials and Methods: A systematic literature search was performed in three databases (Medline, Embase and the Cochrane Library) for reports of spinal and intracranial abscess associated with CNB. Patient characteristics, symptoms, risk factors and neurological outcome were analysed.

Results and Discussion: The search yielded 667 articles, of which 137 articles were reviewed; 253 patients with spinal abscess (SA), 3 patients with intracranial abscess (IA) and 1 patient with both SA and IA were reported. SA occurred predominantly after epidural anaesthesia (83.0%). The majority of reported cases were related to chronic pain treatment (34.7%). In patients with SA, clinical factors associated with persistent neurological deficit were male sex and initial motor deficit (adjusted odds ratio [aOR] 2.8, 95% CI 1.1 - 7.0; $p = 0.027$ and aOR 5.0, 95% CI 1.2 - 20.5; $p = 0.027$, respectively). IA occurred in 3 females; 2 cases after spinal anaesthesia and 1 case after epidural anaesthesia.

Conclusion(s): Patients can experience spinal or intracranial abscess after CNB. Neurosurgical evacuation is the treatment of choice in patients presenting with neurological deficit. In patients with pain as isolated symptom, conservative management may be indicated, provided that continuous patient monitoring is guaranteed. Since diverse details of complications as spinal or intracranial abscess were encountered in case reports, we want to accentuate that reporting in literature or registering complications on a national base is needed to analyse the characteristics of rare and severe complications of CNB.

03AP01-3

Intravenous dexamethasone for the prophylaxis of postoperative nausea and vomiting after neuraxial administration of long-acting opioids: a systematic review and meta-analysis

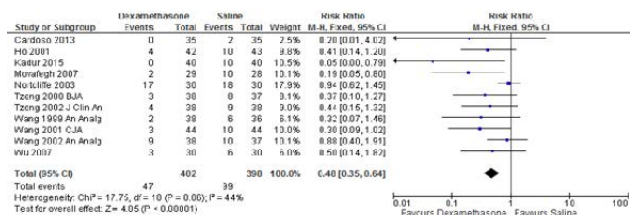
Grape S.¹, Albrecht E.²

¹Hopital de Sion, Dept of Anaesthesiology & Intensive Care, Sion, Switzerland, ²Lausanne University Hospital, Dept of Anaesthesiology, Lausanne, Switzerland

Background: Neuraxial administration of long-acting opioids provides effective analgesia but is associated with postoperative nausea and vomiting (PONV). Intravenous (IV) dexamethasone has been reported to prevent this side-effect, but with conflicting results. We performed a systematic review to assess the prophylactic effect of IV dexamethasone on PONV in patients receiving neuraxial long-acting opioids.

Methods: We searched the electronic databases MEDLINE, EMBASE, the Cochrane Central Register of Controlled Trials, the Web of Science and LILACS. We followed the PRISMA statement guidelines. Our primary outcome was the rate of PONV at 24 postoperative hours (PO h), analysed according to the type of comparator: IV dexamethasone versus placebo or IV dexamethasone versus IV dopamine receptor antagonists. Secondary outcomes were pain scores (converted to an analogue scale, 0-10) and need for rescue analgesics, all measured at 24 PO h. Meta-analyses were performed with "Review Manager" software (RevMan_version_5.1.6).

Results and Discussion: We included 11 randomized controlled trials with a total of 908 patients. In 7 trials opioids were injected intrathecally and in 4 trials epidurally. Authors used morphine in 9 trials, meperidine in 1 trial and pethidine in 1 trial. At 24 PO h patients receiving dexamethasone had a significantly reduced rate of PONV compared to placebo [risk ratio=0.5; 95%CI: 0.4; 0.6; $p < 0.00001$; figure 1].



[Figure 1]

Compared to placebo, the dexamethasone group had a reduction in pain scores at 24 PO h [mean difference -0.7; 95%CI: -1.2; -0.1; $p = 0.02$] and in need for rescue analgesics [risk ratio=0.7; 95%CI: 0.6; 0.9; $p = 0.003$]. Neither PONV, pain scores nor the need for rescue analgesics differed significantly between patients who received dexamethasone or dopamine receptor antagonists.

Conclusion: Compared to placebo but not to dopamine receptor antagonists, IV dexamethasone reduces PONV, pain scores and the need for rescue analgesics at 24 PO h after neuraxial administration of long-acting opioids.

03AP01-4

Retrospective cohort of 24,974 surgical cases under spinal anesthesia: bupivacaine dose and failure rate

Avidan A., Weissman C., Weiniger C.

Hadassah Hebrew University Medical Center, Dept of Anaesthesiology & Intensive Care, Jerusalem, Israel

Background and Goal of Study: Per text books and current literature, bupivacaine is the preferred local anesthetic for spinal anesthesia. Recommended doses range from low (up to 5mg) to high (up to 15-20mg). There is a debate about the selection of hyperbaric, hypobaric or plain bupivacaine.

The goal of this study was to investigate the selected bupivacaine dose used for spinal anesthesia for common lower body surgery and to examine the failure rates.

Materials and Methods: This study was approved by the Hadassah Institutional Review Board (IRB). Data from anesthetics with spinal anesthesia for various types of surgery of the lower body (obstetric, gynecologic, proctologic, orthopedic, urologic, inguinal hernia and bone marrow aspiration) were retrieved from the anesthesia information management system (Metavision, iMDsoft, Israel) of the Hadassah - Hebrew University Medical Center from February 2007 to December 2016.

Results and Discussion: Data from 24,974 anesthesia records were retrieved and summarized (Figure 1).

Type of Surgery	N %	Duration (minutes)			Dose Bupivacaine (mg)						Failure Rate
		Mean SD	Mean SD	Mean SD	Hyperbaric		Hypobaric		Plain		
					N %	Mean SD	N %	Mean SD	N %	Mean SD	
Proctology	1701 6.8%	49±110	19 ±12	1590 96.7%	8.5 ±2.3	4 0.2%	7.9 ±1.7	17 1.1%	7.7 ±1.8	21 1.2%	
Orthopedic	9742 39.0%	100 ±178	59 ±173	7613 82.2%	9.2 ±2.9	756 8.2%	9.4 ±4.1	820 8.9%	6.6 ±3.6	205 2.1%	
Cesarean delivery	8814 35.3%	73 ±165	31 ±23	7937 92.9%	9.0 ±2.3	13 0.2%	9.2 ±1.9	598 7.0%	7.9 ±3.3	147 1.7%	
Bone marrow aspiration	70 0.3%	85 ±28	45 ±22	67 95.7%	10.2 ±1.7	0		3 4.3%	8.3 ±3.2	6 8.6%	
Gynecology	508 2.0%	63 ±25	37 ±20	458 96.2%	8.6 ±2.0	0		18 3.8%	9.0 ±2.6	15 3.0%	
Inguinal hernia repair	1886 7.6%	76 ±55	48±22	1703 93.1%	9.6 ±4.1	9 0.5%	9.1 ±1.5	118 7.8	7.8 ±1.8	98 3.0%	
Urology	2253 9.0%	73 ± 43	43 ±26	2105 97.1%	9.6 ±2.6	5 0.2%	8.8 ±1.1	57 2.6%	8.2 ±1.8	68 3.0%	
Total	24974			21473 88.7%	9.2 ±2.2	787 0.2%	9.1 ±1.1	1631 1.1%	660 2.2%		

[Figure 1]

Hyperbaric bupivacaine was the most frequent choice for all surgeries, and most frequently reported sensory levels were appropriate to cover for the surgical innervation. The sensory level was not reported in 57% of cases. Overall, 2.2% of the spinals were reported as failures.

Conclusion(s): The selection and dose of spinal anesthesia were suitable for the duration of surgery. Hyperbaric bupivacaine was the most common choice. Doses were between the recommended low and high doses. The failure rate was like that reported in the literature.

03AP01-5

Paramedian approach: a better technique for spinal anaesthesia in elderly patients for femoral proximal fracture surgery

Zhurda T., Hoesheka S., Sturce R., Bajraktari M., Jaho E., Dautaj B. University Trauma Hospital, Dept of Anaesthesiology, Tirane, Albania

Background and Goal of Study: Spinal anaesthesia(SA) has been the technique of choice for femur fracture surgery in elderly patients. Usually SA is performed using the midline approach, but it is technically difficult where adequate flexion for proper positioning is not possible, such as patients with femur fracture. Some authors have recommended paramedian approach because this approach does not require flexed position as in midline approach.

The goal of this study was to determine which of approaches of SA should be preferred as first choice in elderly patients for femur proximal fracture surgery. **Materials and Methods:** We prospectively studied 88 patients aged >65 years, who underwent open repair of a femur proximal fracture. These patients were randomized to receive SA either with the midline approach (group M, n=44) or paramedian approach (group P, n=44). In both groups the SA was given with 25 gauge spinal needle in sitting position at L3-L4 interspace. For every patient we considered the: average age, success rate in first attempt, number of punctions, and failure.

Results and Discussion: The mean age in the M group was 71.4 and in the P group 73.2 years. First attempt success rate was 27 (61.3%) in M group and 40 (90.9%) in P group. More than one attempt was required in 21 patients (47.7%) in the M group, and 6 patients (13.6%) in the P group. In three cases of M group, spinal puncture was impossible and were successful with the paramedian approach. In both the groups, there was no failure of spinal anesthesia.

Conclusion(s): In conclusion, paramedian approach is better approach for SA and should be routinely used as first choice in elderly patients with proximal femur fracture where adequate flexion for proper positioning for midline approach is not possible.

Reference:

1. Ahsan-ul-haq M, Amin S, Javadi S. Paramedian technique of spinal anesthesia in elderly patients for hip fracture surgery. *J Coli Physicians Surg Pak*. 2005; 15: 160-1.
2. Ahmed T, Ullah H. Paramedian technique of spinal anaesthesia in elderly patients for hip fracture surgery. *J Coll Physicians Surg Pak*. 2007;17(3):184.
3. Rabinowitz A et al. The paramedian technique: a superior initial approach to continuous spinal anesthesia in the elderly. *Anesth Analg* 2007.105(6)1855-7.

03AP01-6

Optimal level of epidural block for perioperative analgesia in nuss procedure

Fesenko U.¹, Myhal I.², Albokrinov A.²

¹Danylo Halytsky Lviv National Medical University, Dept of Anaesthesiology & Intensive Care, Lviv, Ukraine, ²Lviv Regional Children's Clinic Hospital, Dept of Anaesthesiology & Intensive Care, Lviv, Ukraine

Background and Goal of Study: Pectus excavatum (PE) is the most frequent congenital deformity of thorax. Nuss procedure (NP) is a minimally invasive method of PE correction. Postoperative (PO) period after NP is associated with severe pain because of aggressive distortion of thorax and probably intercostal nerves involvement. Gold standard of PO analgesia after NP is epidural anesthesia (EA). Common practice lies in placing the tip of EA catheter at the level corresponding to the deformity location dermatome. However, there is information in scientific literature about effective high EA during awake cardiac surgery via median sternotomy.

Objective: To compare analgesic efficacy of conventional approach to EA and high EA during and after NP

Materials and Methods: Thirty-two 13 to 16 year old children with PE were randomized into 2 groups ("Conventional", n=18 and "High", n=14) before NP. Intravenous induction and maintenance of anesthesia with propofol (3 mg/kg and 6 mg/kg*hour respectively) was performed. Left double lumen endotracheal tube was placed after fentanyl (5 mcg/kg) and atracurium (0.6 mg/kg) administration. In "Conventional" group epidural puncture with loss of resistance technique was performed in lateral position by paramedian approach 2 interspinous spaces below the deformity level (Th7-Th8, n=4, Th6-Th7, n=8, Th5-Th6, n=7) and EA catheter was advanced 3 cm cranially. In "High" group epidural puncture was made at the Th2-Th3 level using the same technique. In all patients 10 ml of bupivacaine 0.5% was injected into epidural space after test dose. Continuous infusion of 0.25% bupivacaine 4-6 ml/h, NSAIDs and paracetamol were administered to all patients after surgery. Morphine 0.1 mg/kg was used as rescue analgesia when pain intensity exceeded 40 mm of visual analog scale. Intraoperative dose of fentanyl, PO pain scores and PO morphine consumption were registered.

Results and Discussion: Intraoperative fentanyl dose between "High" and "Conventional" groups did not differ significantly (2.8 ± 0.11 vs 3.4 ± 0.08 mcg/kg*hour, $P=0.087$). Postoperative pain scores and morphine dose were significantly lower in "High" group compared to "Conventional" group (21.3 ± 3.4 vs 45.6 ± 5.7 mm, $P=0.021$, and 0.15 ± 0.03 vs 0.57 ± 0.08 mg/kg*day, $P=0.018$, respectively).

Conclusion(s): High EA is more effective perioperative analgesic technique in Nuss procedure compared to conventional approach to EA level.

03AP01-7

The influence of spinal anesthesia and body positioning on cerebral blood flow and hemodynamics

Grauslyte L., Banevicius G., Bilskiene D., Vilke A., Macas A.

Lithuanian University of Health Sciences, Dept of Anaesthesiology, Kaunas, Lithuania

Background: Spinal anesthesia is commonly used in herniated lumbar disc surgery, during which prone position of the patient is necessary. It is thought that this position can increase intraabdominal pressure. Both spinal anesthesia and increased intraabdominal pressure can have an effect on the systemic and cerebral blood flow dynamics. The goal of this study was to evaluate the cerebral blood flow changes in patients prior to and after spinal anesthesia in different body positions.

Methods: The study was carried out in a teaching hospital during a six month period in 2016. Cerebral blood flow dynamics in middle cerebral artery were registered using transcranial Doppler for patients undergoing herniated lumbar disc surgery under spinal anesthesia. The measurements were made in 4 timepoints: prior to spinal anesthesia (1), 10 minutes after the local anesthetic injection in lateral position (2), after placing the patient in prone position (3) and after placing the abdomen supporting frame beneath the patient (4). Demographic data were collected. Statistical analysis was carried out using Chi-Square and Kruskal-Wallis tests.

Results: Overall, 70 patients were included in the study. All of the patients fit the criteria for ASA I-III, mean age 48.4 ± 12.2 years. Comparing 1st and 2nd measurement points systolic 132.4 ± 21.7 mmHg \rightarrow 117.5 ± 17.5 , diastolic 72.3 ± 12.1 \rightarrow 66.7 ± 9.6 and mean arterial pressure (MAP) 96.5 ± 13.8 \rightarrow 86.7 ± 11.5 decreased statistically significantly ($p=0.000$, $p=0.001$ and $p=0.000$ accordingly). After the patient was placed in a prone position (between 2nd and 3rd measurement points) systolic flow velocity decreased 89.3 ± 18.9 cm/s \rightarrow 83.0 ± 18.9 ($p=0.047$), but the diastolic 66.7 ± 9.6 \rightarrow 70.8 ± 12.4 ($p=0.016$) and MAP 86.7 ± 11.5 \rightarrow 90.7 ± 12.5 ($p=0.037$) grew. Following the frame for abdomen support placement (between 3rd and 4th measurement points) the resistance index increased 0.510 ± 0.06 \rightarrow 0.512 ± 0.05 ($p=0.000$), but the systolic 121.3 ± 22.4 \rightarrow 114.8 ± 15.3 ($p=0.017$) and MAP 90.7 ± 12.5 \rightarrow 85.9 ± 11.6 ($p=0.026$) dropped. MAP fell by more than 20% compared to the first blood pressure measurement after the frame placement in 14 (20%) cases.

Conclusions: Spinal anesthesia caused significant drop in systemic hemodynamics. Prone position decreased systolic flow velocity in the brain, but cause a rise in MAP. The abdomen support frame had effect on both systemic and cerebral blood flow trends as well. Further studies are needed to avoid adverse events cause by manipulations during spinal anesthesia.

03AP01-8

Continuous caudal epidural infusion for surgical treatment of severe forms of hypospadias in pediatric patients

Galante D.¹, Badii F.², Melai E.³, Pedrotti D.⁴, Lambo M.S.⁵, Cococcia L.⁶

¹University Hospital, Ospedali Riuniti of Foggia, Dept of Anaesthesiology & Intensive Care, Foggia, Italy, ²Hospital of Vittorio Veneto, Dept of Anaesthesiology & Intensive Care, Vittorio Veneto, Italy, ³Ospedale Unico della Versilia, Dept of Anaesthesiology & Intensive Care, Lido di Camaiore, Italy, ⁴S. Chiara Hospital, Dept of Anaesthesiology & Intensive Care, Trento, Italy, ⁵Spirito Santo Hospital, Dept of Anaesthesiology & Intensive Care, Pescara, Italy, ⁶SS Annunziata Hospital, Dept of Anaesthesiology & Intensive Care, Sulmona, Italy

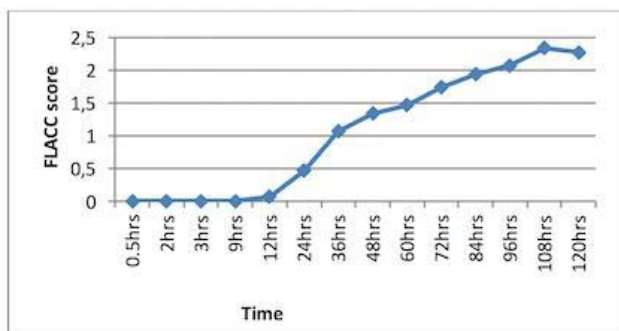
Background and Goal of Study: Severe forms of hypospadias are an important chapter of pediatric surgery. Blended anesthesia represents the best technique for these patients which provides excellent intra and postoperative analgesia. We evaluated the use of continuous caudal epidural infusion of levobupivacaine and fentanyl combined with general anesthesia for severe hypospadias surgery in children.

Materials and Methods: A systematic multicentric review of our recorded data was analysed. Forty-two patients, 2-6 years age, weighing 3 - 18 kg, ASA II, suffering from severe forms of hypospadias were enrolled. Anesthetic management included a combined caudal epidural and general anesthetic

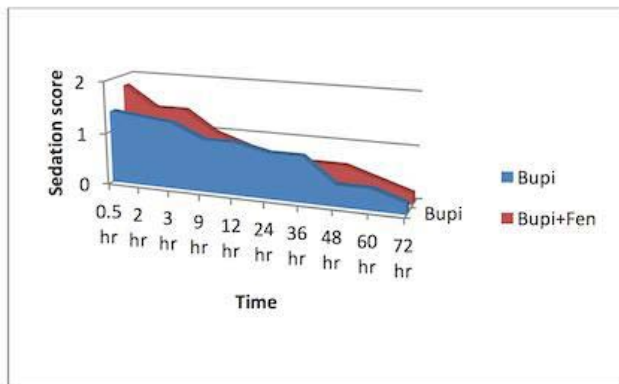
technique. Epidurally initial bolus 1 ml/kg of 0.25% levobupivacaine with fentanyl 1 μ g/kg was administered after the induction of general anesthesia with a mixture of Air/O₂, sevoflurane and orotracheal intubation without curarization. Postoperative analgesia was maintained by continuous infusion of 0.0625% - 0.125% levobupivacaine (depending on the age of the children) at 0.1 ml/kg/hr with fentanyl 1 μ g/kg for 2 days. Postoperative pain was assessed with FLACC pain scale using face, legs, activity, cry and consolability and sedation score was assessed by using a four point sedation score.

Results and Discussion: Epidural caudal anesthesia was performed in all patients without complications. In 4 patients it was difficult to locate the caudal space and has made necessary to use an ultrasound-guided technique. Epidural catheter was introduced through the caudal space without difficulty. Children showed hemodynamic stability and only in one patient occasional bradycardia occurred. Sedation score was <2 and FLACC pain scale was <4 (Figure 1). Intraoperative and postoperative analgesia was excellent in all patients. Only in 3 patients, during the postoperative time, a rescue dose of ketorolac and paracetamol was necessary.

Conclusions: General anesthesia combined with epidural caudal continuous analgesia improve intra and postoperative pain control in pediatric patients undergoing severe forms of hypospadias in pediatric patients without complications or side effects.



FLACC score in all patients was less than 4



Sedation Score. Postoperative mean sedation score in all patients was less than 2

[Figure 1]

03AP01-9

Comparison of two doses of hypobaric bupivacaine in unilateral spinal anesthesia for hip fracture surgery: 5 mg versus 7.5 mg

Nakhli M.S., Kahloul M., Chouchene A., Chebbi N., Naija W., Mhamdi S.

Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse, Tunisia

Background and Goal of Study: Hip fracture is a frequent and severe disease. Its prognosis depends on the perioperative hemodynamic stability which can be preserved by the unilateral spinal anesthesia especially with low doses of local anesthetics.

This study aims to compare the efficacy and hemodynamic stability of two doses of hypobaric bupivacaine (7.5 mg vs 5 mg) in unilateral spinal anesthesia.

Materials and Methods: In this prospective, randomized, double-blind study, 108 patients scheduled for hip fracture surgery under unilateral spinal anesthesia were enrolled to receive either 5 mg (group 1) or 7.5 mg (group 2) of hypobaric bupivacaine. Spinal anesthesia was performed in lateral position. Patients' socio-demographic characteristics, hemodynamic profile, sensory and motor blocks parameters were recorded.

Results and Discussion: Both groups were comparable regarding to demographic data. Two cases of failure occurred in group 1 and one case in group 2 corresponding to a comparable efficiency rates (96.29% and 98.14% respectively; $p = 0.5$). A higher mean onset and lower mean regression times of sensory block were significantly noted in group 1. The incidence of bilateralization, the incidence of hypotensive episodes and the vascular loading were significantly higher in group 2.

Conclusion(s): The dosage of 5mg of hypobaric bupivacaine in unilateral spinal anesthesia is as effective as the dosage of 7.5 mg with lower bilateralization incidence and better hemodynamic stability.

03AP01-10

The role of using Ephedrine after the administration of spinal anesthesia in preventing hypotension after lowering the patients' legs at the end after the transurethral resection of prostate (TURP) and transurethral resection of bladder tumor (TUR BT)

Gani H.¹, Naco M.¹, Shpata V.², Domi R.¹, Ohri I.¹, Beqiri V.¹

¹UHC, Mother Teresa, Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ²University of Medicine, Faculty of Medical Science and Technical, Dept of Anaesthesiology, Tirana, Albania

Background and Goal: The aim of this study was to investigate the role of Ephedrine 25mg (s/c) use right after the application of spinal anesthesia in blood pressure after lowering the legs at the end after the TURP, TUR BT.

Materials and Methods: In this study were included all patients who have undergone TURP or TUR BT. Total number was 120 patients, aged between 50-82 years old. Patients were separated in two groups G. E and G.C. Patients of G.E group were given 25 mg ephedrine s/c right after the application of spinal anesthesia. On the other hand G.C patients were not given anything. The level L2-L3 with sol. Bupivacaine 0.5%-3ml (15mg). We have analyzed blood pressure, cardiac frequency and the consumption of Ephedrine which was used. Chi-square test was applied to compare the mean values of systolic blood pressure. P value ≤ 0.05 was considered statistically significant.

Results and Discussion: There were no significant differences between the two groups in age ($P = 0.8$), chronic alcohol consumption, ($P = 0.6$) history of hypertension, ($P = 0.8$), sensory block height, ($P = 0.6$) of patients. There were no differences between the two groups regarding blood loss, Ephedrine was considerably during the intervention, but also at the end of it after the legs were lowered, which made a big difference between the two groups. What was noticed was the difference between the groups in the consumption of Ephedrine. In G.E. the Ephedrine was consumption mean (SD) 15 mg (range 10-20 mg). While in the G.C. the Ephedrine was consumption mean (SD) 45mg (range 30-60 mg). In G.E there was significantly less use of Ephedrine compared to G.C ($P < 0.001$). There was noticed a sharp decrease of the systolic pressure after lowering the legs in G.C compared to G.E, where there was no decrease in blood pressure at all ($P < 0.001$). Systolic blood pressure significantly decreased from baseline in the G.C control group (from 130 ± 17 mm Hg to 60 ± 17 mm Hg), (after lowering the legs).

($P = 0.005$), while in the G.E. ephedrine group no decrease in the blood pressure was noticed from the basal one. [from 120 ± 12 mm Hg to 105 ± 10 mm Hg (after lowering the legs). ($P = 0.005$)]. The G.C. control group had a lower Systolic blood pressure, than G2 ephedrine group Statistically significant between of them ($P = 0.001$).

Conclusion: We concluded that the usage of 25 mg Ephedrine s/c is effective in preventing hypotension after lowering the patients' legs at the end of the TURP and TUR BT intervention ($P = 0.001$).

03AP01-11

Do really we know what cause hypotension after spinal anaesthesia?

Solares G., Abascal E., Rabanal J.M., Eced M., Salomon C., Solar A.

HUMV, Dept of Anaesthesiology, Santander, Spain

Background and Goal of Study: Most clinicians believe that hypotension (HP) due to spinal anaesthesia (SA) is caused by a decrease in SVR (1), others have implicated CO(2). This study was designed to clarify this controversy with a non-invasive device measuring CO ($N_{OIV}DCO$).

Materials and Methods: After IRB approval and written informed consent, 105 ASA I-IV patients that received SA were prospectively studied. Bupivacaine 0.5% was used to block patients at L3-4. SAP, CI and SVRI were continuously measured using a finger volume clamp device (Clearsight®). Data was collected at baseline, 5min before SA(0), and thereafter until 20min before surgery. We compared this data with those obtained at the lowest SAP value registered (Lw_{SAP}). Sensory block height (SBH) was determine by pinprick, every 5min. HP was treated when $SAP < 90mmHg$. Data was statistically analysed with Wilcoxon, Pearson and t-Test.

Results and Discussion: Three different groups of patients were identified according haemodynamic behaviour at Lw_{SAP} . Group A (n=50) response was characterized by a decrease of SAP and SVRI while CI increased ($\% \Delta SAP_0 vs_{Lwsap} = -12\%$; $\% \Delta SVRI_0 vs_{Lwsap} = -22\%$ and $\% \Delta CI_0 vs_{Lwsap} = +11\%$; $p > 0,05$). In this group, $\% \Delta SAP$ changes were best predicted by the sum of $\% \Delta SVRI$ and $\% \Delta CI$ ($R^2 = 0,5$; $p = 0,01$).

Group B (n=33) response showed a fall of the three variables ($\% \Delta SAP_0 vs_{Lwsap} = -27\%$; $\% \Delta SVRI_0 vs_{Lwsap} = -19\%$ and $\% \Delta CI_0 vs_{Lwsap} = -11\%$; $p > 0,01$). The $\% \Delta SAP$ changes were best predicted again by the sum of the other two ($R^2 = 0,8$; $p = 0,01$).

Group C (n=22) response showed a fall of SAP and CI while SVRI increased ($\% \Delta SAP_0 vs_{Lwsap} = -19\%$; $\% \Delta SVRI_0 vs_{Lwsap} = +20\%$ and $\% \Delta CI_0 vs_{Lwsap} = -26\%$; $p > 0,01$). However, $\% \Delta SAP$ changes were related only to $\% \Delta CI$ ($R^2 = 0,3$; $p = 0,01$). SBH of all groups were different since the beginning, within groups ant between them ($GA_{SBH20min} = T8$; $GB_{SBH20} = T6$; $GC_{SBH20} = T5$; $p < 0,05$). At low SBH ($T \leq 8$) the main cause of HP is a decrease in SRV while CO acts in the opposite direction. As body SBH raised, HP is the result of the additive fall of both. However, at $T \geq 5$ the decrease in CO is the only determinant factor, which elicits a sympathetic mediated baroreceptor response in non-blocked areas that increase SVI (3).

Conclusion(s): The aetiology of HP due to SA is a complex physiologic process that changes depending upon body SBH. Treatment should be directed to its specific cause. $NOIVDCO$ may play a capital role to achieve it.

References:

1. Critchley:BJA,1994;
2. Green,1973;
3. Taniguchi:AnestAnal,1997

03AP02-1

Reverse Takotsubo cardiomyopathy following intrathecal anaesthesia for hip replacement surgery

Diaz T., Valle A., Rodriguez A., Alegret N., Bosch E., Colilles C.
Hospital Universitari Parc Tauli, Dept of Anaesthesiology & Pain Medicine, Sabadell, Spain

Background: Takotsubo Cardiomyopathy (TC) is a transient acute stress-induced cardiomyopathy with left ventricular (LV) apical and mid-wall dysfunction imitating myocardial infarction in the absence of obstructive coronary artery disease. The pathogenesis is not known, but is presumably evoked by sympathetic over activity from physical or psychological stress. A variant of TC, with akinesis of the mid and basal LV segments and sparing in the apex, has been called Reverse TC.

Case report: We present a case of a 40 year old man, who was scheduled to undergo hip replacement surgery. At preoperative evaluation he was categorized as ASA physical status I. No toxic habits were registered.

The day of the surgery, intrathecal bupivacaine (11 mg) was given; after blockade was established at T-10, hypotension was treated with 9 mg ephedrine, followed by bradycardia (36 beats/min), 1 mg atropine was administered, complaining of oppressive chest pain followed by ventricular tachycardia and torsade de pointes. Advanced cardiac life support was started, being effective

after 8 minutes. Immediate cardiac catheterization revealed no obstruction in any of the coronary arteries, the ventriculography showed LV ejection fraction of 25%, and hypokinesia of the basal and midventricular left ventricle. Cardiac enzymes were elevated (peak Troponin T 2231 ng/L). Toxics were tested, determining cannabis consumption.

The patient recovered heart function in five days. Once patient was conscious he referred significant history of anxiety in the last year because of family lost, as well as regular cannabis abuse (daily), and occasional cocaine abuse.

Discussion: Reverse TC is mostly common in young people, it has been reported after ingestion of energy drinks. Some authors suggest that continuous consumption of cannabis, and a potential role of the endocannabinoid system in the pathogenesis of cardiovascular disease. TC is becoming increasingly described as an underdiagnosed complication during common medical procedures, being more frequent in the perioperative period, characterized by an increased sympathetic activity and catecholamine surge. Also direct neurohumoral effect caused by inadvertent intrathecal injection has been reported, resulting in a circulating catecholamine surge and related myocardial stunning.

Learning points: We must be aware of this threatening condition in the perioperative setting, especially in young patients. Immediate medical support is needed.

03AP02-2

Incremental titration of unilateral spinal anaesthesia in a patient with severe aortic stenosis

Jones J., Gouveia J., Gomes P.

Hospital da Luz, Dept of Anaesthesiology, Lisboa, Portugal

Background: Aortic stenosis(AS) is associated with increased perioperative risk for cardiac events. Rigorous hemodynamic monitoring with early treatment of hypotension is essential. Unilateral spinal anaesthesia and continuous spinal anaesthesia using an indwelling catheter are 2 reported techniques used for lower limb surgery in high-risk patients, to minimize hemodynamic instability. We report the case of a patient with severe AS undergoing urgent knee surgery under unilateral spinal anaesthesia achieved with intermittent injection of small volumes of local anesthetic through a spinal needle. We could not find this technique reported before in the literature.

Case report: A 78year-old female with symptomatic AS (valve area of 0,9cm²) was proposed for right knee surgery. We performed a spinal anaesthesia in the right lateral decubitus at L3-L4 interspace with a 25G needle and administered incremental doses of 1mg of hyperbaric bupivacaine+0,25µg of sufentanyl every 2,5 minutes, with the bevel directed to the dependent side. Non-invasive blood pressure was measured before each bolus administration. 6mg of bupivacaine+3,25µg of sufentanyl were administered over 15 minutes, the needle was removed and the patient was left in lateral decubitus for another 15 minutes. Unilateral sensory-motor block was achieved, with a T11 sensory level. Hemodynamic stability was maintained throughout the procedure, without the need for vasopressor institution.

Discussion: Elderly patients experience increased hemodynamic instability with spinal blockade. To minimize it, it is recommended to use small doses of local anesthetic, to add adjuvants and to do a unilateral block when possible. We did the spinal block in an incremental way, which is reported to provide greater hemodynamic control than single-bolus injection technique, without the use of a catheter, which are not available in our hospital.

References: SPAortic stenosis and perioperative risk with noncardiac surgery. Journal of ACC.65(3),2015; —LMM. Continuous spinal anaesthesia with minimally invasive haemodynamic monitoring for surgical hip repair in two patients with severe aortic stenosis. RBA.2016;66(1):82-5

Learning points: Progressive attainment of appropriate block by injecting intermittent small volumes of local anesthetic through a spinal needle is a safe technique and minimizes perioperative cardiovascular instability associated with single-bolus spinal anaesthesia.

03AP02-3

Spinal anaesthesia in a patient with Machado-Joseph disease

Tavares F, Pereira C., Macieira J.

Centro Hospitalar Tâmega e Sousa, Dept of Anaesthesiology, Penafiel, Portugal

Background: Machado Joseph Disease (MJD) or spinocerebellar ataxia type 3 (SCA3) is an inherited neurodegenerative disorder characterized by progressive sensory and motor dysfunction¹. MJD is a rare disease and to the extent of our knowledge only 2 reports document the anaesthetic management of patients affected by this condition: one used an epidural anaesthesia and the other used a combined spinal-epidural technique with hyperbaric bupivacaine. We describe the third case.

Case report: A 65-year-old woman with MJD complicated with severe weakness in the arms and legs and diffuse polymyalgias presented in the emergency setting for surgical repair of a bimalleolar fracture. Besides the neurodegenerative disorder she also had atrial fibrillation, bradycardia-tachycardia syndrome with an artificial pacemaker in place, hypertensive disease, obesity and dyslipidemia.

After informed consent, a subarachnoid block was performed at the L3-L4 lumbar intervertebral space with 10mg of hyperbaric bupivacaine taking advantage of an expected lateralization of the blockade due to the positioning and so a more expectable cardiovascular stability. Sensory block reached the T10 level. The procedure was uneventful. Postoperative normal recovery occurred and the patient was discharged 2 days after. One month after the spinal anaesthesia no new neurological changes have been identified or reported when compared to the preoperative setting.

Discussion: Central nervous system disorders may be considered a relative contraindication to regional anaesthesia because of the risk and difficulty in determining the cause of eventual exacerbation of neurological deficits. Nevertheless, given that there are no large clinical studies supporting either type of anaesthetic management in MJD, we opted for regional blockade instead of general anaesthesia taking into consideration the 2 uneventful cases already reported in literature and the cardiac disease of the patient. The regional technique allowed hemodynamic stability, an easier postoperative analgesic management and minimized post-procedure pulmonary complications such as hypoventilation, aspiration and hypoxia due to impaired neuromuscular function.

References:

1. Henry Paulson Machado-Joseph Disease/Spinocerebellar Ataxia Type 3. *Handb Clin Neurol.* 2012; 103: 437-449.

Learning points: Neuroaxial anaesthesia with hyperbaric bupivacaine can be a safe option for lower limb surgery in patients with MJD.

03AP02-4

The best of both worlds! Continuous spinal anesthesia and peripheral nerve blocks for hip surgery in a patient with severe cardiac disease

Ferreira S., Vieira D., Jesus T., Antunes C., Barros A., Magalhães J.

Hospital Sra Oliveira, Dept of Anaesthesiology, Guimarães, Portugal

Introduction: The elderly patient with cardiovascular disease represents a daily challenge for the anesthesiologist. The authors present a case report of a successful use of regional techniques in a patient with hip fracture purposed for left hemiarthroplasty.

Case report: 84 year male, severe depression of cardiac function (ejection fraction: 26%) with implantable cardioverter-defibrillator (ICD), low functional ability, auricular fibrillation (reverted hipocoagulation), cerebral infarction, chronic kidney disease and diabetes.

The ICD was disabled, defibrillation pads were placed in anterior/posterior position, as well as a radial catheter to monitor direct blood pressure. The anesthesiologist performed a continuous spinal block, in lateral position under full aseptic conditions (18 G Tuohy epidural needle / 20G catheter), paramedian approach, in L4-L5 interspace.

After obtaining free flow of cerebrospinal fluid, the catheter was inserted 3 cm into subarachnoid space and administered sufentanyl 2 µg and bupivacaine 0,33%, 2.6 mg (0,8 mL). The patient had two drops in BP (<65mmHg), without any discomfort, that solved with ephedrine 10 mg. Before transferring the patient to intensive care unit (ICU), the spinal catheter was removed. The procedure was ineventful. After reversion of sensitive block, the anesthesiology performed in the ICU ultrasound guided blocks of the left femoral, lateral

cutaneous of thigh and the anterior branch of obturator nerve - UGPB (total ropivacaine 0,5%: 125mg). The patient became comfortable during all postoperative period. There was no report of postpuncture dural headache.

Discussion and conclusion: The continuous spinal block remains a valid technique for patients with cardiovascular disease, adding the great stability with minimum necessary dosis for an effective block¹. In this patient, combining it with the ultrasound guided peripheral blocks for postoperative pain control allowed a superior cardiovascular stability and patient comfort². There are several reports of successful use of UGPB for hip surgery as this case report exemplified.

References:

1. Amin SM, Sadek SF Continuous spinal anesthesia for elderly patients with cardiomyopathy undergoing lower abdominal surgeries. *Egyptian Journal of Anaesthesia.* 2016; 32:535-540

2. Jiménez SMI, Gago MB *et al.* Efficacy of obturator and femoral cutaneous nerve blocks for postoperative analgesia in hip surgery. *Revista Española de Anestesiología y Reanimación.* 2009; 56: 590-597

03AP02-5

Failed continuous spinal for hip fracture: case report, causes, prevention and management

Nogueira Z., Sousa L., Santa Bárbara R., Viana I.

Hospital de Santa Maria, Dept of Anaesthesiology & Pain Medicine, Lisbon, Portugal

Background: Continuous spinal anesthesia (CSA) allows titration of the block level, longer spinal block duration, and greater hemodynamic stability. Although regarded as a reliable regional block method, the possibility of failure has been recognized. In previous studies, the incidence of failed CSA is low.

Case report: A 73-year-old male, ASA3, admitted with hip fracture, proposed for surgical stabilization, was submitted to CSA. Tuohy needle was inserted at the L3-L4 intervertebral space, with freely flowing clear cerebrospinal fluid (CSF). Through an intrathecal catheter, sufentanil 25µg and levobupivacaine 5mg were injected, followed by 1mL of saline solution bolus. No evidence of sensory, motor or sympathetic block was observed in the following 15minutes (min). Catheter localization was confirmed by CSF aspiration and glucose test. Another bolus of levobupivacaine 7,5mg was injected from a new ampoule, and again no evidence of sensory, motor or sympathetic block was observed 15min later. Confirmation of catheter localization was made again by the same methods. In this setting, general anesthesia was instituted. At the end of the surgical procedure, 60min later, it was still possible to aspirate CSF from the catheter, though without any evidence of anesthetic or analgesic effect.

Discussion: Based on repeated confirmation of catheter localization, lumbar puncture failure and catheter misplacement have been ruled out. Factors affecting the spread of local anesthetics solution through CSF were considered as the main possible causes in this case. Besides obvious anatomical abnormalities, which were not documented in our patient, septae formed by ligaments, spinal stenosis or congenital arachnoid cysts were considered as the most likely etiologies. Although rare, local acidosis and sodium channels mutations can be considered as other causes of CSA failure.

References:

1. Moore JM. CSA. *Am J Ther.* 2009 Jul-Aug;16(4):289-94; 2. Kung CC1, Lin SY, Tang CS, Wu TJ, Sun WZ. Clinical study of failure in CSA with bupivacaine. *Kaohsiung J Med Sci.* 1998 Aug;14(8):486-91.

Learning Points: Although CSA is considered a highly reliable technique, in seldom cases this technique can result in an anesthetic failure.

03AP02-6**Thoracic epidural anesthesia performed during open cholecystectomy in patient with situs inversus totalis in Kartagener's syndrome**

Kazazi E.¹, Marta A.², Peci J.³, Saliu R.⁴, Bulku E.⁵, Dautaj B.⁶
¹Hospital of Librazhd District, Dept of Anaesthesiology & Intensive Care, Librazhd Elbasan, Albania, ²Hospital of Librazhd District, Dept of Surgery, Librazhd Elbasan, Albania, ³American Hospital of Tirana, Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ⁴Hospital of Librazhd District, Pulmonology, Librazhd Elbasan, Albania, ⁵Mother Theresa University Hospital of Tirana, Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ⁶National Center of Trauma, Dept of Anaesthesiology & Intensive Care, Tirana, Albania

Background: Kartagener's syndrome is a rare condition comprising the triad of situs inversus, chronic sinusitis, and bronchiectasis. General anaesthesia in this high surgical risk patient can trigger pulmonary and cardiac complications.

Case report: A 83 years old obese female ASA II presented to our surgical clinic for open cholecystectomy. She had a history of intermittent left upper quadrant pain, emesis, fever, elevated transaminases, elevated bilirubinemia, leukocytosis. She was known as dextrocardia treated on medications for arterial hypertension, recurrent pulmonary infections and sinusitis. An abdominal echography showed the left position of liver that supported the diagnosis of acute cholecystitis in the presence of biliary cholelithiasis. Electrocardiograph (ECG) showed T wave inversion in lead I, aVL, V₂ to V₆ with deep Q waves in lead I and aVL. A chest X-Ray revealed bilateral basal consolidation. A thoraco-abdominal tomography (CT) was done that confirmed situs inversus totalis and bilateral bronchiectasis. Pulmonary function tests showed a PEF of 216 L/min, FEV₁ 1.15L, MVV 47% compatible with moderate-severe obstruction. Thoracic epidural anesthesia was employed at the level T9-T10 with 20 ml Bupivacaine 0.5% mixed 100mcg fentanyl. The analgesia and muscle relaxation were optimal during the intervention. A mild sedation was performed with propofol and midazolam. Patient was transferred at the ward for further postoperative treatments.

Discussion: We founded at the literature same cases undergoing surgery and implications under general anaesthesia such as left endobronchial placement of the endotracheal tube, prolonged paralysis after administration of succinylcholine, cardiac and pulmonary complications. We choosed to perform thoracic epidural anesthesia as a sole and the safest anaesthetic technique to prevent these complications and to reduce postoperative pain and vomiting.

References:

1. Gruber EM, Kritzing M, Deviatko E, Wisser W, Zurakowski D, Haider W: The effects of thoracic epidural analgesia with Bupivacaine 0.25% on Ventilatory Mechanics in Patients with Severe COPD. *Anesthesia & Analgesia* 2001, 93:1015 - 1019
2. Thoracic epidural anaesthesia for open cholecystectomy. Zahoor MU1, Masroor R, Khurshid T, Azhar R, Amjad Yasin MM. *J Coll Physicians Surg Pak*. 2011 Nov;21(11):654-8. doi: 11.2011/JCPSR654658

Learning points: Epidural anaesthesia has been shown to reduce intraoperative and postoperative complications in patients with Kartagener's syndrome undergoing open cholecistectomy.

03AP02-7**Continuous spinal anesthesia (CSA) for emergency exploratory laparotomy - a valid approach?**

Matias B.¹, Fragoso P.², Melo A.²
¹Centro Hospitalar de Setúbal, Dept of Anaesthesiology, Setúbal, Portugal, ²Hospital de Braga, Dept of Anaesthesiology, Braga, Portugal

Background: Emergency laparotomy in the elderly patient with multiple comorbidities represents a challenge to any anesthetic approach. CSA is a century technique, and despite it has been unpopular among anesthesiologists¹, it has several advantages in this context².

Case report: 81-year old man, history of pulmonary tuberculosis and severe chronic obstructive pulmonary disease, proposed for emergency exploratory laparotomy for suspected intestinal obstruction. CSA was performed

with epidural kit, catheter inserted at L1-L2 level, using Levobupivacaine 5 mg, Sufentanil 2.5 mcg and Magnesium Sulfate 25 mg (total volume 2 mL) to achieve T4 level block. The procedure lasted 40min, during which no additional spinal bolus were necessary, neither sedative medication. Postoperative care was uneventful. Intrathecal catheter was used for postoperative analgesia.

Discussion: CSA consists on the intermittent administration of small doses of local anesthetic through a catheter placed in the subarachnoid space. Compared to other techniques it has quicker onset, more pronounced sensory-motor blockade and hemodynamic stability^{1,2,3}. It also allows prolonging anesthesia for the desired time and catheter use for postoperative analgesia¹. Equipment currently available ranges from a standard epidural (macro catheter) to specially designed spinal micro-catheters¹. This technique can be chosen as a sole anesthetic technique for laparotomy, especially in patients with severe cardio-respiratory disease who would otherwise be considered unlikely to tolerate general anesthesia or where general anesthesia could result in a prolonged stay in the intensive care unit². Main concerns regarding CSA are infection, post-dural puncture headache and neurological complications¹. None of these complications has a frequency that would discourage the use of this type of anesthesia². Our result is in agreement with others published^{2,3}, yet more studies are necessary to reach a consensual approach regarding equipment and dose regimens.

References:

1. Asian Journal of Pharmaceutical and Clinical Research, 2015; 6: 50-53
2. Current Anaesthesia & Critical Care, 2009; 20:60-64
3. J Anaesthesiol Clin Pharmacol. 2011; 27(1): 139-141

Learning Points: Emergency laparotomy in the elderly patient with multiple comorbidities remains a major challenge to any anesthetic approach.

CSA can be used as a sole anesthetic technique, especially in patients with severe cardio-respiratory disease.

03AP02-8**Continuous spinal anaesthesia for emergency infra umbilical laparotomy in a patient with Eisenmenger's syndrome**

Saura C.¹, Oliveira C.¹, Gregório A.R.², Pereira V.¹, Sampaio J.¹
¹Hospital Garcia de Orta, Dept of Anaesthesiology, Almada, Portugal, ²Hospital Alvaro Cunheiro Garcia de Orta, Dept of Anaesthesiology, Almada, Portugal

Background: Eisenmenger's Syndrome (ES) refers to a reversed left-to-right intracardiac shunt due to Pulmonary Hypertension (PH). It is one of the leading causes of perioperative death in non cardiac surgery¹. In infraumbilical surgery, successful anesthetic management has been described using either epidural anesthesia or general anesthesia (GA). We describe another regional technique that matches this population needs, the type of surgery, and about which, literature is scarce.

Case report: A 23-year-old female with an atrio septal defect leading to ES underwent continuous spinal anesthesia (CSA) for an emergency laparotomy due to a ruptured ovarian cyst. It was inserted an epidural catheter (18-gauge) at L3-L4 intervertebral space (3cm in the subarachnoid space). It was first given 1ml Levo-bupivacaine 0.5% plus 25µg Sufentanil, followed by 2 doses of 0.5ml Levo-bupivacaine during surgery titrated according to anesthetic and hemodynamic effects. It was obtained a block height to the sixth thoracic dermatome. During surgery, the oxygenation and arterial pressure remained unchanged.

Discussion: Whatever anaesthetic technique, the major principles are to maintain the systemic vascular resistance (SVR), cardiac output, preload and to avoid elevation of pulmonary vascular resistance (PVR) in order to minimize the changes in right-left shunt. With CSA we obviated the following hazards of GA: vasodilation and myocardial depressant effect of induction and maintenance of anesthesia. Increase in PVR due to catecholamine release after laryngoscopy and intermittent positive pressure ventilation. On the other hand, single shot spinal anaesthesia (SSA) is too hemodynamically unstable. Epidural anaesthesia (EA) reduces hemodynamic instability but is less reliable and may lead to conversion to GA and undesired painful sympathetic stimulation. Additionally, its very slow onset hinder a perfect titration in useful time. CSA allows a meticulous level of block and prevents an excessive sympathetic block with uncontrolled decrease in systemic vascular resistance. If necessary, the duration and level of block can be rapidly increased.

References: 1. P.J. Cole et al. *Incremental Spinal Anaesthesia for Elective Caesarean Section in a Patient with Eisenmenger's Syndrome* Br J Anaesth 2001; 86: 723-6

Learning Points: CSA appears to have clear advantages over GA and EA in this high-risk patients. It grants minimal interference with cardiovascular and respiratory systems.

03AP02-9

Ultrasound-guided paravertebral block for abdominal pain relief after transcatheter intrarterial chemoembolization of hepatic metastases

Anaya R., Baños Lapuente V., Hoffmann R., Gil Sánchez J.M., Italiano S., Moral García M.V.
Hospital de la Santa Creu i Sant Pau, Dept of Anaesthesiology, Barcelona, Spain

Background: Transarterial chemoembolization with Irinotecan is an alternative to surgery in patients with metastatic lesions of the liver (1). Up to 90% of patients develop Postembolization Syndrome (abdominal pain, nausea, vomiting and fever), and paravertebral block could minimize these symptoms.

Case report: A 58 years old woman with colorectal cancer history, treated with neoadjuvant irinotecan followed by laparoscopic right hemicolectomy, relapsed one year later with a solitary hepatic lesion in the right lobe treated with two hepatic chemoembolization sessions. For this procedure, we performed a single shot right T8 paravertebral block, using a 21-gauge SonoTAP® needle guided by ultrasound using 20 ml of ropivacaine 0.75%. Light sedation with propofol infusion was provided, as well as antiemetic prophylaxis with 8 mg dexametazone, 1 mg granisetron and 40mg omeprazole.

We achieved a good analgesic control during the chemoembolization without any incidence. The Visual Analgesic Score was less than 4 during the following 24 hours and no opioids were required.

Discussion: The paravertebral block is commonly used in thoracic anaesthesia and offers a good analgesia after liver trauma or even in percutaneous nephrolithotomy.

We have seen that blockade could be effective with an unilateral single shot technique and offers good pain control during chemoembolization and early postoperative period. Patients with a more extensive hepatic affection would probably need a bilateral block to provide a good analgesia control.

References: Dhand S, Gupta R. Hepatic transcatheter arterial chemoembolization complicated by postembolization syndrome. *Semin Intervent Radiol.* 2011 Jun;28(2):207-11

Learning Points:

1. Hepatic chemoembolization with Irinotecan generates acute pain associated with important nausea and vomiting.
2. Single Shot Paravertebral block provides good analgesia with lower opioid consumption and subsequent lower nausea and vomiting and better patient comfort compared with general anaesthesia.
3. The use of ultrasound provides feasibility and better efficacy to the technique.

03AP02-10

Persistent Hypothermia and Excessive Sweating Following Intrathecal Morphine Administration in a Teenage Boy: A case report

Caria T.¹, Ferraz S.², Silva A.³, Cenicante T.⁴, Candeias M.J.⁴

¹Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal, ²Centro Hospitalar Vila Nova de Gaia/Espinho, Dept of Anaesthesiology, Vila Nova de Gaia, Portugal, ³Centro Hospitalar Lisboa Central, EPE, Dept of Surgery, Lisboa, Portugal, ⁴Centro Hospitalar Lisboa Central, EPE, Dept of Anaesthesiology, Lisboa, Portugal

Background: Opioids are usually used intrathecally in the management of intra and postoperative pain. Despite the better tolerance of this administration, the limiting side effects of systemically administered opioids are still present.¹ There are few case reports of hypothermia induced after spinal morphine injection, but none in the pediatric population.

We present a case of mild hypothermia in a teenage after administration of intrathecal morphine.

Case report: A 15-year-old boy, ASA 2, was scheduled for elective surgery of a pelvic mass resection. General anesthesia was combined with spinal anesthesia, using levobupivacaine 7,5 mg and morphine 0,2 mg. The surgical procedure was eventless.

On arrival in the post-anesthetic recovery unit, the patient presented a decreased tympanic temperature (34,4°C) associated with excessive sweating, no shivering hyperglycemia and complained of feeling hot. All other vital signs were normal. It was decided to maintain clinical vigilance and hourly monitoring of temperature and capillary glycaemia values.

Despite active warming with forced air warming system, temperature was maintained below 35°C for 16 hours, with gradual remission of symptoms and normalization of glycaemia values.

Discussion: Core body temperature is normally tightly regulated. The mechanism by which intrathecal morphine causes hypothermia has not yet been elucidated, but the most viable hypothesis will be the opioid influence at hypothalamus.

In this case the most probable causes of post anesthesia hypothermia were excluded so we can admit that the cause of hypothermia was the spinal administration of morphine.

In some reports naloxone and lorazepam were successfully used to reverse the symptoms. In our report, they disappeared 16 hours later, without pharmacotherapy, which favors that the cause of hypothermia was due to intrathecal morphine.^{1,2}

References: 1-Mach J et al. Intrathecal Opioid - Induced Hypothermia Following Subarachnoid Block With Morphine Injection for Elective Cesarean Delivery: A Case Report. *American Association of Nurse Anesthetists.* 2016; 84 (1): 23-26; 2-Ioscovich Y. Hypothermia Following Intra-Thecal Morphine Injection during Cesarean Section a Case Report and Literature Review. 2015. *J Anesth Clin Res* 6: 527

Learning Points: Patients undergoing subarachnoid block with intrathecal morphine may develop a disruption on thermoregulation, leading to a resistant postoperative hypothermia associated with excessive sweating.

03AP02-11

Sub arachnoid block in pregnant patient with suspected hereditary hypokalemia periodic paralysis (HHPP)

Veterini A.S.¹, Maharani V.², Utariani A.²

¹Dr Soetomo Hospital, Dept of Anaesthesiology & Intensive Care, Surabaya, Indonesia, ²Airlangga University, Dept of Anaesthesiology & Intensive Care, Surabaya, Indonesia

Background: Pregnancy contribute to trigger the muscle paralysis in HHPP patients. The difficult to diagnose make it very challenging for the treating clinician to manage this case.

Case report: A 20 years old woman with first pregnancy, 38-39 weeks gestation, the baby's weight prediction were 3000 grams, hypokalemia and first grade obesity. The height were 160 cm, BMI were 30,3 kg/m², the others was in the normal limit. There was a history about hypokalemia 3,0 meq/L. The latest laboratory examination was severe hypokalemia 2,1 meq/L, with weakness in the both lower extremities. The treatment was giving KCL 50mEq/24 hours and KSR tablet 3 times daily. In the few time after giving KCL, suddenly there was his in the uterus, the baby's heart rate became deceleration, and the team decided to do LSCS. Anesthesia technique with regional anesthesia sub arachnoid block. Local anesthesia was lidodex 5 % with adrenaline 1 : 200.000. Baby born with the apgar score was 3-5-7. Therapy for hypokalemia was continued in post operative periode with KSR per oral three times daily.

Discussion: Any pregnancy associated with paralysis is a high-risk pregnancy. The medical team must be prepared to appropriately handle an episode of weakness or paralysis, if one develops during labor and delivery³.

References:

1. Abbas, Haider; Kothari, Nikhil; Bogra, Jaisri. Hypokalemic Periodic Paralysis. *J Maxillofac Surg.* 2012 Jul-Dec; 3(2): 220-221.
2. Levitt, Jevit O. Practical Aspects in The Management of Hypokalemic Periodic Paralysis. *J Transl Med.* 2008; 6: 18.
3. Lin, Shi-Hua; Yang, Sung-Sen; Chau, Tom. A Practical Approach to Genetic Hypokalemia. *Electrolyte Blood Press* 8:38-50, 2010. The Korean Society of Electrolyte Metabolism.
4. Finstere, Josef; Stollbelger, Claudia; Keller, Hans. Arrhythmia-related work-up in hereditary myopathies. *Journal of Electrocardiology* 45 (2012) 376-384. Elsevier.
5. Kulkarni, Maity; TV, Srividya; Gopal, N. Hypokalemic Paraplegic in Pregnancy. *J Clin Diagn Res.* 2014 Jun; 8(6): OD03-OD04.

6. Keskin, Ozgul. Anesthesia Management For Patient With Familial Hypokalemia Periodic Paralysis. *Yeditepe Medical Journal* 2014;8(31-32): 838-841.

Learning Points: We emphasize that pre operative assessment, intraoperative awareness, and post operative monitoring contributes the outcome. In this case we report the successful of subarachnoid block in suspected HHPP with pregnancy.

03AP02-12

Panic attack following spinal block: an unexpected and challenging event

Oliveira C., Nóbrega S., Simões V., Romão C., Poeira R.
Centro Hospitalar Lisboa Central, Dept of Anaesthesiology, Lisboa, Portugal

Background: A panic attack is a sudden episode of intense fear with potentially serious pathophysiological changes, in the absence of a real or apparent danger. In a patient prone to anxiety, surgery can trigger a panic attack and, if performed under regional anesthesia, it might result in injury to the patient or staff members, having to sedate the patient or to reschedule the procedure. We present a case of a panic attack following a spinal block.

Case report: A 75-year-old man with a past history of atrial fibrillation, hypertension, COPD, chronic renal disease and anxiety was scheduled for elective inguinal hernioplasty. Premedication included 1mg lorazepam on the night before and on the morning of surgery.

Before patient arrival to the operating room, anaesthetic technique, benefits and potential risks of spinal anaesthesia were explained. Patient was alerted about the numbness and inability to move lower limbs and didn't show any signs of distress.

Patient was sedated with 2 mg midazolam and subarachnoid block was performed and well tolerated. Fifteen minutes later, patient complained that he couldn't feel his limbs and developed intense psychomotor agitation, tachycardia, hyperventilation and sudoresis. He was immediately sedated with midazolam and propofol and the surgery proceeded uneventfully. At the end of the procedure, patient stayed anxious for not feeling lower limbs and just became calm after reversion of sensitive and motor block.

Discussion: Diagnosis of a panic attack it's difficult to make as clinical manifestations may mimic a high spinal block, prompt and immediately intervention is crucial.

Although anxiety related complications, like vasovagal episodes, are well described during regional anaesthesia, as far as we know there isn't any case reporting a panic attack after regional anaesthesia.

References:

Davis-Evans C. *AORN Journal* 2013; 97(3): 354-361

Mingir, T., Ervatan, Z., Turgut, N. *Türk J Anaesth Reanim*, 2014;42:190-195

Learning points: Our case is a reminder that anaesthesiologists should be aware that, when performing regional anaesthesia, it's crucial to minimize anxiety for patient's comfort and for a successful outcome.

03AP03-1

Effect of intrathecal injection of bupivacaine on GABAAR α 1 subunit in rats

Hanxiang M., Yonghai Z., Fan Y., Qinghong L.
General Hospital of Ningxia Medical University, Dept of Anaesthesiology, Yinchuan, China

Background and Goal of Study: Accumulating evidence suggested that spinal anesthesia had sedative effect, but its mechanism was still not clear. We previously found that bupivacaine spinal anesthesia could increase the contents of inhibitory amino acid GABA. Our hypothesis was that the subarachnoid block would be related to the expression of GABAAR α 1 subunit in the intumescentia lumbalis of rats.

Materials and Methods: With IRB approval, 32 male Sprague-Dawley rats were randomly divided into four groups: control group (group C, n=8), saline group (group NS, n=8), 0.5% bupivacaine 10 minutes group (group B10, n=8), and bupivacaine 30 minutes group (group B30, n=8). The rats were intrathecally catheterized and rats were intrathecally administered 20 microliter of saline in group NS and 20 microliter of 0.5% bupivacaine in group B10/

B30, respectively. The rats were sacrificed and took out the spinal cord in group C, at 10 minutes after intrathecal saline or bupivacaine in group NS and group B10, and at 30 minutes after intrathecal bupivacaine in group B30. The protein level of GABAAR α 1 subunit in cytoplasm, membrane and whole-cell were detected by western blot. Densitometric analysis was performed on the western blot images using Image J to quantitate the amount of protein levels. The level of protein was analyzed by one-way ANOVA and $P < 0.05$ was taken as statistically significant.

Results and Discussion: The whole-cell protein content of GABAAR α 1 subunit had no difference among groups ($P > 0.05$), while the content in the cytoplasm and membrane were significantly changed. In the cytoplasm, the protein content of GABAAR α 1 in group B10/B30 were significantly decreased compared with group C and group NS (each $P < 0.05$), especially in group B10 ($P < 0.01$). The membrane protein content of GABAAR α 1 were inversely significantly increased in group B10/B30 than that in group C and group NS (each $P < 0.05$), especially in group B10 ($P < 0.01$). Our results indicate that intrathecal injection of bupivacaine is related to the cytoplasm GABAAR α 1 subunit protein transport to the cell membrane, which may mediate in part the sedation of spinal anesthesia.

Conclusion(s): Intrathecal bupivacaine has no effect on the whole-cell GABAAR α 1 subunit protein in the intumescentia lumbalis of rats. However, it is related to the cytoplasm GABAAR α 1 subunit protein transport to the cell membrane, and maybe it is one of the mechanisms of spinal anesthesia-induced sedation.

03AP03-2

Inhibition of T-type Ca $^{2+}$ channel induces human neuroblastoma cell death and enhances neurotoxicity of bupivacaine

Tanaka K.¹, Sakakibara K.¹, Hashimoto A.¹, Feng G.G.², Fujita Y.¹, Fujiwara Y.¹

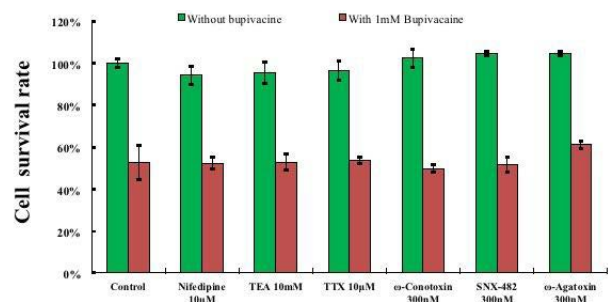
¹Aichi Medical University, Dept of Anaesthesiology, Nagakute, Aichi, Japan, ²Aichi Medical University, Dept of Pharmacology, Nagakute, Aichi, Japan

Background: Local anesthetics are known to produce neurotoxic effects. Although it has been speculated that local anesthetics might exert neurotoxic effect by increasing the intracellular Ca $^{2+}$ concentration, the exact mechanisms have yet to be elucidated *1. The objective of this study was to determine if T-type Ca $^{2+}$ channel is involved in the mechanisms of neurotoxicity of bupivacaine.

Methods: The effects of ion channel inhibitors or bupivacaine on human neuroblastoma cell (SH-SY5Y) viability were examined using the MTT assay. Analysis of variance with replication or t-test was used for the comparisons of each treatment where applicable. A probability value less than 0.05 indicated statistically significant difference

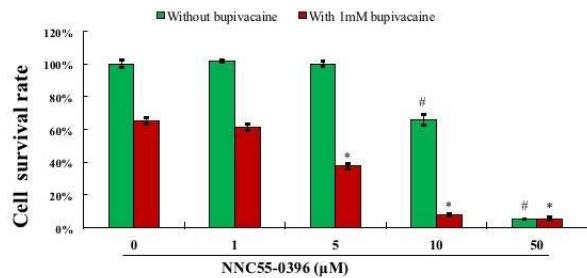
Results: Tetrodotoxin (Na $^{+}$ channel inhibitor), tetraethylammonium (K $^{+}$ channel inhibitor), nifedipine, ω -conotoxin, SNX-482, ω -agatoxin (L-type, N-type, R-type, P-type Ca $^{2+}$ channel inhibitors, respectively) did not induce SH-SY5Y cell death (Fig.1).

However, NNC 55-0396 (T-type Ca $^{2+}$ channel inhibitor) induced cell death in a concentration dependent manner. When each of ion channel inhibitors and bupivacaine were applied in combination, only NNC 55-0396 significantly increased neurotoxicity of bupivacaine in a concentration-dependent manner (Fig.2).



Data are expressed as the mean \pm SD.

[Fig.1]



Data are expressed as the mean \pm SD.

* $p < 0.05$ versus with 1mM bupivacaine only # $p < 0.05$ versus control

[Fig. 2]

Discussion: Previous studies have reported that inhibition of T-type Ca^{2+} channel causes inhibition of cell proliferation and induction of apoptosis in colon cancer cells *2. The results of this study revealed that inhibition of T-type Ca^{2+} channel induces cell death and increases neurotoxicity of bupivacaine. our data suggested that the inhibition of T-type Ca^{2+} channel may be involved in neurotoxicity of bupivacaine.

Conclusion: Inhibition of T-type Ca^{2+} channel induces SH-SY5Y cell death and enhances neurotoxicity of bupivacaine.

References: *1 J Anesth. 2006; 20: 196-201 *2 Mol Cancer Res. 2014; 12: 348-58

03AP03-3

Pentadecapeptide BPC 157 counteracts the bupivacaine effect on a cell membrane

Zivanovic-Posilovic G., Balenovic D., Barisic I., Sindić A., Vlainic J., Sikiric P.

University of Zagreb School of Medicine, Department of Pharmacology, Zagreb, Croatia

Background and Goal of Study: Bupivacaine toxicity following accidental overdose still lacks therapeutic solution. Pentadecapeptide BPC 157 antiarrhythmic potential has been proved regarding digitalis overdose, hyper- and hypokalaemia, as well as bupivacaine toxic dose in rats.

The aim of the study is to establish its antiarrhythmic potential in vitro, on a cell membrane as well.

Materials and Methods: The effect of bupivacaine (1mM) on cell membrane depolarization was explored by measuring membrane voltages (V_m) in HEK293 cells, alone and in combination with BPC 157 (1 μ M). One-way ANOVA and a subsequent post hoc Student-Newman-Keuls test were used to compare the difference between the groups ($p < 0.05$).

Results and Discussion: The effect of BPC 157 application alone resulted in a V_m of 1.7 ± 0.6 mV ($n=11$), while the basal membrane potential was -36.0 ± 1.6 mV (1). Bupivacaine (1 mM) application changed the membrane potential of HEK293 cells by 2.13 ± 0.38 mV ($n = 4$). The depolarization effects were relative to the starting membrane potential ($r = -0.6$, Fig. A). In the presence of 1 μ M BPC 157, bupivacaine-induced depolarization was inhibited (0.38 ± 0.24 mV, $n = 4$, Fig. B).

Fig. A and B

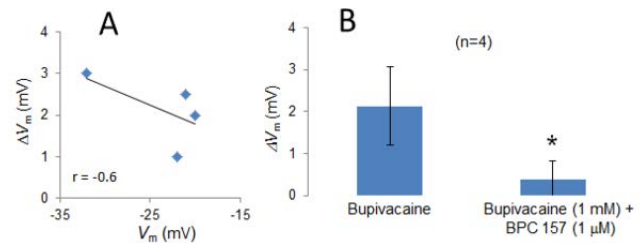
A: depolarization caused by bupivacaine was in negative correlation with starting membrane potential;

B: in the presence of BPC 157 bupivacaine did not depolarized HEK293 cells any more. Data are means \pm S.E.M., the number of experiments are given in the bracket. * $P < 0.05$ vs. control.

Conclusion(s): These findings suggest that stable gastric pentadecapeptide BPC 157 should be a potential antidote for bupivacaine cardio toxicity, while its activity is probably related to K^+ channels.

References:

1. Barisic I, Balenovic D, Klicevic R et al. Mortal hyperkalemia disturbances in rats are NO-system related. The life saving effect of pentadecapeptide BPC 157. Regul. Pept. 2013;181: 50-66.
2. Sintra Grilo L, Carrupt PA, Abriel H et al. Block of the hERG channel by bupivacaine: Electrophysiological and modeling insights towards stereochemical optimization. Eur J Med Chem. 2011 Aug;46(8):3486-98.
3. Jiang B, Sun X, Cao K, Wang R. Endogenous Kv channels in human embryonic kidney (HEK-293) cells. Mol Cell Biochem. 2002 Sep;238(1-2):69-79



[Fig. A and B]

03AP03-5

Addition of dexmedetomidine to QX-314 enhances the duration of cutaneous analgesia in rats

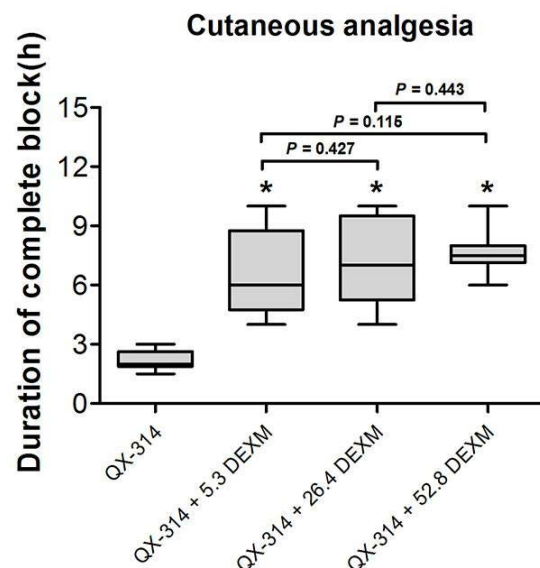
Zhao W.L.¹, Shi Y.¹, Liu J.¹, Jiang J.L.², Zhang W.S.³

¹Sichuan University, Dept of Anaesthesiology, Chengdu, China, ²Zun Yi Medical University, Dept of Anaesthesiology, Zun Yi, China, ³West China Hospital of Sichuan University, Dept of Anaesthesiology, Chengdu, China

Background and Goal of Study: Previous studies have demonstrated that the combination of dexmedetomidine with commonly-used local anesthetics can improve the duration of anaesthesia. We designed this study to observe whether adding dexmedetomidine to QX-314, the quaternary lidocaine derivative, would enhance the onset and duration of cutaneous blockade in rats.

Materials and Methods: Fifty-six Sprague-Dawley rats ($n = 8$ /group, 230-275g) were divided into seven groups, 35 mM QX-314, dexmedetomidine (5.3 μ M, 26.4 μ M, 52.8 μ M) with or without 35 mM QX-314. The rats' dorsal surface of the fixed thoracolumbar area were shaved. The tested solutions were injected by using a 26-gauge needle subcutaneously. Cutaneous analgesia was defined as the blockade of the cutaneous trunci muscle reflex. Six pinpricks per test were enough to obtain the results and the absence of lower or equal to three of six responses were defined as complete cutaneous blockade. The assessment was performed at the intervals after injection as follows: 15 min, 30 min, 1 h, 2 h, 3 h, 4 h, 6 h, 8 h, 10 h until the values were up to the baseline (six responses per test). The data were presented as medians with interquartile ranges. The Mann-Whitney U test with Bonferroni's correction ($\alpha = 0.05/6$) was used for multiple comparisons of duration of complete block.

Results and Discussion: Duration of complete cutaneous blockades were enhanced when 35 mM QX-314 plus dexmedetomidine (5.3 μ M, 26.4 μ M, 52.8 μ M) compared with QX-314 alone (Fig. 1, $P < 0.0083$). However, there were no statistic difference among three groups of dexmedetomidine. In addition, concentrations of 5.3 μ M, 26.4 μ M and 52.8 μ M dexmedetomidine exhibited no effective blockade.



[Figure 1]

Conclusion: In summary, this study verified the hypothesis that coadministration of QX-314 with clinical-dose dexmedetomidine produced a synergistic anaesthetic effect to enhance the duration of cutaneous block in rats. Accordingly, dexmedetomidine may be a good adjuvant to QX-314 for long-acting anaesthesia. Further study is needed to testify other methods of local anaesthesia and elucidate the specific mechanism.

03AP03-6

Serum IL-6,IL- 10 and substance P concentrations of patients administered distinct anaesthetic techniques in breast cancer surgery

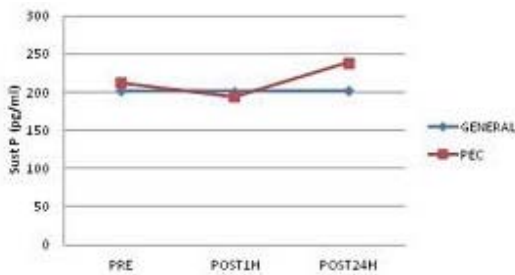
Lopez V., Cassinello F, Moris L., Aravelo J., Vasquez M., Muñoz L. *Fundacion Jimenez Diaz University Hospital, Dept of Anaesthesiology, Madrid, Spain*

Background: Breast cancer is one of the main causes of death between women. Even when surgery is supposed to be curative, patients can suffer from metastatic disease. Perioperative factors including anaesthetic technique might influence whether minimal residual micrometastases are eliminated or became full-blown metastatic disease. Apoptosis of tumoral cells is influenced by multiple factors, as immune cytokine signalling. Many of these aspects can be modified by anaesthesia.

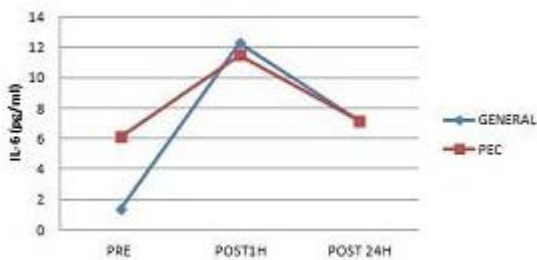
Goal of Study: To determine whether the regional/propofol anaesthesia can affect the serum levels of cytokines.

Materials and Methods: 20 women with diagnosis of breast cancer were randomized to receive either pectoral block with propofol anaesthesia (PEC) or general anaesthesia with sevoflurane and opioids (GEN) Levels of IL-6, IL-10 and substance P (SP) by using ELISA test were registered before induction, 1 h after surgery and 24h after surgery.

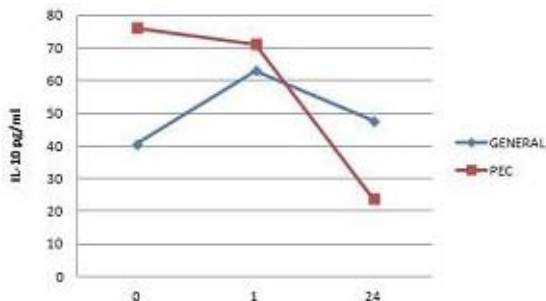
Results: Fig I, II and III shows the level of IL-6, 10 and SP in both types of anaesthesia.



[Level of substance P]



[Serum levels of IL-6]



[Serum levels of IL-10]

Discussion: SP and IL-6 stimulate tumor cell proliferation, migration and infiltration. IL-10 seems to inhibit cancer cell survival.

It has been proposed that local anesthetic can attenuate cytokine response in cancer surgery, however we didn't find any association between type of anaesthesia and levels of il-6,il-10 or SP ($p > 0.5$).

Conclusion: Further studies are necessary to clarify the role of anaesthesia in serum cytokines levels.

References: 1. Cancer surgery: how may anesthesia influence outcome? Cassinello, F; Prieto I; *Journal of clinical anesthesia* 2015;27(3);262-272

03AP03-7

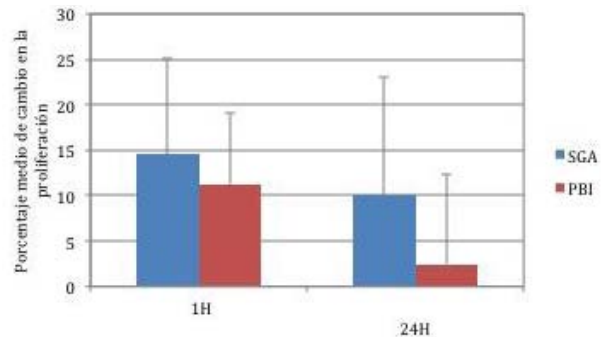
Effect of anaesthetic techniques on proliferation MDA-MB-231 tumor cells in vitro in breast cancer surgery

Moris L., Cassinello F, López Pérez V. *Fundacion Jimenez Diaz University Hospital, Dept of Anaesthesiology, Madrid, Spain*

Background and Goal of Study: Cancer remains one of the leading causes of death in the world. The perioperative period implies alterations in the immune system that confers a favorable environment for progression of oncologic disease. The goal of study is to compare the effect of serum obtained from patients with breast cancer who received two different types of anaesthesia on proliferation in cancer cell line MDA-MB-231-ER-negative. To evaluate the consumption of opioid analgesics in each group.

Materials and Methods: Longitudinal and prospective study in patients diagnosed with infiltrating ductal carcinoma of the breast, treated with tumorectomy or simple mastectomy, with or without sentinel node or axillary lymphadenectomy. 20 were randomized, 10 patients in each group. The group of patients receiving general anaesthesia and maintenance with sevoflurane along with pre-incision morphine bolus (SGA) and the group receiving general anaesthesia and maintenance with iv propofol in continuous infusion together with lateral and anterior cutaneous branches of the intercostal nerve block prior to incision (PBI). Blood samples were collected prior to induction, one hour after the end of the procedure and at 18-24 hours postoperatively. The influence on cell proliferation were performed with the breast cancer cell line MDA-MB-231 ER negative. Cell proliferation was detected by fluorescence emission at 4 hours.

Results and Discussion: There is a clear trend, non-significant, towards greater tumor proliferation *in vitro* in patients anesthetized with the SGA protocol (sample 1h: $p = 0.49$, sample 24h: $p = 0.31$).



[Figure: Proliferation]

In the PBI group, patients did not require postoperative fentanyl with a significant difference ($p = 0.033$).

Conclusion: There is a trend towards lower *in vitro* proliferation of breast tumor cells from the MDA-MB-231 ER-negative tumor cell line exposed to the serum of PBI protocol patients compared to the SGA protocol.

References: Deegan CA, Murray D et al. Effect of anaesthetic technique on oestrogen receptor-negative breast cancer cell function *in vitro*. *Br J Anaesth.* 2009;103(5):685-90.

03AP03-8

Effect of anaesthetic techniques on migration and apoptosis MDA-MB-231 tumor cells in vitro, in breast cancer surgery

Morís L., Cassinello F, Lopez V.

Fundacion Jimenez Diaz University Hospital, Dept of Anaesthesiology, Madrid, Spain

Background: Some drugs and anaesthetic techniques are proving to have influence on the proliferation, invasion and apoptosis of tumor cells.

Goal of Study: To compare the effect of serum obtained from patients with breast cancer who received two different types of anaesthesia on migration and apoptosis tumor cells in vitro.

Materials and Methods: Patients undergoing mastectomy were randomized to receive propofol/lateral and anterior intercostal nerve block anaesthesia (PBI, n=4) or sevoflurane/opioid anaesthesia (SGA, n=4).

Blood samples:prior to induction,1h and 24h after the end of the surgery. The ER-negative MDA-MB-231 cell line was treated with patient serum.

The migration was detected through a wound healing scratch assay test. Apoptosis was evaluated with fluoescence stained with annexin V and 7-AAD.

Results and Discussion: There was lower migration in the PBI group without differences statistically significant.

Conclusions: Tumor cell line cultured with the serum of PBI patients migrate more slowly. Reduction of apoptosis was observed in cell line cultured with serum of SGA group.

References:

Deegan CA et al.Effect of anaesthetic technique on oestrogen receptor-negative breast cancer cell function in vitro. Br J Anaesth.2009;103(5):685-90.
 Jaura AI et al.Differential effects of serum from patients administered distinct anaesthetic techniques on apoptosis in breast cancer cells in vitro: a pilot study. Br J Anaesth.2014;113:163-7.

03AP03-9

A new model for the pharmacokinetic and pharmacodynamics analysis of epidural administered drugs in sedated dogs

Sang Sik C.¹, Jung Eun K.¹, Mi Kyoung L.¹, Bong Jae L.²

¹Pain Clinic Center, Korea University Guro Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Pain Clinic Center, Kyung Hee University Gangdong Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Many studies have evaluated the epidural pharmacokinetic and pharmacodynamic profiles in animal studies. Yaksh developed a study model in dogs. He threaded two catheters, one caudally around the cisterna magna into the intrathecal space and the other at the lumbosacral area upward into the epidural space to meet the two catheters at the same spinal level. However, in this method, some problems can occur such as bleeding and spinal cord damage due to the long trajectory of epidural catheter. Here we present a novel model, non-surgical and less invasive for the pharmacokinetic and pharmacodynamic analysis of epidural administered drugs.

Materials and Methods: The study was conducted after institutional approval for animal experiment by the Korea University Institutional Animal Care and Use Committee. Twelve dogs weighing 21 kg (21 ± 2.77 kg; mean ± SD) were used.

Epidural catheterization

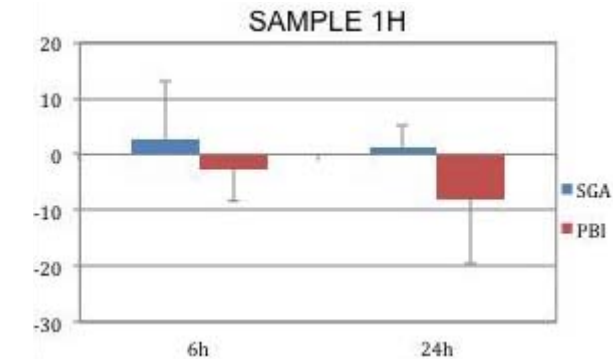
Epidural catheterization was performed at the upper level of vertebrae T1-T2 in lateral position. Epidural catheterization was performed with "the loss of resistance to air" technique in midline approach Using a C-arm. Tuohy needle was inserted midline between the first and second thoracic spinous process. The needle advanced slowly into the epidural space applying constant pressure to the plunger of the syringe with the thumb. A flexible catheter was then threaded cranially to the epidural space at C2-C3 level. The location of the catheter tip was verified fluoroscopically by injecting contrast medium into the catheter.

Intrathecal catheterization

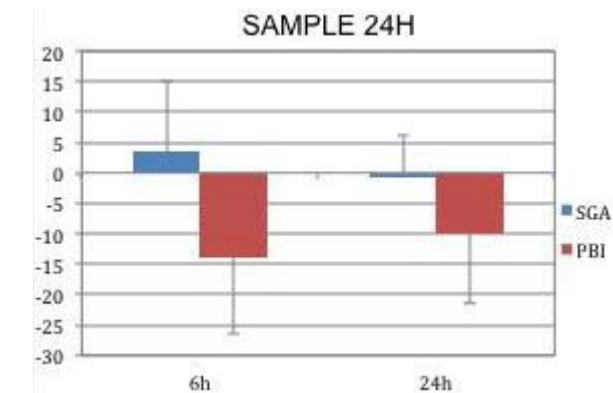
In the lateral position, the external occipital protuberance, as well as both tips of the transverse processes of C1, was located using palpation; these three points formed the vertices of a triangle and the center of a triangle was a target point. Under local anesthesia, a 17G Tuohy needle was inserted into the cisterna magna region, checking the midline. A flexible catheter was then inserted caudated through the needle to the C2-C3 level; that is, to the same level as the epidural catheter.

Results: In this study, we succeeded epidural and intrathecal catheterization all twelve dogs in sedation state. There were no side effects or complications associated with the new method of epidural and intrathecal catheterization.

Conclusions: A new model for the pharmacokinetic and pharmacodynamic analysis of epidural administered drugs in dogs is better than the Yaksh's model.

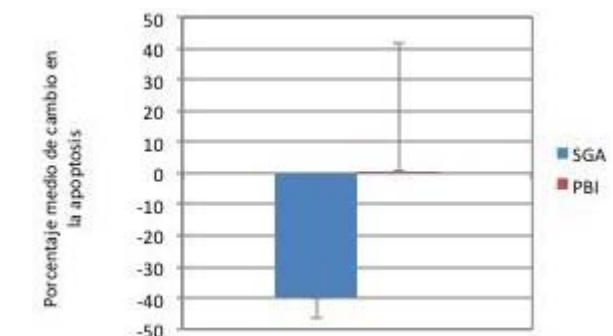


[Migra1]



[Migra24]

A reduction of apoptosis (39.8%) was observed in the SGA group (p 0.06) compared to the PBI group (0.75%).The results are not significant.



[Apop]

03AP03-10**Observation of the drug diffusion using ultrasound contrast agent in pig meat**

Ando T.¹, Mori A.², Arakawa Y.¹, Nishiwaki K.²

¹Nagoya University Hospital, Dept of Anaesthesiology, Nagoya, Japan, ²Nagoya University Graduate School of Medicine, Dept of Anaesthesiology, Nagoya, Japan

Background: The diffusion of local anesthetics in the regional nerve blockade is usually observed fluoroscopically after the injection of mixture of the drug solution and a non-ionic contrast agent Iohexol. Actually, a clear contrast image of the drug diffusion can be obtained using Iohexol. However, taking patient's safety into consideration, X-ray exposure in fluoroscopy is not suitable for routine use. A minimally invasive contrast agent, "Sonazoid® for Injection" (Daiichi Sankyo) consists of perflubutane microbubbles and is characterized by a prolonged ability to maintain its contrasting attributes. In the present study, to establish a simple and trustworthy method for the observation of drug diffusion, we examined the usefulness of Sonazoid® in pig meat.

Materials and Methods: A mixed solution of Sonazoid® (final concentration: 1,000, 3,000, or 10,000 times dilution of clinically-used solution) and 0.04% trypan blue solution as a pigment was prepared. A nerve block needle was punctured into a pig meat and the epidural anesthesia catheter, which was filled with the prepared solution, was placed 2 cm from the needle tip and 0.1 ml of the solution was injected through the catheter.

After acquiring the imaging, the maximum reaching distance of the solution was measured using the contrast mode of the ultrasound diagnostic apparatus Aplio™ 300 (Toshiba Medical Systems). Then, the pig meat was sliced and the longest distance in the trypan blue stained region was measured by a ruler. The usefulness of Sonazoid® was evaluated by calculating the error rate from above two measurements. Statistical analysis was performed using the SPSS software.

Results: The error rates of 10,000, 3,000, and 1,000 times dilution of Sonazoid® were 42.0, 19.0, and 5.0% in median, respectively (n = 5). The error rate of 10,000 times dilution showed a significantly higher value as compared with those of the other groups (vs. 3,000 times dilution: p = 0.015, vs. 1,000 times dilution: p = 0.002).

There was no significant difference of the rate between 3,000 and 1,000 times dilution (p = 0.422). These results suggest that high concentration of Sonazoid® could be a useful tool for the detection of drug diffusion in the regional nerve blockade.

Conclusion(s): In the present study, we demonstrated that the error rates between ultrasonic diagnostic image and the real diffusion depended on the dilution rate of Sonazoid® in the observation of liquid diffusion using pig meat.

03AP04-1**Effect of the addition of dexamethasone on the effectiveness and duration of the sciatic-popliteal block with ropivacaine for Hallux surgery**

Gomez Martin A.¹, Gutiérrez González C.², García González N.², Noguero del Cid C.², Álvarez Arias C.², Posada Mesa L.F.¹

¹Hospital San Agustín, Dept of Anaesthesiology, Avilés, Spain, ²Hospital Universitario Central de Asturias, Dept of Anaesthesiology, Oviedo, Spain

Background and Goal of Study: Sciatic-Popliteal Blockade (SPB) provides a good anesthetic level during Hallux surgery. The addition of adjuvant drugs to local anesthetics (LA) improves the quality of nerve plexus blockade, including dexamethasone (DXM) because of its anti-inflammatory and decreasing vascular permeability effect.

The aim of our study is to assess the effect of DXM on the duration of postoperative analgesia in Hallux surgery, comparing the local administration versus intravenous.

Materials and Methods: Prospective, randomized study in patients scheduled for Hallux Valgus Surgery under sedation Midazolam 2mg and SPB as follows: Group 1 (n = 19): SCP with Ropivacaine 0.475%
Group 2 (n = 23): DXM (8 mg) in the BCP with Ropivacaine 0.475%
Group 3 (n = 22): SCP and DXM (8 mg) intravenously.
Age, ASA, weight, duration of surgery and consumption of analgesics and opioids were recorded intraoperative.

Postoperatively, we recorded VAS (Visual Analogic Scale), sensory and motor blockade at the outcome from Postanesthetic Unit, 6 h, 12 h and 24 h, duration of sensory and motor blockade, rescue analgesia, side effects and readmissions.

Statistical analysis: ANOVA (Analysis of Variance) with SPSS v18.0.

Results and Discussion: No statistically significant differences were found for demographic and intraoperative variables. There was a longer duration of the sensory blockade in groups 2 and 3 (22.75h ± 4.3 and 23.64h ± 4.7) compared to Group 1 (17.53 ± 3.8), although it was not statistically significant. There were also no statistically significant differences regarding VAS and duration of motor block at different times between the 3 groups. We found significant differences in number of readmissions. Only one of the patients in Group 1 required general anesthesia and no side effects were reported due to the drug.

Instead of our results showed a non significantly extension of the sensory block with the administration of DXM intravenously, the decreasing in readmissions is a great clinical sign that shows a better pain control.

Conclusion: It is necessary to conduct studies with a larger sample size to evaluate the clinical impact of the different routes of administration of DXM in patients with locoregional Anesthesia-Analgesia.

03AP04-2**The analgesic efficacy of dexamethasone as a perineural adjunct for peripheral nerve block versus systematic administration: a systematic review and meta-analysis**

Albrecht E.¹, Kirkham K.²

¹Lausanne University Hospital, Dept of Anaesthesiology & Pain Medicine, Lausanne, Switzerland, ²Toronto Western Hospital and Women's College Hospital, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada

Background and Goal of Study: Perineural dexamethasone has recently gained popularity in regional anaesthesia to prolong analgesia duration, but its advantage over intravenous administration is disputed. The objective of this meta-analysis is to compare the effect of both routes of administration on peripheral nerve blockade.

Materials and Methods: The methodology followed the PRISMA statement guidelines. The primary outcome was duration of analgesia analysed according to the type of local anaesthetic administered (bupivacaine or ropivacaine). Secondary outcomes included cumulative intravenous morphine consumption equivalent, pain scores and complication rates (infection, glycemia, neurologic deficit).

Results and Discussion: Nine controlled trials, including 665 patients were identified. Duration of analgesia was significantly increased by an average of 12% with perineural vs intravenous injection (mean difference: 2.5h; 95%CI: 0.5, 4.6 h; p=0.02). Subgroup analysis reveals that the duration of analgesia was increased 17% with bupivacaine (mean difference: 4.1h; 95% CI: 1.8, 6.3h; p=0.0003) and 8% with ropivacaine (mean difference: 1.5h; 95% CI: -1.4, 4.4h; p=0.31), without a difference between groups (p= 0.17). The quality of evidence for our primary outcome was moderate according to the GRADE system. There were no significant differences in the other secondary outcomes. No neurological complications or infections were reported. Hyperglycemia occurred more often when dexamethasone was injected intravenously, however, this was only reported by one trial.

Conclusion(s): There is evidence that perineural dexamethasone combined with bupivacaine prolongs the duration of analgesia when compared to intravenous dexamethasone. These results should be interpreted with caution due to heterogeneity of the results.

03AP04-7**The effect of caudal or intravenous dexmedetomidine on postoperative analgesia produced by caudal bupivacaine in children. A randomized controlled double blinded study**

AlJa'bari A., Alzaben K., Qudisat I.

University of Jordan, Dept of Anaesthesiology & Intensive Care, Amman, Jordan

Background and Goal of Study: The aim of this study was to compare the effects of caudal and intravenous dexmedetomidine 1Mic/Kg on postoperative analgesia after caudal bupivacaine in pediatric patients undergoing lower abdominal and perineal surgeries.

Materials and Methods: 75 ASA 1, children aged 1-6 years were randomly allocated in 3 groups. All received 1 ml/Kg caudal bupivacaine 0.25%. Group B (N=25) received 10 ml IV saline. Group B Dcau received 1 Mic/kg caudal dex. Group B DIV received 1Mic/kg IV dex.

Results and Discussion: Group B Dcau had a significantly lower time to first rescue analgesia than other groups. groups B Dcau and B DIV had lower pain and behavior scores than Group B. 8 patients in group B had agitation compared 2 in B DIV and 0 in group B Dcau. 4 patients developed bradycardia and hypotension in group B DIV.

Conclusion(s): Compared to IV Group, caudal dex. during caudal bupivacaine anesthesia provided prolonged postoperative analgesia and greater analgesic sparing without side effects.

References: Comparison of caudal bupivacaine alone with bupivacaine plus 2 doses of dex. for postoperative analgesia in pediatric patients undergoing infra umbilical surgeries. KAlzaben et al, journal of pediatric anesthesia June 2015.

03AP04-8**Dexamethasone as an adjuvant to local anesthetic in ultrasound-guided thoracic wall block for breast cancer surgery. A report of 2 cases**Ferrieri A.¹, Marrone A.¹, Bajocco C.², D'Ettorre M.³, Petrini F.¹, Maggiore S.M.¹

¹G. d'Annunzio' University, Training Centre of Anesthesia, Reanimation, Intensive Care and Pain Medicine, Chieti, Italy, ²ASST Gaetano Pino - CTO, Service of Anesthesia and Reanimation, Milano, Italy, ³University Vita-Salute San Raffaele, Dept of Anaesthesiology & Intensive Care, Milano, Italy

Background: Dexamethasone (DEX) has been used as an adjuvant in regional anaesthesia, both in perineural and in fascicular blocks. Following an algic stimulus, DEX seems to attenuate C-fibers response, thus down-regulating P-substance release and preventing neuropathic pain, and reduces cytokines release that sensitise the nociceptors. Its anti-inflammatory properties ease the periaxonal inflammation and ischemia of the surgically traumatized nerve, thus sparing nerve fibers and decreasing further damage.

However, DEX effect on the duration of analgesia and reduction in post-surgical pain is unclear, and no data exists on its use in patients undergoing regional anesthesia for breast surgery. We describe the effect of DEX on post-surgical pain in two patients undergoing regional anesthesia for breast surgery.

Case report: Two female patients (age: 60 years) underwent a supero-external segmentectomy with sentinel-node biopsy for breast cancer. The operation was performed with a thoracic wall block in deep sedation (Propofol 10 mg/ml injected at 2 mg/kg/h) with spontaneous respiration.

All patients were dosed with an intravenous premedication (fentanyl 100 mcg plus midazolam 2 mg) and intraoperative paracetamol (1000 mg i.v.). Both patients received levobupivacaine 0.375% + lidocaine 0.5% 35ml for the thoracic wall block.

Patient A received an intramuscular bolus of 8 mg DEX.

Patient B received 8 mg fascicular DEX diluted in the local anesthetics. Pain was assessed with the numerical rating scale (NRS) up to 48h after surgery. Adverse events were recorded.

Discussion and Results: Both patients had no or very mild pain. In particular, patient A experienced mild pain (NRS=1) from 24 to 36 hours after the operation. Patient B experienced no pain in the first 48hrs after the operation. No adverse event was recorded.

	NRS 2h	NRS 4h	NRS 6h	NRS 8h	NRS 12h	NRS 24h	NRS 36h	NRS 48h
Patient A	0	0	0	0	0	1	1	1
Patient B	0	0	0	0	0	0	0	0

[Table 1: Post-surgical pain]

Learning points: This is one of the first report on the use of adjuvant DEX during regional anesthesia for breast surgery. In our patients, DEX administration (both i.m./fascicular) during thoracic wall block for breast cancer surgery was feasible and safe, and could have played a role in decreasing or delaying postoperative pain.

03AP04-9**Comparison of Dexametazone 8mg with Diclophenac 75mg to prevent headaches after spinal anaesthesia**Gani H.¹, Naco M.¹, Shpata V.², Ohri I.¹, Kerçi M.¹, Sula H.¹

¹UHC 'Mother Teresa', Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ²University of Medicine, Faculty of Medical Science and Technical, Dept of Anaesthesiology, Tirana, Albania

Background and Goal of Study: The aim of this study was to determine the preventive effect of dexamethasone 8mg or Diclofenac 75 mg on relative frequency and intensity of PDPH after spinal anesthesia.

Materials and Methods: In this study are included 180 patients (ASA) physical status I-II patients, aged 18-45 years, scheduled for urologics procedures under spinal anesthesia participate in this double-blind, randomized, controlled study. The patients with history of migraine or other type of headache were excluded. After the patients arrived to the operating room, noninvasive arterial blood pressure, heart rate, respiratory rate and (SpO2) level were monitored. Patients were divided into 3 groups with 60 patients each; G1 control group, (didn't take anything). G2 (which took Dexametazon 8 mg), and G3 (which took Diclofenac 75 mg). All procedures were performed in sitting position by same anaesthesiologist with enough experience. The sub-arachnoid space was punctured with a 26 G Whitacre needle at L2/L3, with Bupivacaine 0.5%-3ml (15mg). Bradycardia or hypotension that happens is fixed with Ephedrine or Atropine. Before surgery, the patients were informed about using visual analog scale (VAS), ranging from 0 (none) to 10 (worst possible pain), for evaluation of their headache. By using VAS score, PDPH was evaluated at 6-48 h after arrival to the ward. Chi-square test was applied to compare the mean values of Postdural puncture headache (PDPH) between the two groups P value ≤0.05 was considered statistically significant.

Results and Discussion: There were no differences between the two groups regarding shivering (P<0.6), hemodynamic changes (P<0.8). Number of patients who had a headache in G3 was only 3 patients (5%) out of them. In G2 the patients with headache were nine (15%). While in G1 the patients with headache were 11 patients (18% out of them), with a statistically significant difference between the G3 and G2 and G1 groups (P<0.05). There were also noticed differences regarding VAS between the two groups (G3/G1 and G3/G2). In G3 VAS was 2.3±0.7, while in G2 VAS was 6.3 ±0.7. In G1 VAS was 6.7± 1.2, (P<0.05). But it didn't have a statistically difference between G1 and G2. In G1 VAS was 6.7± 1.2, while in G2 VAS was 6.3 ±0.7 (P<0.8).

Conclusion(s): We came to the conclusion that the prophylactic use of Diclofenac 75 mg before spinal anesthesia, plays a role in reducing headaches after spinal anesthesia in the new ages (P<0.05).

03AP05-1**Thoracic paravertebral block assessed with computed tomography Cone Beam 3D. Part one: different patterns of diffusion**

García Gregorio N.¹, Diaz Cambronero O.¹, Alberola Estelles M.J.¹, Marques Gonzalez A.¹, Errando Oyonarte C.², Argente Navarro P.¹
¹Hospital Universitario y Politecnico La Fe, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²Consortio Hospital General Universitario de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background and Goal of Study: Diffusion of local anesthetic (LA) and somatosensory extension after thoracic paravertebral block (TPVB) are not predictable. Most published diffusion studies are conducted in cadaver models, guided by classical techniques. There are few diffusion studies following ultrasound-guided (US) puncture. Our objective was to describe the patterns of diffusion of LA into the paravertebral space after US-guided bilateral TPVB through 3D computed tomography (CTCB) images analysis.

Materials and Methods: Observational prospective study. Institutional Ethics Committee and patient informed consent was obtained. Seventy-five bilateral TPVB were performed in 45 patients (>18 yo, ASA II-III) scheduled for transarterial chemoembolization for treatment of liver tumor lesions. Exclusion criteria: refusal to participate, BMI >30 kg/m², thoracic spine surgery/anomalies, LA or contrast hypersensitivity, platelet count <70x10⁹/L, Quick index <60%. Under standard monitoring, sedation and the patient in prone position we performed US single-shot TPVB at the 6th thoracic vertebral level (5 ml of lomeprol 350, 5 ml of PS, 5 ml of LA per side). Afterwards CTCB was performed. A single, blinded radiologist evaluated diffusion pattern (*longitudinal* L, predominant diffusion in the paravertebral space (TPVS); *intercostal* IC, predominant diffusion in intercostal space; *cloud-like* CL rounded diffusion without clear L or IC; *mixed* M: two or more patterns combined) and US image quality (good, adequate, suboptimal).

Results: Twelve TPVB were excluded due to image loss. Specific US landmarks could be identified and TPVB performed in all cases. The mean (SD) distribution of LA was 2.63 (1.63) vertebral levels for the right side and 2.75 (1.23) for the left. Data about different patterns are shown in table 1. In 3 TPVB there was interpleural diffusion. In 38.1% of TPVB there was epidural diffusion and in 71.4% prevertebral diffusion.

Pattern of difusion	Right TPVB	Left TPVB
1. Longitudinal	1 (1.6%)	1 (1.6%)
2. Cloud-like	5 (7.9%)	7 (11.1%)
3. Intercostal	10 (15.9%)	5 (7.9%)
4. Mixed	45 (71.4%)	49 (77.8%)
5. Other	2 (3.2%)	1 (1.6%)

[Table 1. Patterns of diffusion]

Conclusion: Despite US-guide part of the LA diffuses outside the TPVS probably because its anatomical communications. The most frequent was mixed spread patten. A significant proportion of LA goes to the epidural and prevertebral spaces.

03AP05-2**Thoracic paravertebral block assessed with 3D Cone Beam computed tomography. Part two: clinical effectiveness for transarterial liver chemoembolization**

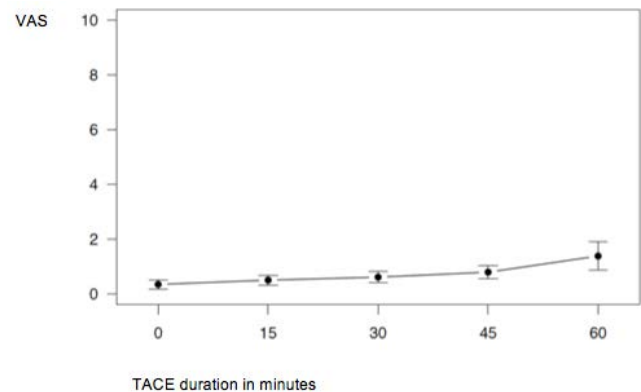
García Gregorio N.¹, Diaz Cambronero O.¹, Vila Montañes M.¹, Marques Gonzalez A.¹, Errando Oyonarte C.², Argente Navarro P.¹
¹Hospital Universitario y Politecnico La Fe, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²Consortio Hospital General Universitario de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background and Goal of Study: Thoracic paravertebral block (TPVB) has been described as a safe and effective anesthetic technique for thoracoabdominal interventions. Compared to epidural anesthesia, the gold standard, it has a lower rate of adverse effects and contraindications. Our objective was to

evaluate the effectiveness of ultrasound-guided (US) bilateral TPVB for treatment of tumor liver lesions by transarterial chemoembolization (TACE). Part 1 described the patterns of diffusion.

Materials and Methods: Observational prospective study. Institutional Ethics Committee and patient informed consent was obtained. 75 bilateral TPVB were performed in 45 patients (>18 yo, ASA II-III) scheduled for TACE. Exclusion criteria: refusal to participate, BMI >30 kg/m², thoracic spine surgery/anomalies, LA or contrast hypersensitivity, platelet count <70x10⁹/L, Quick index <60%. The patient was sited in prone position. Under standard monitoring and conscious sedation US single-shot bilateral TPVB was performed at thoracic six level (5 ml of lomeprol 350, 5 ml of PS, 5 ml of LA per side). Somatosensory block level extension was evaluated 20 min after the puncture by pinprick (adequate level from 5th to 12th). Propofol perfusion was used for sedation and intraoperative pain was evaluated by visual analogue scale (VAS) every 15 min. Fentanyl 50 microg boluses were administrated if VAS >4. Procedural complications and adverse effects during TPVB and TACE were recorded.

Results: 12 TPVB were excluded due to image loss. Although somatosensory level was insufficient in most cases, analgesia was enough to complete the procedure in all cases (Figure 1): consumption of fentanyl was 0 microg in 76.2% cases, 50 microg in 9.5% cases and 100 microg in 14.3% cases. The only complication recorded was nausea and vomiting in 12.7% TPVB. There was no pleural puncture, pneumothorax or systemic LA toxicity.



[Figure 1. VAS during TACE]

Conclusions: TPVB is effective and safe for TACE. Somatosensory extension is inadequate to evaluate TPVB effectiveness. US improves accuracy, allowing constant visualization of the needle and diffusion of LA. It also allows to decrease the effective dose, minimizing toxicity of LA.

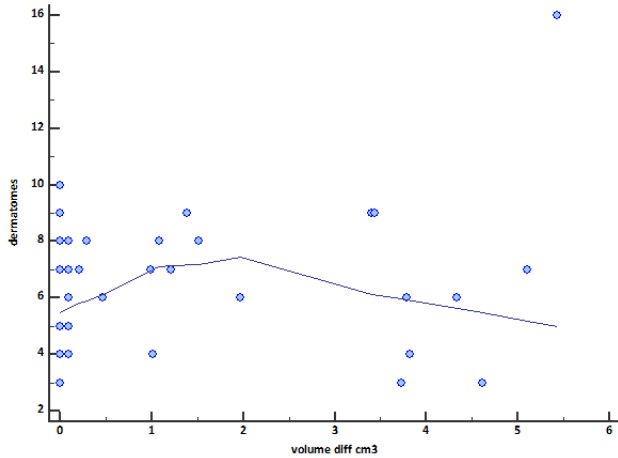
03AP05-3**Measurement of local anesthetic volume spread in epidural space during paravertebral block**

Atallah F.¹, Clauzet E.¹, Lieutaud S.¹, Jaffro M.², Mazerolles M.¹
¹Toulouse University Hospitals, Dept of Anaesthesiology & Intensive Care, Toulouse, France, ²Toulouse University Hospitals, Radiology, Toulouse, France

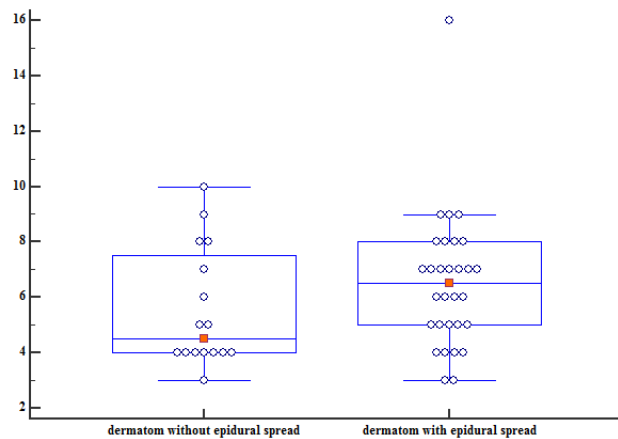
Background and Goal of Study: Paravertebral block (PVB) is frequently associated with some epidural spread of the local anesthetic (LA) injected in the paravertebral space. We studied by computed tomography (CT) the incidence of this spread, measured the amount of the local anesthetic detected in the epidural space and looked for its influence on sensory block extension.

Materials and Methods: After local ethical committee approval and informed consent, 46 patients undergoing percutaneous radio-frequency ablation of renal tumor were studied. PVB was performed at two levels (T9,T11) according to Eason Wyatt technique. After CT control of needles extremity position, 13ml of levobupivacaine 3.75% and 2ml of radio-opaque iohexol 300 were injected at each level. A second CT control was realized 5 minutes later. Sensory block was checked by cold test and number of blocked dermatomes recorded at 20 and 90 min. CT saggital sections were reconstructed and computed using Osirix Lite medical imaging viewer software to measure volume of LA spread in the epidural space.

Results and Discussion:



[Sensory block extension and Epidural Volume Spread]



[Sensory block extension and epidural spread]

The two groups with and without epidural spread were statistically similar regarding age, size, weight and sex. There was a spread of LA to epidural space in 30 out of 46 patients (65%). Only 20 patients had a significant measurable volume of spread ($\geq 0.1\text{cm}^2$). Mean volume was 1.07 ± 1.73 ml with a range of 0-5.43 ml. There was neither correlation between sensory block importance and presence of epidural spread, Mann-Whitney test ($p=0.177$) nor with volume of local anesthetic spread in epidural space, Spearman ($p=0.127$, $r_s=0.228$).

Conclusion: During PVB, the incidence of epidural spread was high, but the volume of local anesthetic spread was small. This epidural spread did not influence significantly the importance of sensory block.

Acknowledgement: Dr JM Conil for his kind valuable statistical help.

03AP05-4

Influence on a haemodynamic the paravertebral blockade at the open radical cystectomy

Kananchuk S., Ilukevich G.V.

Republican Clinical Medical Belarus President Administration Centre, Dept of Anaesthesiology & Intensive Care, Minsk, Belarus

Background and Goal of Study: security impact assessment of paravertebral blockade on hemodynamics during radical cystectomy.

Materials and Methods: On the basis of the NCCB from 2013 of 2016 was carried out a prospective randomized study with an analysis of anesthetic management of radical cystectomy in 107 patients with the bladder cancer (88 men and 19 women) mean age 61.0 ± 9.1 . All patients used an endotracheal anesthesia with regional blockade. The test subjects were divided into 3 clinical groups (Gr): Gr1 ($n=36$, 33.6% of the total number of patients) - performed prolonged bilateral paravertebral blockade. Puncture and catheterization

was performed at the level $\text{Th}_9\text{-Th}_{10}$; Gr2 ($n=35$, 32.8%) - prolonged epidural blockade, was performed at $\text{Th}_9\text{-Th}_{10}$; Gr3 ($n=36$, 33.6%) - combined spinal-epidural at two levels (epidural at $\text{Th}_9\text{-Th}_{10}$; spinal - at $\text{L}_2\text{-L}_3$). Adequacy of anesthesia throughout was evaluated in terms of mean arterial pressure (MAP), heart rate (HR), in addition to the integrative assessment of blood pressure used the coefficients R1 and R2. R1-the ratio of the systolic blood pressure to the diastolic blood pressure and the R2-ratio diastolic blood pressure to pulse pressure. Normally, $R1=1.67 \pm 0.18$ units., $R2=1.60 \pm 0.49$ units. Allocate the following stages of the study: 1st-before the surgery; 2nd-beginning of the operation; 3th-most traumatic stage operation, 4th - ending the operation. Statistical processing was performed using the SPSS program.

Results and Discussion: After 15.0 ± 4.3 min after the start of surgery in all clinical groups noted gradual stabilization of the HR to stress-normal level. Marked reduction in HR was observed in 9 patients, which required the use of M-anticholinergics: in the Gr2 - 6 pers., in Gr3 - in 3, in Gr1 - was not required. Between the groups on the map were statistically significant differences in the results ($p \leq 0.05$) between Gr1 and Gr2 between Gr1 and Gr3, starting with the 2nd stage, which required the use of inotropic support in the Gr2 - in 15 patients, and Gr3 - in 24. The indicators R1 and R2 were no significant differences between the groups, in Gr3 the values of R2 from the start of surgery there was a statistically significant increase compared to the norm.

Conclusion(s): The use of paravertebral blockade at radical cystectomy effective method of anesthetic management, provides hemodynamic stability and is most appropriate in patients with concomitant diseases of the cardiovascular system.

03AP05-6

Erector spinae plane block: a new regional analgesic option for thoracoscopy

Vicente Fernandez P¹, Pereira F², Morales Sarabia J.¹, Biosca Perez E.¹, Gomez Diago L.¹, Hernandez Cadiz M.J.¹

¹Hospital General Universitario de Valencia, Dept of Anaesthesiology & Pain Medicine, Valencia, Spain, ²Hospital Santa Maria Maior, Dept of Anaesthesiology, Lisboa, Portugal

Background: A novel interfascial block has been applied by Forero et al.'s in patients with severe thoracic neuropathic pain and acute postoperative pain after thoracoscopy(1).

This surgery requires general anaesthesia and one-lung ventilation. Regional analgesia techniques, as epidural or paravertebral blocks, are usually not performed and are not justified in this type of procedures.

The ESP block seems to affect both dorsal and ventral rami of the thoracic spinal nerves and good quality of analgesia may be achieved with less potential complications.

Case report: We performed this new regional technique in a patient who underwent thoracoscopic surgery for superior left lobe lung resection.

After the induction of anaesthesia the patient was positioned in right lateral decubitus. The linear ultrasound probe was positioned on the left side with longitudinal orientation 3cm lateral to the T5 spinous process. First, an horizontal scan of the area was performed and three muscles, superficial to the transverse process, were identified by this order: trapezius, rhomboid major and erector spinae. Second, a 100 mm block needle was inserted in plane with a caudal orientation until the posterior interfascial space of the erector spinae muscle. A total of 20 ml of levobupivacaine 0,25% was injected in this area with a single injection.

In the postoperative care pain assessment the patient showed an EVA 0 in movement as resting, also maintaining thermoanalgesic sensibility. Controls were made at 12, 24 and 48h. EVA 0 did not change in any control, being the coadjuvant analgesia minimally needed. Due to this optimum analgesic control the patient was able to breath deeply and make a very efficient breathing physiotherapy.

The patient was discharged at 72h without reporting any complication neither needing rescue analgesia.

Discussion: We think that this new regional block can be a paramount tool to control acute postsurgical pain after minimal invasive thoracic surgery. However, due to the lack of evidence of the ESP block in the acute pain setting, further studies should be performed to evaluate this technique.

References: 1. Forero M, Adhikary S, Lopez H, et al. The Erector Spinae Plane Block: A Novel Analgesic Technique in Thoracic Neuropathic Pain. Reg Anesth Pain Med 2016;41: 00-00

Learning points: Erector spinae block. Thoracoscopy.

03AP05-8**Analgesic effectiveness of modified continuous transversus abdominis plane block with low dose of local anesthetic continuous infusion in closure loop stoma in accordance with ERAS pathway**

Cholvisudhi P., Morarach P.

Faculty of Medicine, Chulalongkorn University, Dept of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: Closure loop stoma can be performed as a minor surgery, but patients still suffer from postoperative pain. With enhanced recovery after surgery (ERAS) concept increasingly becoming a concern among surgeons, one key success is new evidence about modern alternatives to traditional morphine-based analgesic regimens. We have therefore modified a technique of continuous transversus abdominis plane block (MCTAP) by a catheter insertion into TAP plane by surgeon under direct visualization. Also, we used very low dose of local anesthetic continuous infusion: 2 ml/hr- that has never before been experimented. The aim of this analytic cohort study was to evaluate the analgesic effectiveness of MCTAP block compared with opioid-based analgesia in stoma reversal patients.

Materials and Methods: After approval of the Institutional Review Board, patients undergoing closure loop stoma were examined and divided into two groups. Patients who received postoperatively continuous infusion of 2 ml/hr bupivacaine 0.2% via TAP catheter plus intravenous morphine injection as needed were enrolled in MCTAP group, while patients receiving intravenous morphine injection on demand alone were enrolled in conventional group. Opioid consumption, numeric rating pain scores (NRPS), time to bowel function returns, and surgical recovery were recorded.

Results and Discussion: A total of 42 patients, 20 were in MCTAP group and 22 in conventional group. Total morphine consumption in MCTAP patients was significantly lower than conventional patients (7.4 ± 2.4 , 21.82 ± 5.4 mg respectively, $P < 0.005$). No significant difference was detected in NRPS. The median of time to first flatus was significantly less in MCTAP patients (35 and 42 hrs, respectively, $P < 0.05$). Also, Time to first clear liquid intake was significantly less in MCTAP patients (41 and 46.5 hrs, respectively, $P < 0.05$). Patients in MCTAP group required significantly less postoperative length of stay than those in conventional group (median = 85 and 96 hrs, respectively, $P < 0.01$).

Conclusion(s): This study demonstrates that MCTAP block with low dose local anesthetic continuous infusion is an effective analgesic technique in closure loop stoma and may also be a useful alternative analgesic remedy following stoma reversal in accordance with ERAS concept.

03AP05-9**The ropivacaine concentration required for ultrasound-guided rectus sheath block in pediatric patients undergoing laparoscopic inguinal hernia repair surgery**Tachi K.¹, Inomata S.², Tokuwaka J.¹, Oosaka Y.², Tanaka M.²¹University of Tsukuba Hospital, Dept of Anaesthesiology, Tsukuba, Japan, ²University of Tsukuba, Dept of Anaesthesiology, Tsukuba, Japan

Background and Goal of Study: The rectus sheath block (RSB) is a method of obtaining analgesia by injecting a local anesthetic into the intercostal nerve passing through the rectus abdominis muscle as a target. The RSB was reported to be useful for analgesia of pediatric umbilical hernia surgery. However, the concentration of ropivacaine required for this block is not clear. We examined the concentration of ropivacaine required for RSB under ultrasonic guidance for children undergoing laparoscopic inguinal hernia repair surgery.

Materials and Methods: The study was approved by our institutional review board. We studied 25 consecutive children (age range, 9 months to 7 years) ASA physical status I to II undergoing laparoscopic inguinal hernia repair surgery. After the introduction of general anesthesia with nitrous oxide and 5% sevoflurane in oxygen, intravenous (IV) catheter was inserted. Orotracheal intubation was performed without IV anesthetics or neuromuscular relaxants. Ultrasonic-guided RSB was then performed using a linear probe (6 - 13 Hz). The dosage of ropivacaine was 0.15 ml/kg on one side, 0.30 ml/kg in total. The concentration of ropivacaine was determined by Dixon's up-and-down method starting from 0.30% in increments of 0.05%. After completion of the block, general anesthesia was maintained with sevoflurane (expiratory con-

centration 2%) in oxygen and air. The surgery started ≥ 15 minutes after the RSB. If there was body movement or a raise in the patient's heart rate or systolic blood pressure of $\geq 20\%$ within 1 minute from the start of the surgery, the RSB was judged invalid.

The half maximal effective concentration (EC_{50}) for the ropivacaine RSB was calculated using the probit test.

Results: The EC_{50} of RSB using ropivacaine in the pediatric patients (weight range, 8.1-21.8 kg) was $0.16 \pm 0.09\%$ (mean \pm SD). The maximum concentration of ropivacaine required for the RSB was 0.30% in this patient series.

Conclusions: The EC_{50} of ropivacaine for ultrasound-guided RSB was $0.16 \pm 0.09\%$ in pediatric patients under general anesthesia. The highest ropivacaine concentration required for the RSB was 0.30%. We will continue our research to calculate the EC_{95} .

03AP05-11**Ultrasound-guided continuous thoracic paravertebral block in a pediatric patient with severe scoliosis for nephrectomy surgery**Ibrahim M.¹, Thompson M.²¹University at Buffalo, Dept of Anaesthesiology, Buffalo, United States, ²Women & Children's Hospital of Buffalo, Dept of Anaesthesiology, buffalo, United States

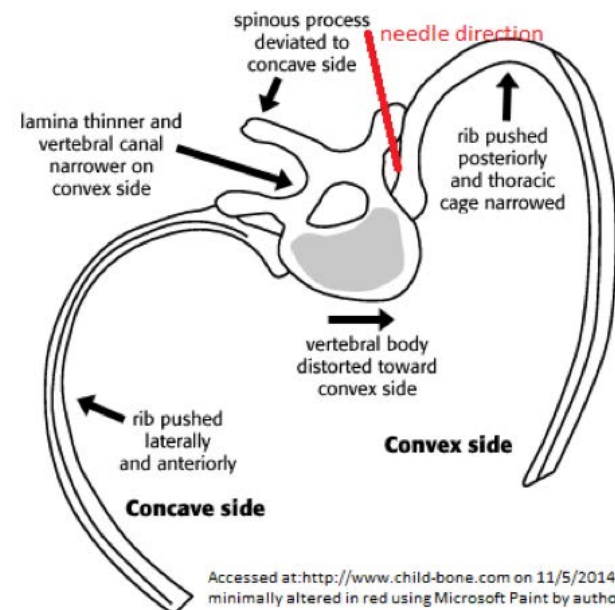
Background: Thoracic epidural anesthesia is an accepted pain management technique for major upper abdominal surgery. Presence of moderate scoliosis has a higher rate of difficult or failed placement. Here we report successful placement of thoracic paravertebral block (TPVB) catheter under USG (ultrasound guidance) in a patient with severe scoliosis for unilateral flank incision for nephrectomy for persistent severe pyelonephritis.

Case report: An 8 years old 19 kg male patient with

- profound global developmental delay
- spina bifida
- severe scoliosis and
- long course of pyelonephritis with significant symptoms

presented for open left nephrectomy via flank incision. Pre-procedure US scanning was performed in the sagittal, intercostal oblique, and axial planes to formulate a planned needle direction. Under USG, an 18 gauge Touhy needle was advanced using transverse intercostal in plane technique. Needle visualization and indentation of the pleura verified position of the needle. Catheter was threaded and secured in place.

Patient was evaluated postoperatively by the nursing staff, he consistently had a pain score of 0/10 throughout the postoperative course, no narcotics were needed. Catheter was removed on postop day 3.



Accessed at: <http://www.child-bone.com> on 11/5/2014, minimally altered in red using Microsoft Paint by author

[illustration photo]

Discussion: Continuous TPVB was successful in providing postoperative pain control after nephrectomy surgery in our pediatric patient with severe scoliosis. Real time assessment of anatomic structures before needle placement was achieved with ultrasound scanning. Scoliosis clearly poses challenges and additional risk for neuraxial and regional techniques. Moderate and severe scoliosis may not preclude placement of TPVB, and ultrasound is useful to facilitate its placement. Understanding chronic curvature of spinous processes and transvers processes in patients with scoliosis is important.

References:

- Bowens C et al. An approach to neuraxial anaesthesia for the severely scoliotic spine. *Br J Anaesth*
 2. Ko JY, et al. Clinical implications of neuraxial anesthesia in the parturient with scoliosis. *Anesth Analg*

Learning points: Severe scoliosis isn't a contraindication to neuraxial anesthesia and paravertebral catheter can safely be inserted under USG.

03AP06-1

Iliac fossa block is useful for postoperative analgesia of total hip arthroplasty

Murata Y¹, Inomata S.², Tajima K.³, Saito S.⁴, Tanaka M.²

¹University of Tsukuba Hospital, Dept of Anaesthesiology, Tsukuba, Japan, ²University of Tsukuba, Dept of Anaesthesiology, Tsukuba, Japan, ³Tsukuba Memorial Hospital, Dept of Anaesthesiology, Tsukuba, Japan, ⁴Tsukuba Gakuen Hospital, Dept of Anaesthesiology, Tsukuba, Japan

Background: Benefit of combined regional anesthesia during lower-extremity joint operation under general anesthesia have been reported. However, a peripheral nerve block presents a risk of nerve injury. Here we examined new type of block; iliac fossa block, in which a medicinal solution is injected into the iliac fossa distant from the nerve. Like the conventional iliac fascia block, the iliac fossa block can block the lateral femoral cutaneous nerve, femoral nerve and obturator nerve. In addition, because of the local anesthetic spread to the central side, the block can be expected to act on the lumbar plexus.

Methods: This study was approved by the Ethics Committee, and we informed consent from adult patients who were confirmed to undergo a total hip arthroplasty (THA) under general anesthesia. Patients who were contraindicated for regional anesthesia or had neurological disorders, diabetes mellitus, etc. were excluded. Although the securing of airway and the medication for general anesthesia were at the discretion of each anesthesiologist, fentanyl and remifentanyl were used as opioids. In the iliac fossa block group after the introduction of anesthesia, 40 ml of 0.25% ropivacaine was injected, in the control group, the block was not used. We determined the amount of fentanyl used during each surgery and the requirement of fentanyl as intravenous patient-controlled analgesia (IV-PCA) up to 48 hr post-surgery. The primary outcome was cumulative fentanyl consumption up to 48 hr post-surgery. We also checked the block area. The values were mean \pm standard deviation, p value less than 0.05 was considered as significant in the unpaired t-test.

Results: Age and BMI average were 60 years old and 24 kg / m², respectively, with no significant difference between the two groups. In regarding to intraoperative fentanyl dose, there was no significant difference between 208 \pm 80 μ g in the block group (n = 10) and 242 \pm 61 μ g in the control group (n = 13). The cumulative fentanyl requirement values at 24 and 48 hr postoperatively were significantly less in the block group vs. the control group; 274 \pm 46 μ g vs. 468 \pm 305 μ g at 24 hr (p = 0.03) and 557 \pm 138 μ g vs. 788 \pm 405 μ g at 48 hr (p = 0.05). The surgical time was significantly longer in the block group (p=0.01).

Conclusion: The postoperative fentanyl requirement was significantly less in the iliac fossa block group, and this block was useful for the postoperative analgesia of THA.

03AP06-2

Comparison of two peripheral block methods for position pain in femoral neck fractures

Unal H., Baskan S., Aytac I., Alkan M., Baydar M.

Numune Research and Education Hospital, Dept of Anaesthesiology & Intensive Care, Ankara, Turkey

Background and Goal of Study: In cases of femoral neck fractures, spinal, or epidural block combined techniques are widely preferred anesthesia. However, the position during the application of these techniques causes severe pain especially in lateral decubitus position. The fascia iliaca compartment block and the femoral nerve block are two of the peripheral nerve blocks used to relieve the patient's position pain due to the femur fracture. The purpose of this study is to compare the comfort of the patient with femoral neck fracture, which is applied preoperatively with the ultrasound-guided, femoral or fascia iliaca block while positioning during regional anesthesia.

Materials and Methods: 60 ASA physical status I-III patients aged minimum 60 years included in this study. Fascia iliaca compartment block (FICB) performed with USG in Group-1, USG-assisted femoral nerve blockade in group-2. Sensory block times, before and during position VAS scores, patient satisfaction and additional sedation recorded.

Results and Discussion: Complete block time in two groups were 16,2(\pm 3,7) in FICB and 14,8(\pm 3,6) in FNB. In addition, we found that both blocks were effective in reducing the VAS score. Although no statistically significant difference was found, the FNB group found that the satisfaction level of the patients was higher than the other group.

Conclusion(s): We conclude that FICB can be used to relieve pain during positioning of the patient in neuroaxial block applications in hip fracture operations similar to FNB, and patients may be satisfied with this situation.

References:

1. Iamaroon A, Raksakietisak M, Halilamien P, Hongsawad J, Boonsararuxsapong K. Femoral nerve block versus fentanyl: Analgesia for positioning patients with fractured femur. *Local Reg Anesth*, 2010;3:21-6.
2. Kumar D, Hooda S, Kiran S, Devi J. Analgesic Efficacy of Ultrasound Guided FICB in Patients with Hip Fracture. *J Clin Diagn Res*. 2016 Jul;10(7):UC13-6. doi: 10.7860/JCDR/2016/17802.8123.
3. Yun MJ, Kim YH, Han MK, Kim JH, Hwang JW, Do SH. Analgesia before a spinal block for femoral neck fracture: fascia iliaca compartment block. *Acta Anaesthesiol Scand*. 2009 Nov;53(10):1282-7. doi: 10.1111/j.1399-6576.2009.02052.x.

03AP06-3

Pudendal nerve block with ropivacaine decreased catheter-related bladder discomfort in male patients: a randomized controlled study

Liao R.

West China Hospital, Sichuan University, Dept of Anaesthesiology, Chengdu, China

Background: Catheter-related bladder discomfort (CRBD) is a common distressing symptom complex during the postoperative period, especially in urologic procedure with a relative greater size urinary catheter. In this study, we enrolled male patients undergoing elective prostate surgery with urinary catheterization under general anesthesia, and compare the efficacy of pudendal nerve block (PNB) and intravenous tramadol in CRBD prevention.

Materials and Methods: A total of 91 male patients undergoing elective prostate surgery with urinary catheterization were randomized to receive either bilateral PNB with 0.33% ropivacaine (the PNB group, n=45) or intravenous tramadol 1.5mg/kg (the TRA group, n=46) after the completion of surgery. The primary outcome was the incidence of CRBD. The most important secondary outcome was the severity of postoperative CRBD, and other secondary outcomes included numeric rating scale (NRS) for postoperative pain, incidences of postoperative side effects including postoperative nausea/vomiting (PONV), sedation, dizziness, and dry mouth.

Results: The incidence of CRBD was significantly lower in the PNB group than in the TRA group, either upon arrival to PACU (15.5% v.s 63.1%,), or at 1h (13.3% v.s 54.3%), 2h (13.3% v.s 58.7%), 4h(8.9% v.s 39.1%) and 6h (11.1% v.s 43.6%) after patients' arrival in PACU. Compared with the TRA group, the severity of postoperative CRBD upon arrival to PACU (p=0.012), and at 1 h

($p=0.027$), 2h ($p=0.021$), 4h ($p=0.033$), and 6h ($p=0.035$) after patients' arrival in PACU were all significantly reduced in the PNB group. The incidences of postoperative nausea, vomiting, dizziness, and sedation were decreased significantly in the PNB group compared with the TRA group ($p < 0.05$).

Conclusion(s): Pudendal nerve block with ropivacaine has a better effect for CRBD reduction and less side effects than intravenous tramadol administration for male patients undergoing prostate surgery.

		PNB group (n=45)				TRA group (n=46)					
Time point		0h	1h	2h	4h	6h	0h	1h	2h	4h	6h
Incidence of CRBD*	Yes	7 (15.5%)	6 (13.3%)	6 (13.3%)	4 (8.9%)	5 (11.1%)	29 (63.1%)	25 (54.3%)	27 (58.7%)	18 (39.1%)	20 (43.5%)
	No	38 (84.5%)	39 (86.7%)	39 (86.7%)	41 (91.1%)	40 (88.9%)	17 (36.9%)	21 (45.7%)	19 (41.3%)	28 (60.9%)	26 (56.5%)
Severity of CRBD*	Mild	4	3	4	4	4	16	15	14	12	15
	Moderate	3	3	2	0	1	6	3	7	3	2
	Severe	0	0	0	0	0	7	7	6	3	3
NRS score (Median)		3	2	1	2	1	4	2	2	2	2
Incidence of side effects	Nausea*	0	2	0	0	0	19	11	3	3	1
	Vomiting*	0	0	0	0	0	9	3	2	0	0
	Dizziness*	0	0	0	0	0	9	4	2	0	0
	Sedation*	4	2	0	0	0	17	13	5	5	3

*: $p < 0.05$ during intergroup comparison.

[Table. Incidence and severity of CRBD]

03AP06-4

The analgesic efficacy of local infiltration analgesia versus peripheral nerve block after anterior cruciate ligament reconstruction: a systematic review and meta-analysis

Albrecht E.¹, Kirkham K.²

¹Lausanne University Hospital, Dept of Anaesthesiology & Pain Medicine, Lausanne, Switzerland, ²Toronto Western Hospital and Women's College Hospital, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada

Background and Goal of Study: Femoral nerve block is considered by many to be the gold standard in pain management following anterior ligament reconstruction. Local infiltration analgesia is an alternate approach that applies the concept of surgical wound infiltration with local anaesthetics. The objective of this meta-analysis was to compare both analgesic treatments for analgesia and functional outcomes following anterior ligament reconstruction.

Materials and Methods: This meta-analysis was performed according to the PRISMA statement guidelines. The primary outcomes were pain scores at rest (analogue scale, 0-10) in the early (0-2 postoperative hours), intermediate (3-12 postoperative hours), and late postoperative periods (13-24 postoperative hours). Secondary outcomes included range of motion, quadriceps muscle strength, and rates of complications (neurologic events, cardiovascular events, falls and knee infections.)

Results and Discussion: Ten trials, including 588 adult patients were identified. Pain scores in the early (mean difference: 1.6; 95%CI: 0.2, 2.9mg; $I^2=97%$; $p=0.02$), intermediate (mean difference: 1.2; 95%CI: 0.4, 1.5; $I^2=85%$; $p=0.002$) and late (mean difference: 0.7; 95%CI: 0.1, 1.4; $I^2=82%$; $p=0.03$) postoperative periods were significantly reduced in patients with femoral nerve block. The qualities of evidence for our primary outcomes were moderate to high according to the GRADE system. Regarding the functional outcomes, only one trial reported similar range of motion at 48 postoperative hours. No trials sought to record sides-effects.

Conclusion(s): Femoral nerve block provides superior postoperative analgesia after anterior cruciate ligament reconstruction compared to local infiltration analgesia. The impact of improved analgesia on function remains unanswered due to the lack of functional outcomes recorded.

03AP06-5

Effect of lateral femoral cutaneous nerve block combined with femoral nerve block on postoperative pain after total hip arthroplasty: a retrospective study

Terao Y.¹, Oji M.¹, Urabe S.¹, Tominaga S.¹, Fukusaki M.¹, Hara T.²

¹Nagasaki Rosai Hospital, Dept of Anaesthesiology, Sasebo, Japan,

²Nagasaki University School of Medicine, Dept of Anaesthesiology, Nagasaki, Japan

Background and Goal of Study: There are conflicting reports whether lateral femoral cutaneous nerve-block (LFCNB) combined with analgesics is effective for postoperative pain after total hip arthroplasty (THA). This retrospective study was carried out to determine whether LFCNB combined with femoral nerve-block (FNB) is effective for postoperative pain after THA.

Materials and Methods: The Institutional Research Committee approves this retrospective study and to waive informed consent. This study was conducted in Nagasaki Rosai Hospital from June 2015 to November 2015 (pre-LFCNB period) and June 2016 to November 2016 (post-LFCNB period). We started LFCNB combined FNB in the all patients undergoing THA before general anesthesia from April 2016. We included consecutive 39 patients without nerve block (NB group) in pre-LFCNB period and 45 patients with nerve block (B group) in post-LFCNB period. Exclusion criteria were spinal anesthesia, revision arthroplasty and bilateral arthroplasty. Ultrasound guided LFCNB and FNB with each 0.25% levobupivacaine 20ml were performed before general anesthesia in B group. Anesthesia was induced with thiopental or propofol followed by sevoflurane, or total intravenous anesthesia with propofol. Fentanyl and remifentanyl were used as the analgesic agent. 50 mg of flurbiprofen or 1000 mg of acetaminophen was administered before skin closure. The pain score was evaluated by numeric rating scale (NRS) from 0 to 10 at 0 (T0), 1 (T1), 3 (T2), 6 (T3) and 9 (T4) hr after surgery, and in the next morning (TN). The patients were administered diclofenac sodium, loxoprofen or pentazocine for postoperative pain, if needed. We evaluated the number of administration of them until 12 hr and 24 hr after surgery. The results were expressed as median. Statistical analyses were performed by Mann-Whitney *U* test or Chi square test. A p -value < 0.05 was considered statistically significant.

Results and Discussion: The height, weight and number of men out of patient's characteristics were higher in NB group compared with B group. NRS scores for postoperative pain at T0 [0 (0, 4) vs 5 (0, 8)], T1 [0 (0, 2) vs 5 (2, 7)], T2 [1 (0, 2) vs 4 (2, 5)], T3 [1 (0, 3) vs 3 (2, 4)] and T4 [2 (0, 4) vs 3 (0, 5)] were lower in B group compared with NB group. There were no significant differences in the number of analgesics between two groups.

Conclusion(s): LFCNB combined with FNB is effective for postoperative pain during early postoperative period after THA.

03AP06-6

D-dimer levels after hip arthroplasty: a comparison of spinal anaesthesia alone and spinal anaesthesia plus paravertebral block

Fesenko V.¹, Kolomachenko V.²

¹Lviv National Medical University, Dept of Anaesthesiology & Intensive Care, Lviv, Ukraine, ²Kharkiv Postgraduate Medical Academy, Dept of Anaesthesiology, Kharkiv, Ukraine

Background and Goal of Study: Certain combinations of techniques (neuraxial or peripheral) for anaesthesia and analgesia may be associated with attenuation of the prothrombotic state following total hip replacement. Our aim was to compare D-dimer levels after two options of regional analgesia.

Materials and Methods: In 18 patients having hip osteoarthritis, total hip replacement was performed under spinal anaesthesia, either alone (control group, $n = 9$) or combined with paravertebral block through a catheter introduced at L3 level for post-operative analgesia (study group, $n = 9$). D-dimer levels were measured with an immunoturbidimetric method.

Results and Discussion: Preoperatively, D-dimer levels ($M \pm SD$) were, respectively, 0.55 ± 0.34 in the control and 0.45 ± 0.21 $\mu\text{g FEU/mL}$ in the study group, the difference was insignificant ($p = 0.334$). Postoperatively, in the study group, D-dimer levels were less than those in the control group on the first (1.62 ± 0.68 vs 4.25 ± 3.06 , $p = 0.011$), third (0.85 ± 0.29 vs 1.80 ± 1.11 , $p = 0.012$), and seventh (2.05 ± 0.57 vs 3.31 ± 0.87 , $p < 0.001$) days.

Conclusion(s): Prolonged lumbar paravertebral block attenuates the prothrombotic state following total hip replacement.

03AP06-7

Regional anesthesia for pediatric lower limb surgery

Frugiuole J., Cecchetti M., Gargiulo C., Tempra E., Giannopolo L., Bonarelli S.

Istituto Ortopedico Rizzoli, Dept of Anaesthesiology & Intensive Care, Bologna, Italy

Background and Goal of Study: Paediatric Spinal Anaesthesia is a safe alternative to General Anaesthesia for lower limb surgery. Emerging data demonstrate feasibility, efficacy and safety of Peripheral Nerve Blocks (PNBs) in children.

We present results of a perioperative protocol in pediatric orthopedic surgery with patients aged between 5 and 14 years undergoing spinal anesthesia while under sedation and receiving a single-shot of US/ENS guided sciatic nerve block.

Materials and Methods: 381 lower limb surgery corrections (Flat Foot and Tibial Osteotomy) were performed between April 2012 and December 2016. Children were 206 male and 175 female, ASA I, from 5 to 14 years old. Signed consent forms were collected from both parents during the pre-hospitalisation visit. Patients were premedicated one hour before surgery with midazolam syrup 0.5mg/kg.

We monitored standard vital signs and made IV sedation with ketamine 2mg/kg, atropine 0.01mg/kg and midazolam 0.05mg/kg iv. Children received spinal anesthesia with levobupivacaine 0.3mg/kg, by US identifying L4/L5 level.

We performed the ENS/US-guided single shot sciatic nerve block (subgluteal approach) by using levobupivacaine 1.5mg/kg per side. Surgery had an average duration of 25 min ± 10 per side. Once a plaster cast was fitted total OR time was 90 min ± 15.

Before discharging we evaluated vital signs and level of sedation using the Scale of sedation (SS) with Bromage 3 and facial pain scale (FPS)0.

Postoperative pain was managed by acetaminophen 15mg/kg orally every 8 hours.

Rescue dose was set by Tramadol drops 1mg/kg (lock-out 3 times per day) and recording FPS at rest and in motion every 6 hours until discharge.

Results and Discussion: Spinal anesthesia was successfully performed in all cases.

Only 1 child experienced a post-dural puncture headache lasting 4 days. It was treated with rehydration.

After surgery, the average FPS was 2 after 6 hours and 2.5 after 12 hours, while at discharge the average FPS was 1.1.

12 patients required pain treatment per os.

All patients were discharged on the third postoperative day.

Conclusion: Central Blocks allow blockade of sympathetic pathways resulting in profound suppression of stress responses to surgery. PNBs was found to be a safe technique, maintaining effective analgesia following discharge. The reduction of surgical stress and control of analgesia using advanced techniques influenced the outcome in terms of length of stay. We found also lack of significant perioperative complications.

03AP07-1

Addition of liposome bupivacaine in interscalene brachial plexus block lowers postoperative pain up to 1 week after rotator cuff surgery

De Meersman S.¹, Smeets A.-S.¹, Byloos B.¹, Buck R.¹, Hassanin J.², Leunen I.², Zol Study Group

¹KU Leuven ZOL Genk, Dept of Anaesthesiology, Leuven, Belgium,

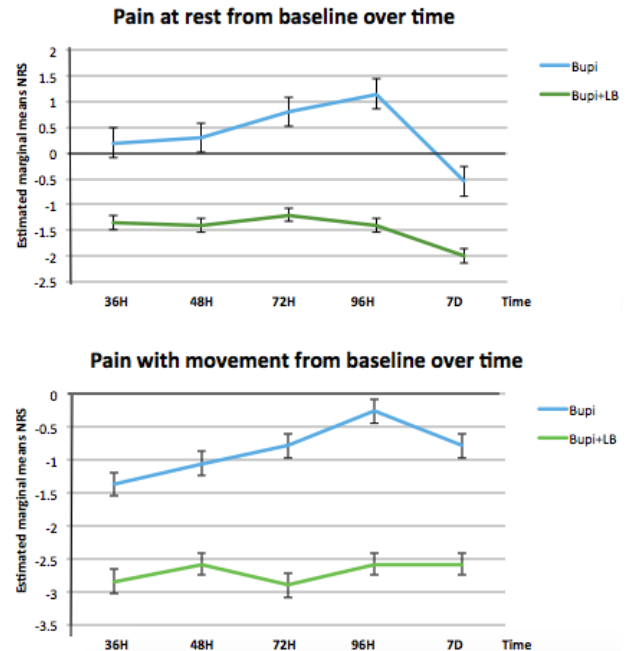
²Ziekenhuis Oost-Limburg, Dept of Anaesthesiology, Genk, Belgium

Introduction: Surgical repair of the rotator cuff is frequently associated with significant pre- and postoperative pain. Dexamethasone and clonidine have been used in interscalene brachial plexus block (ISBPB) to extend the duration of analgesia, yet these additives are not FDA approved and have not been consistent in prolonging postoperative analgesia.¹ We examined the efficacy of liposome bupivacaine (LB), when added to bupivacaine (Bupi), to provide extended analgesia in the first postoperative week in ISBPB for rotator cuff surgery.

Methods: In this IRB & FAMHP approved single centre, double blinded study, 40 patients having rotator cuff repair were randomized to receive ISBPB with 15 mL of Bupi 0.25% (Bupi; n=20) or a mixture of 5 mL Bupi 0.25% and 10mL LB 1.33% (Bupi+LB; n=20). All patients received multimodal postoperative

analgesia. Numeric Rating Scale (NRS) scores were obtained for pre- and postoperative pain at rest and with movement of the shoulder. Differences from preoperative pain scores were calculated for postoperative hours 36, 48, 72, 96 and 7 d. The effect of Bupi+LB on pain at rest and with movement was examined in regression models that accounted for repeated measures in the first postoperative week.

Results: Mean NRS scores preoperatively were similar in both groups at rest (2.8;3.4) and with movement (5.85;6.5). Pain at rest and with movement were lowered for the group that received Bupi+LB compared to Bupi. Overall difference from preoperative pain was 0.4 ± 0.6 (Bupi) v -1.5 ± 0.6 (Bupi+LB) for pain at rest (multivariate $p = 0.032$). Overall difference from preoperative pain was -0.9 ± 0.5 v -2.7 ± 0.5 , respectively, for pain with movement (multivariate $p = 0.014$). The effect for both pain at rest and with movement appeared to be decreased approximately two NRS points and was most notable at 96 h (Graph1).



[Estimated marginal means at rest and with movement]

Conclusions: The addition of LB to Bupi, significantly decreased postoperative pain compared to baseline up to 7 postoperative days both at rest and with movement.

References: 1. Desmet M, Br J Anaesth. 2013,

03AP07-2

Patients' perception of postoperative pain management after arthroscopic shoulder surgery: selective shoulder block versus interscalene block

Vranken D.¹, Dubois J.¹, Schoorens D.², Jamaer L.¹, Ory J.-P.¹, Stessel B.¹

¹Jessa Hospital, Dept of Anaesthesiology & Intensive Care, Hasselt, Belgium,

²Jessa Hospital, Dept of Anaesthesiology & Pain Medicine, Hasselt, Belgium

Background and Goal of Study: Recently, the International Pain Outcomes Questionnaire (IPOQ) has been developed and validated for postoperative pain assessment.

In a randomized controlled trial comparing the analgesic efficacy of a combined selective "shoulder block" (SSB) of the suprascapular nerve (SSN) and the axillary nerve (AN) and a conventional single-shot interscalene block (ISB) of the brachial plexus for postoperative analgesia after arthroscopic shoulder surgery, we applied the IPOQ to evaluate our patients' perception of postoperative pain management.

Materials and Methods: Patients undergoing arthroscopic shoulder surgery (n=100) were randomized into two groups: ultrasound-guided ISB (n=50) or ultrasound-guided SSB (n=50).

Patients' perception of postoperative pain management was assessed with a Dutch version of the IPOQ by telephone call on the 2nd postoperative day. A p-value <0.05 was considered statistically significant.

Results and Discussion: In total 100 patients were recruited and 2 were excluded from the statistical analysis in the SSB group because they did not receive the allocated intervention. Furthermore, 5 patients were lost to follow-up (3 in the ISB group and 2 in the SSB group), 1 patient after 8 hours and 4 patients could not be reached by phone on the 2nd postoperative day. We could not detect a statistically significant difference between the two study groups in any of the 13 items of the IPOQ.

We only observe a tendency towards more interference with activities out of bed in the ISB group (p=0.075) and more drowsiness in the SSB group (p=0.064).

With so many items tested, there is a high probability that these observations are established by coincidence.

Conclusion(s): Patients' perception of postoperative pain management with ISB and SSB is similar on the second day after arthroscopic shoulder surgery. We suggest SSB to be a valuable alternative for ISB in patients with a contra-indication for ISB.

03AP07-3

Selective shoulder block versus interscalene block: the need for rescue opioids after arthroscopic shoulder surgery

Dionys A.¹, Dubois J.¹, Schoorens D.², Jamaer L.¹, Ory J.-P.¹, Stessel B.¹

¹Jessa Hospital, Dept of Anaesthesiology & Intensive Care, Hasselt, Belgium, ²Jessa Hospital, Dept of Anaesthesiology & Pain Medicine, Hasselt, Belgium

Background and Goal of Study: Arthroscopic shoulder surgery is often associated with severe postoperative pain. To reduce opioid requirements, single-shot interscalene block (ISB) of the brachial plexus is widely used for postoperative analgesia.

To avoid ISB related side-effects, a combined selective "shoulder block" (SSB) of the suprascapular nerve (SSN) and the axillary nerve (AN) has been advocated.

Obviously, analgesic efficacy of both approaches should be compared.

We tried to evaluate analgesic efficacy by assessing the need for rescue opioids in the first 24 hours after surgery.

Materials and Methods: Patients undergoing arthroscopic shoulder surgery (n=100) were randomized into two groups: ultrasound-guided ISB (n=50) or ultrasound-guided SSB (n=50).

The probability of postoperative need for piritramide was assessed at discharge from the Post Anesthesia Care Unit (PACU) to the ward and afterwards registered by an electronic controlled intravenous analgesia (PCIA) system. Data recorded by the PCIA system was read out after 24 hours and divided into 4-hour blocks. An improved estimate for the difference between ISB and SSB was obtained using a mixed model that correctly accommodate the intra patient correlations that result from the repeated measurement of the probability of postoperative need for piritramide.

Results and Discussion: In total, 100 patients were recruited. Two were excluded from the statistical analysis in the SSB group since they did not receive the allocated intervention. Data were missing from 3 patients in the ISB group and 6 patients in the SSB group.

The probability that piritramide was delivered by a PCIA system was significantly higher in patients treated with SSB as compared to ISB, during the first 12 to 16 hours after surgery. The difference gradually decreased to result in a trend towards higher probability of need for piritramide in the ISB group in the final 4-hour interval.

Our results are in line with current literature: patients who receive an ISB can suffer more rebound pain at 24 hours as compared to patients without an ISB (1).

Conclusion(s): An ISB is superior to an SSB in reducing the need for rescue opioids in the first 12 to 16 hours after arthroscopic shoulder surgery.

At 24 hours however, there is a trend towards a higher need of rescue opioids in the ISB group, likely due to a higher incidence of rebound pain in this group.

References: 1. Abdallah et al. *Anesth Analg*. 2015 May(5):1114-29

03AP07-4

Programmed intermittent bolus infusion for interscalene block reduces the incidence of phrenic paralysis on the first postoperative day in patients having shoulder surgery

Tanaka K., Shikata Y., Fujita Y., Hashimoto A., Sato Y., Fujiwara Y. *Aichi Medical University, Dept of Anaesthesiology, Nagakute, Japan*

Background and Goal of Study: Interscalene block (ISB) effectively provides postoperative analgesia in patients having shoulder surgery. However, phrenic paralysis associated with ISB is sometimes problematic especially in patients with reduced respiratory function. We recently found that continuous ISB increase the incidence of phrenic paralysis on the first postoperative day (1POD). Previous studies have suggested that programmed intermittent bolus (PIB) infusion improves the efficacy of some regional anesthesia techniques while minimizing the dose of local anesthetics needed (1).

The goal of this study was to determine if PIB could reduce the incidence of phrenic paralysis associated with ISB on 1POD in patients having shoulder surgery.

Materials and Methods: After institutional approval and written informed consent were obtained, 14 patients scheduled for shoulder arthroplasty participated in this study. They were randomly assigned to have ISB using PIB (Group P) or ISB with continuous infusion (Group C) as postoperative analgesia. Before the induction of general anesthesia, ISB catheter was placed under ultrasound guidance. General anesthesia was induced with propofol, remifentanyl, rocuronium and maintained with sevoflurane and remifentanyl. After the emergence from general anesthesia, 15ml of 0.15% levobupivacaine was infused every 6 hours in Group P. In Group C, 0.15% levobupivacaine was continuously infused at 6ml/h. The incidence of phrenic paralysis was evaluated using ultrasound examination and chest X-ray on 1POD. Postoperative visual analog scale (VAS) score was also evaluated.

Results and Discussion: The incidence of phrenic paralysis on 1POD was 71% and 14% in Group P and C, respectively (p<0.05). VAS at 8h after surgery was 1.7±1.4 and 0.7±1.6 (mean±S.D.) in Group P and Group C, respectively (N.S.). The dose of levobupivacaine needed to produce postoperative analgesia was significantly smaller in Group P

Conclusion(s): PIB reduces the incidence of phrenic paralysis on 1POD in patients having ISB for postoperative analgesia.

References: 1. Capogna G et al. *Anesth Analg* 2011;113:826-31.

03AP07-5

Extrascapular catheter tip placement for continuous interscalene brachial plexus block reduces hemidiaphragmatic paresis compared with a conventional intrascapular tip placement: a randomized, controlled, double-blind trial

Albrecht E.¹, Bathory I.¹, Fournier N.², Jacot-Guillarmod A.¹, Farron A.³, Brull R.⁴

¹Lausanne University Hospital, Dept of Anaesthesiology & Pain Medicine, Lausanne, Switzerland, ²Lausanne University Hospital, Institute of Social and Preventive Medicine (IUMSP), Lausanne, Switzerland, ³Lausanne University Hospital, Department of Orthopaedic Surgery, Lausanne, Switzerland, ⁴Toronto Western Hospital and Women's College Hospital, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada

Background: The rate of hemidiaphragmatic paresis at 24h postoperatively after continuous interscalene brachial plexus block (CISB) is reported to be as high as 71%. We tested the hypothesis that an extrascapular placement of the catheter tip would reduce the rate of hemidiaphragmatic paresis compared to intrascapular tip placement for CISB while providing effective analgesia.

Methods: Seventy patients scheduled for elective major shoulder surgery were randomized to receive an ultrasound-guided CISB plexus block for analgesia, with a catheter tip placed between the levels of C5 and C6 and either within (intrascapular group) or outwith (extrascapular group) the brachial plexus sheath. Catheters were bolused with 20mL ropivacaine 0.5% followed by a 4ml.h⁻¹ infusion rate of ropivacaine 0.2%.

The primary outcome was rate of hemidiaphragmatic paresis (diaphragmatic excursion reduction >75%), measured by M-mode ultrasonography, before and 24h after the procedure. Secondary outcomes included forced vital

capacity, forced expiratory volume in 1 second, pain score at rest (numeric rating scale, 0-10) and intravenous morphine equivalent consumption at 24h postoperatively.

Results: The rate of hemidiaphragmatic paresis at 24h postoperatively was significantly reduced in the extrafascial group (intrafascial: 41%[95%CI:25-59%]; extrafascial: 15%[95%CI:5-32%]; $p=0.01$), while other respiratory functional outcomes were similar. At 24h postoperatively, we found no differences in pain scores at rest (intrafascial:3[95%CI: 2-3];extrafascial:3[95%CI: 2-40.7]; $p=0.93$), or cumulative intravenous morphine equivalent consumption (intrafascial:7[95%CI: 5-9];extrafascial:6[95%CI: 3-9]; $p=0.75$).

Conclusions: Placement of the catheter tip immediately outside of the brachial plexus sheath reduces the rate of hemidiaphragmatic paresis associated with US-guided CISB on postoperative day 1 while providing effective analgesia following major shoulder surgery. Our results do not support the routine placement of the catheter tip within the brachial plexus sheath.

03AP07-6

Sonographic comparison of two different peripheral nerve catheters for continuous interscalene nerve blocks

Maecken T., Lohr D., Zahn P.K., Litz R.J.

BG University Hospital Bergmannsheil, Dept of Anaesthesiology & Intensive Care, Bochum, Germany

Background and Goal of Study: Efficacy of catheters may decline due to dislocation during the days of treatment. We sonographically compared two different catheters for continuous interscalene brachial plexus blocks not only for placements but also for determining the catheter position at the days after surgery.

We hypothesized that a catheter with a curled tip would provide lower dislocation rates at the interscalene level compared to a catheter with standard straight tip.

Materials and Methods: Approval by the local ethics committee (Ruhr-University-Bochum, Germany) and patient's written informed consent. Inclusion-criteria: Patients with surgery of the shoulder or proximal humerus. Random assignment to control group (standard straight perineural catheter) and study group (flexible curled tip). Both: Pajunk, Geisingen, Germany. 4 experienced physicians placed the catheters under ultrasound guidance in an out-of-plane-technique. All catheters were advanced two centimeters beyond the tip. Sonographic examinations were carried out after placement, postoperatively and on every following day until removal of the catheter (EOT: end of therapy).

Power analysis based on the criterion correct LA-spread revealed a total sample size of 80 (power 0.9; alpha error probability 0.05; effect size 0.4). Chi-Square-Tests were used for categorical data. A significance level of $p<0.05$ was considered as significant.

Results and Discussion: Data of 98 patients were analysed. All catheters were initially placed correctly. Ultrasound was capable to detect the catheter's position on any following examination. In the study group the catheter was more frequently in the correct position ($p<0.001$) and for a longer period of time ($p<0.001$; Figure 1 (Black circles: study group, grey squares: control group); Table 1). The correct perineural spread of LA correlated in both groups with the extent and quality of sensory- and motor block ($r = 0.9359$; $p<0.001$).

Position of Catheter-Tip	Number of sonographic evaluations (one per day/catheter)		P
	study group (n=121)	study group (n=121)	
Correct Position, where catheter was initially placed (lateral to brachial plexus)	52 (43%)	118 (79%)	< 0.001
Superficial to anterior scalene muscle and deep cervical fascia	33 (27%)	8 (5%)	< 0.001
Superficial to medial scalene muscle and deep cervical fascia	9 (7%)	2 (1%)	0.01
Within medial scalene muscle	2 (2%)	4 (3%)	0.6
Within anterior scalene muscle	7 (6%)	4 (3%)	0.2
Superficial to brachial plexus but dorsal to deep cervical fascia	15 (12%)	13 (9%)	0.3

[A-805-0000-00486 -Catheter Positions]

Conclusion(s): A perineural catheter with a curled tip reduced the rate of secondary migrations in the interscalene region compared to catheter with straight tip. However, loss of correct LA-spread occurred frequently due to secondary catheter migrations. Ultrasound is an effective tool to locate the catheter position either by direct or indirect visualization.

03AP07-7

A comparison of ultrasound-guided interscalene and supraclavicular block for postoperative analgesia after shoulder surgery

Chunwoo Y., Inha University Hospital

Inha University Hospital, Dept of Anaesthesiology & Pain Medicine, Incheon, Korea, Republic of

Background and Goal of Study: In contrast to interscalene block, there was little information regarding the analgesic efficacy of supraclavicular block for shoulder surgery. This study aimed to compare the analgesic efficacy and side effects of ultrasound-guided interscalene and supraclavicular block for shoulder surgery.

Materials and Methods: Patients scheduled for shoulder surgery were assigned to receive either ultrasound-guided interscalene ($n = 25$) or supraclavicular block ($n = 24$) with 20 mL of 0.375% ropivacaine. We assessed the duration of postoperative analgesia as a primary outcome and pain scores, supplemental analgesia, diaphragmatic excursion, motor block, fingertip numbness, side effects, and patient satisfaction as secondary outcomes.

Results and Discussion: The duration of postoperative analgesia was not statistically different between groups: 868 (800 - 1440) min for supraclavicular block vs 800 (731 - 922) min for interscalene block (median difference -85 min, 95% CI, -283 to 3 min, $P = 0.095$). The incidence of diaphragmatic paresis was significantly lower in the supraclavicular block compared to that in the interscalene block at 30 min after block (66.7% vs 92%, $P = 0.021$) and in the postanaesthesia care unit (62.5% vs 92%, $P = 0.024$). Motor block was higher in the supraclavicular block in the postanaesthesia care unit but not at 24 h. Other secondary outcomes were similar for both groups.

Conclusion(s): This study showed no statistically significant difference in duration of postoperative analgesia between supraclavicular and interscalene block, but supraclavicular block was associated with reduced incidence of diaphragmatic paresis compared to interscalene block after shoulder surgery.

References: Liu SS, Gordon MA, Shaw PM, Wilfred S, Shetty T, Yadeau JT. A prospective clinical registry of ultrasound-guided regional anesthesia for ambulatory shoulder surgery. *Anesth Analg* 2010; 111: 617-23.

03AP07-9

Effects of a fixed low-dose ropivacaine with different volume and concentrations on brachial plexus block: a randomized controlled trial

Papakitsos G.¹, Kapsali A.², Roimpa A.³, Papakitsou T.⁴

¹General Hospital Arta, Dept of Anaesthesiology, Arta, Greece,

²Dental clinic, Private Clinic, Arta, Greece, ³General Practitioner,

Private, Thessaloniki, Greece, ⁴General Hospital Mesologi, Haematology, Mesologi, Greece

Background and Goal of Study: Previous studies of the relationship between the volume or concentration of local anesthetics and the effects of the block were based on relatively high doses of local anesthetics. We tested the hypothesis that providing low dose of ropivacaine at three combinations of volumes and concentrations for not ultrasound-guided brachial plexus block would produce different effects in the aspect of onset time, pain control and the incidence of side effects.

Materials and Methods: Ninety patients undergoing hand surgery were randomized to receive a nerve stimulator mediated block with ropivacaine 0.75 % (6.7 ml, Group 0.75), 0.5 % (10 ml, Group 0.5) or 0.25 % (20 ml, Group 0.25). The primary end point was the onset time of the sensory blockade, assessed by using a pinprick in the C5-6 dermatome. The secondary end points included the onset time of the motor blockade, block success rate, postoperative pain rating score, rescue analgesics requirement, sleep quality and strength of the hand on the block side.

Results and Discussion: There was a statistically significant difference of the sensory block median onset times among Group 0.75 (5 min), Group 0.5 (10 min) and Group 0.25 (20 min). One patient in Group 0.5 and 20 patients in Group 0.25 did not achieve a complete motor block within 30 min, which were also significantly different. No significant difference was observed in postoperative analgesia and decrease of handgrip strength among the 3 groups.

Conclusion(s): This study demonstrates that ropivacaine 50 mg as 0.25, 0.5 or 0.75 % solution for brachial plexus block before hand surgery produces comparable blockade with few side effects, while 0.75 % seems to be more preferable as it is associated with faster onset time.

03AP07-10

Single-shot Interscalene brachial plexus block reduces the incidence of post-thoracotomy shoulder pain without additional impairment of pulmonary function in patients undergoing open-thoracotomy

Jae Hee W.¹, Kim Y.J.¹, Kim K.C.², Kim C.H.¹, Kim D.Y.¹

¹School of Medicine, Ewha Womans University, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of,

²School of Medicine, Ewha Womans University, Department of Thoracic and Cardiovascular Surgery, Seoul, Korea, Republic of

Background and Goal of Study: The ipsilateral shoulder pain (ISP) following thoracotomy is known to be unresponsive to epidural or paravertebral analgesia. Several methods have been investigated to treat ISP including interscalene block (ISB). Pulmonary function in patients undergoing thoracotomy can be further impaired due to side effects of ISB. In this prospective study, we aimed to evaluate whether ISB using lower concentration of local anesthetic reduces an incidence of post-thoracotomy ISP and affects pulmonary function in patients undergoing lung lobectomy.

Materials and Methods: Patients undergoing lung lobectomy were assigned randomly to either the control group or ISB group according to randomization. On arrival to the operating room, only for patients assigned to ISB group, single-shot ISB was performed under ultrasound guidance by one experienced anaesthesiologist. Then, all patients underwent general anesthesia using one lung ventilation. For all patients, continuous paravertebral block at the proper level was performed with the use of automated pump before closure of chest. The primary outcome was the incidence of ISP during the first 48 hours following surgery. Secondary outcomes were pulmonary function test, pain score of surgical site and the incidence of adverse events up to 48 h.

Results and Discussion: The incidence of ISP was significant lower in ISB patients. Satisfactory sensory blockade of shoulder was achieved in all ISB patients, and any diaphragm elevation was not observed at plain chest radiography taken immediately after surgery. Compared to baseline, FVC, FEV1 and PEFr significantly decreased after surgery, however, there was no difference between groups. The pain score at the surgical site was similar at rest and coughing. No adverse events related with ISB occurred during study period.

Conclusion(s): Single-shot ISB with low concentration of local anesthetic and dexamethasone prevent post-thoracotomy ISP. It did not result in any diaphragmatic elevation and deterioration of pulmonary function in patients undergoing open-thoracotomy.

References: Barak M, Iaroshovski D, Poppa E, et al. Low-volume interscalene brachial plexus block for post-thoracotomy shoulder pain. *J Cardiothorac Vasc Anesth* 2007; 21:554-557.

03AP08-1

A novel approach to post op ear pain: greater auricular nerve continuous catheter analgesia

Ellison M.¹, Ranganathan P.¹, Parsons J.¹, Wilson C.¹, Howell S.²

¹West Virginia University, Dept of Anaesthesiology, Morgantown, United States, ²West China Hospital of Sichuan University, Dept of Anaesthesiology, Morgantown, United States

Case report: A 70 year old male presented for surgery after an ATV accident with injuries including a partially avulsed left ear with exposed cartilage and a non-operative C2 lateral mass fracture and T8 burst fracture. His past medical history was significant for coronary artery bypass grafting and type II diabe-

tes mellitus. He was scheduled for irrigation and debridement and repair of left ear. The patient was in a cervical collar and rated his ear pain to be 10. Due to his severe pain and potential need for serial debridements postoperatively, a continuous greater auricular nerve (GAN) block was planned. He was sedated with midazolam and of fentanyl. A linear ultrasound probe was used to identify the GAN by following it cranially from the superficial cervical plexus to the anterior surface of the sternocleidomastoid. A 22-gauge angiocatheter was placed in close proximity to the nerve and 5 mL of 0.25% Bupivacaine was injected. General anesthesia was induced with propofol, a laryngeal mask airway was placed, and a volatile anesthetic was used through the procedure. No supplemental opioids were necessary intraoperatively or postoperatively in the PACU and an infusion of 0.25% bupivacaine at 1 ml/hr was started. The patient was evaluated daily while the continuous greater auricular nerve block catheter was in place and consistently reported no left ear pain. On postoperative day 3, the catheter was removed.

Discussion: The greater auricular nerve innervates the antitragus, the tail of the helix and lobule of auricle reliably. GAN block has been demonstrated to be a useful block in many acute case settings, including the Emergency Department and Operating Room. The GAN is easily imaged with ultrasound on the anterior surface of the sternocleidomastoid and single shot nerve block has been described. To the best of our knowledge, continuous greater auricular nerve block has not been described in the literature. The ability to place a catheter and provide sustained pain control in the acute setting may offer the same advantages of any other continuous regional blocks including decreased opioid consumption, improved analgesia, decreasing breakthrough pain, and decreasing sleep disturbance.

Learning points:

- Review ultrasonography of the greater auricular nerve.
- Identify indications for greater auricular nerve block based on innervation and external ear anatomy.
- Describe the continuous greater auricular nerve block as a postoperative pain control technique.

03AP08-2

Single injection peribulbar block for extended and complicated vitreoretinal surgery in a high risk patient - a case report

Milanovic M., Susnjar S.

University Clinical Centre of the Republic of Srpska, Dept of Anaesthesiology & Intensive Care, Banja Luka, Bosnia and Herzegovina

Background: Extraction of an intraocular foreign body (IOFB) is a common surgical procedure in ophthalmology. Single injection peribulbar block (SIPB) is not an ordinary anesthetic procedure in these interventions, where general anesthesia is usually applied.

Case report: This is a review of a male patient, 62 years old, with IOFB in his left eye. Due to numerous comorbidities (cardiomyopathy, atrial fibrillation, right bundle branch block, chronic renal failure, hypertension and diabetes), it was decided that the procedure was going to be performed under regional anesthesia (method of SIPB). The patient was administered 100 µg of fentanyl intravenously, and 2% tetracain was applied topically before performing SIPB. Block was performed by one injection next to the eyeball, 5 mm below the lower lacrimal punctum at the angle of 45 degrees relative to all three planes, toward the medial wall of the orbit. At the depth of 16 mm a following solution was applied - 2% lidocain 90 mg, 0.5% levobupivacain 22.5 mg and atracurium 10 mg. Total akinesia and anesthesia of the eye ensued 15 minutes after the block was performed. Surgery lasted seven hours and 45 minutes. During that time the patient was sedated with propofol (35-55 µg/kg/min) and fentanyl (50 µg every 60 minutes). Upon completion of the operation, motor function of the bulb completely recovered after three hours, and a weak pain in the form of tingling occurred nine hours later. During the procedure, the patient was hemodynamically stable, spontaneously breathing with the supplementation of oxygen through the nasal catheter.

Discussion: Keeping in mind poor health of our patient, we have estimated that general anesthesia carries a high operational risk. With patient's consent, it was decided that the operation would be carried using the SIPB, although available data from the literature show that this is not an ordinary procedure and that it is only occasionally applied in complicated vitreoretinal procedures. Surgery in our patient, which was prolonged, went without any complications, and there was no need for subtenon block. Likewise, there was no major post-operative complications, therefore the patient made a quick recovery and was released from the hospital only after three days.

Learning Points: Single injection peribulbar block presents an efficient and a safe method of regional anesthesia which could replace general anesthesia in vitreoretinal surgery in high-risk patients.

03AP08-3

Pectoral nerve block (Pecs block) with sedation for breast conserving surgery without general anesthesia

Jun-Young C., Jae-Woo Y., Eun-Jin M., Seung-Beom K., Hyung-Mo J.

Kyung Hee University, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background: Most regional anesthesia in breast surgeries is performed as postoperative pain management under general anesthesia, and not as the primary anesthesia.

Case report: Regional anesthesia has very few cardiovascular or pulmonary side-effects, as compared with general anesthesia. Pectoral nerve block is a relatively new technique, with fewer complications than other regional anesthesia. We performed Pecs I and Pec II block simultaneously as primary anesthesia under moderate sedation with dexmedetomidine for breast conserving surgery in a 49-year-old female patient with invasive ductal carcinoma. Block was uneventful and showed no complications.

Discussion: Thus, Pecs block with sedation could be an alternative to general anesthesia for breast surgeries.

References:

Abdallah FW, Dwyer T, Chan VW, Niazi AU, Ogilvie-Harris DJ, Oldfield S, et al. IV and Perineural Dexmedetomidine Similarly Prolong the Duration of Analgesia after Interscalene Brachial Plexus Block: A Randomized, Three-arm, Triple-masked, Placebo-controlled Trial. *Anesthesiology* 2016;124:683-95.

Learning points: Pecs blocks could be recommended as an alternative to GA in certain breast surgeries.

03AP08-5

PECS I block in a patient without pectoralis major muscle - is it possible?

Cabral T.¹, Silva R.¹, Trindade H.², Ferreira J.L.²

¹Hospital do Divino Espírito Santo, Dept of Anaesthesiology, Ponta Delgada, Portugal, ²Hospital D. Estefânia, Centro Hospitalar de Lisboa Central, Dept of Anaesthesiology, Lisbon, Portugal

Background: PECS I block was first described in 2011 by Blanco. Its purpose is to place local anesthetic into the interfascial plane between pectoralis major (PM) and minor (Pm) muscles⁽¹⁾, providing anesthesia/postoperative analgesia for some thoracic procedures.

Case report: We present a case report where we perform PECS I block in a female patient, 7 yo, with Poland syndrome, a rare congenital anomaly⁽²⁾, who had an aplasia of the PM muscle and a slight hypoplasia of the hand, both on the left side. She had an anterior axillary fold that limited the extension of the left arm and she was proposed to surgical correction in an outpatient regimen. We induced the general anesthesia with propofol 3 mg/Kg IV, a continuous infusion of remifentanyl 0,5-1 mcg/Kg/min and she was intubated with a classic laryngeal mask.

We also gave dexamethasone 0,1 mg/Kg IV. We performed the PECS I ultrasound-guided block using a linear probe and with the patient in the supine position it was administered 4 mL of levobupivacaine 0,25%. We didn't find the PM muscle but we injected the local anesthetic to spread along the fascia above Pm muscle. Maintenance of the anesthesia was achieved with sevoflurane/O₂ and a continuous infusion of remifentanyl 0,1 mcg/Kg/min the majority of the time.

There were no interurrences and it was also administered paracetamol 15 mg/Kg and ketorolac 0,5 mg/Kg. In the recovery room the patient was well awakened and had only minor pain controlled with conventional opioid-free analgesia until discharge.

Discussion: In this case, performing a combined anesthesia was difficult but effective, allowing to reduce the need of intraoperative opioid use. We didn't find in literature any report of PECS I block in a patient without PM muscle.

References:

1. Blanco R., The "pecs block": a novel technique for providing analgesia after breast surgery. *Anaesthesia* 2011; 66(9):847-8;

2. Caldas, Flávio A. A., Isa, Hellen L. V. R., Trippia, Andréia C., Bísvaro, Ana C. F.P.J., Martinez, Eliane R. C. & Tajara, Luciana M. (2004). Síndrome de poland: relato de caso e revisão da literatura. *Radiologia Brasileira*, 37(5),381-383.

Learning Points: PECS I block can be challenging when the anatomy is not that "by the book", requiring additional skills to the anesthesiologist to perform this interfascial block and provide to the patient a good intra and post-operative analgesia.

03AP08-6

Cyanotic in recovery: what seems safe maybe unsafe

Elnady A., Mathur D.

The Royal Wolverhampton Hospitals NHS Trust, Dept of Anaesthesiology & Intensive Care, Wolverhampton, United Kingdom

Background: Local anaesthetics enhance Methb formation with variable severity. Because cyanosis in recovery have a plethora of causes, diagnosis of local anaesthetic-induced methaemoglobinemia could be quite challenging & hence delayed especially when safe doses are used.

Case report: An ASA II 45-yr-old female, who had upper limb day surgery under regional block, was desaturating in recovery. Having history of brain tumor removal (20 yrs back) causing left hemiplegia, she recovered completely. She had US-guided axillary block (prilocaine 1%, 35 ml) augmented by blocks of radial, ulnar & median nerves (L-bupivacaine 0.25%, 5 ml each) & positioned right laterally. Surgery was uneventful. In recovery, although pink initially, a bluish tinge of lips and nailbeds started to develop. Air entry on left lung base was reduced. CXR revealed raised left hemi-diaphragm & increased hilar bronchovascular markings.

ECG & ABG results were normal, except for hypoxaemia. Co-oximetry showed Methb of 13.1% which dropped to 9.1% 4 hrs later & then 0.1% the next day. At 1 month, follow-up CXR was normal.

Discussion: Methaemoglobinemia, due to exposure to various toxins including prilocaine, reduces RBC ability to release O₂ to tissues & hence left shift of oxyHb dissociation curve. It is not generally appreciated that therapeutic doses of most local anaesthetics can produce this condition.¹ Prilocaine's metabolite, O-toluidine, is responsible for oxidation of oxyHb into Methb. Diagnosis is based on clinical findings (oxygen-resistant cyanosis & cyanosis with normal calculated oxygen saturation) & co-oximetry.

Treatment is both symptomatic and specific (methylene blue and/or ascorbic acid).² Although prilocaine's maximum recommended dose is 6 mg/kg,³ this patient developed significant methaemoglobinemia at around 4.5mg/kg. She had no personal or family history of G6PD deficiency. It was previously advised that prilocaine's dose should be limited to 2.5 mg/kg.²

References:

1. Abu-Laban RB et al. Severe methemoglobinemia from topical anesthetic spray... *Can J Em Med.* 2001; 3(1):51-56.

2. Guay J. Methemoglobinemia related to local anesthetics... *Anesth Analg.* 2009; 108(3):837-845.

3. British National Formulary. Sep 2014: NICE.

Learning points: Prilocaine can induce methaemoglobinemia even in sub-maximal therapeutic doses, so exercise caution when using it in large volumes for major nerve blocks in small patients. Prompt recognition and treatment of the condition can be lifesaving.

03AP08-7**Permanent neuropathy secondary to abscess inguinal after analgesia femoral continues**

Fernández C., Rodríguez P., Gómez L., Hernández M.J., Moliner S., De Andrés J.

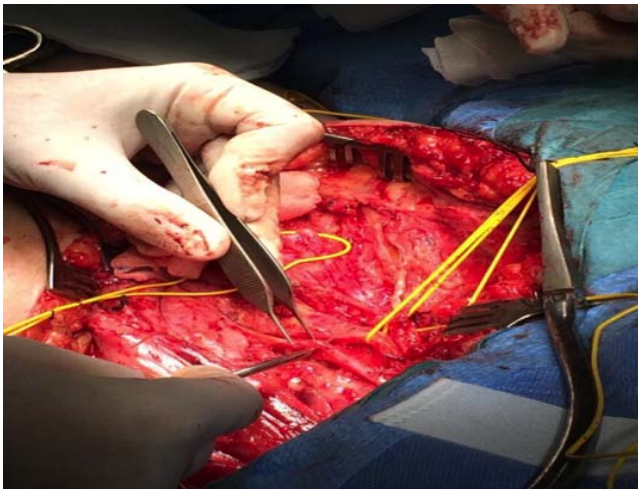
Hospital General de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background: Continuous femoral block is the technique of choice for post-operative pain control in total knee arthroplasty (TKA). (1) Complications are infrequent but can be severe and result in permanent sequelae.

Case report: A 67 year old male scheduled to left TKA. Subarachnoid anesthesia and placement of an echogenic femoral catheter for continuous femoral analgesia with 0.125% levobupivacaine (12 mL / h, boluses 5 mL) were performed with no incidents during both techniques.

Adequate pain control and without signs of infection during postoperative period. At one month, there was a motor deficit in the left lower limb and hypoesthesia in the thigh, which made it impossible for the extension. An electromyography is performed evidencing a left femoral nerve mononeuropathy with severe axonotmosis type. Direct nerve puncture injury was suspected during catheter placement as the source of the lesión.

Facing the persistent motor deficit after rehabilitation and pharmacological treatment, a new EMG was performed at 6 months without improvement of neuropathy. He was referred to Plastic Surgery Department for the exploration of the nerve and the realization of a nerve graft, in the surgery remnants of a perineural abscess were found, being the probable cause of denervation. At 6 months of the nerve repair surgery, there was contraction of the vastus lateralis muscle.



[Abscess]

Discussion: Continuous femoral block is a safe technique with few complications, including the most frequent are neurological and infectious, mainly related to the use of catheters (2). Neurological complications are uncommon but may be severe and permanent (3).

References:

1. Tang Q, Li X, Yu L. *J Orthop Surg (Hong Kong)*. 2016 Aug;24(2):183-7.
2. Joshi G, Gandhi K, Shah N. *Clin Anesth*. 2016 Dec;35:524-529.
3. Widmer B, Lustig S, Scholes CJ. *Knee*. 2013 Jun;20(3):181-5.

Learning points: Infectious complications secondary to the use of catheters for continuous regional analgesia can be serious and lead to permanent neurological lesions.

An aseptic insertion technique and a patient follow-up protocol are recommended through acute pain programs to decrease the number and severity of complications.

03AP08-8**Nephrectomy with awake patient - myth or reality?**

Ferraz S., Lages Torres R., Dahlem C.

Centro Hospitalar Vila Nova de Gaia/Espinho, Dept of Anaesthesiology, Vila Nova de Gaia, Portugal

Surgery of the upper abdomen is traditionally performed under general anesthesia alone or in combination with regional anesthesia (RA). Nephrectomy involves the positioning of the patient in lateral decubitus for several hours, and only 3 cases of RA are described in the literature as an isolated technique for this procedure.^{1,2}

We report the case of a 65-years-old, ASA IV male, BMI 32, presenting for right retroperitoneoscopic radical nephrectomy due to renal neoplasm. He has multiple co-morbidities: hypertension, heart failure, atrial fibrillation, obesity and chronic obstructive pulmonary disease under noninvasive ventilation and home oxygen therapy, proposed for lung transplant. Given the high peri-operative risk for pulmonary complications, the patient was proposed being awake during surgery with epidural (E) anesthesia only, which he accepted. After placement of the E-catheter in T9-T10, 6mL ropivacaine 0.75% was administered with the patient on a slight right tilt and intravenously (IV) 1mg midazolam and 50µg fentanyl; arterial and central venous catheterization were performed. 25minutes(m) after E injection an infusion of noradrenaline was started to maintain mean blood pressure of 65mmHg under restrictive fluids. 90m after the first E bolus, due to slight tension rise and discomfort, 4mL ropivacaine 0.75% E, 1mg midazolam and 50ug fentanyl IV were given. The surgery lasted 112m with the patient comfortable and cooperative, spontaneous ventilation with O₂ by nasal cannula and hemodynamic stability under perfusion of noradrenaline. He remained in the post-anesthesia care unit for 48 hours postoperatively, with continuous E analgesia and rescue opioids, and was discharged on the 6th day without any complication. The patient gave written consent for publication.

General anesthesia in patients with severe respiratory disease is associated with a high rate of pulmonary complications. Keeping the patient awake contributed to an uneventful postoperative course, avoiding difficult ventilatory weaning and/or respiratory infection. The lateral positioning for E injection allowed the anesthetic volume to be reduced, guaranteeing a sufficient block for the surgery but reducing the hemodynamic changes due to the sympathetic block.

1-Can J Urol. 2010;17:5401-2;2-Rev Bras Anestesiol.2014;144

Performing nephrectomy under RA is a real challenge for both the anesthesiologist and the surgical team. We intend to demonstrate its safety and benefits in selected patients.

03AP08-9**Transverse abdominal plane block for percutaneous gastrostomy in patient with amyotrophic lateral sclerosis**

Pota V., Grasso A., Pace M.C., Passavanti M.B., Sansone P, Aurilio C.

Second University of Naples, Dept of Anaesthesiology & Intensive Care, Napoli, Italy

Background: Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease characterised by progressive asymmetric limb weakness, bulbar symptoms such as dysarthria, dysphagia and respiratory muscle weakness. Patients with ALS, may be at increased risk for general anaesthesia because of abnormal response to muscle relaxants, and sensitivity to opioids, sedatives.

Case report: A 68-year-old, 74 kg, male, diagnosed as ALS since 2 years, was admitted to our Intensive Care Unit for respiratory failure. His disease had progressed to involve all four limbs and developed dyspnea with necessity of tracheostomy and continuous BiPAP ventilation and dysarthria and dysphagia with necessity of percutaneous gastrostomy (PEG). We decide to practice in PEG in TAP Block anaesthesia. We decided to perform an echo-guided bilateral subcostal TAP block with slight sedation with midazolam 0,05mg/kg only to tolerate the gastroscopy. After aseptic skin preparation we positioned a high frequency linear transducer under costal margin, visualizing the sonographic marks of antero-lateral abdominal wall: subcutaneous tissue, external and internal oblique muscles, the transvers abdominal muscle and the transverse abdominal plane (TAP) between the last two muscles. A specific 22G needle (80mm) was then introduced from the medial site of the probe using

ad in-plane technique. We visualized the needle tip cross the abdominal wall and we injected 20ml ropivacaine 0.15% between intern oblique and transverse muscles. The same procedure was performed bilaterally. In this way we performed anaesthesia of nerves contained in the selected TAP (T6-L1), especially for the paraumbilical region.

The procedure was well tolerated by the patients with no behavioural sign of pain or discomfort.

Discussion: In patients with ALS, TAP block can provide reliable anaesthesia and effective analgesia for PEG with avoidance of potential risks associated with general anaesthesia, muscle paralysis, and opioid use.

References: Dizdarevic A. Thoracic Paravertebral Block, Multimodal Analgesia, and Monitored Anaesthesia Care for Breast Cancer Surgery in Primary Lateral Sclerosis. *Case Rep Anesthesiol.* 2016

Kak M, et al. Gastrostomy tube placement is safe in advanced amyotrophic lateral sclerosis. *Neurol Res.* 2017 Jan;39(1):16-22.

Learning points: Anaesthesia and amyotrophic lateral sclerosis

03AP08-10

Methicillin-resistant *Staphylococcus aureus* (MRSA) skin infection after epidural anaesthesia: a case report

Caldeira A., [Albuquerque D.](#), Henriques D., Monteiro M.
Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background: Regional anaesthetic (RA) techniques provide excellent anaesthesia and analgesia for surgical procedures, with many benefits compared to general anaesthesia. Most complications of RA are minor, but sometimes serious damage can occur like direct nerve damage, infection and spinal cord compromise that may result in devastating morbidity and mortality.

Case report: We reported a case of MRSA skin infection after epidural anaesthesia in a 66-year-old man who was submitted to total knee arthroplasty under sequential combined-spinal epidural anaesthesia.

The operative procedure, anaesthesia and early postoperative course were uneventful.

After 5 days the catheter was removed and he was discharged from the orthopedic service.

He returned after 5 days for orthopedic follow-up consultation. The Acute Pain Service of the Anaesthesiology Department was called for an erythematous and purulent lesion on the catheter exit site, which was aspirated for bacterial culture, so that susceptibility testing could be performed.

The culture was positive for MRSA and the patient was admitted to begin treatment with Linezolid 600 mg twice a day, after consulting the Infection Control Commission.

During hospitalization he presented clinical and laboratory improvement and was discharged after 8 days, with Linezolid prescription for 6 weeks, with no further complications.

Discussion: Catheters should not remain longer than clinically necessary and in our case maybe it was too long because the pain was controlled at the third/fourth day.

Bacterial filters may be considered during extended continuous epidural infusion, as in our case.

Aseptic technique and sterile occlusive dressings should always be used during the placement of neuroaxial catheters, combined with skin preparation using chlorhexidine.

Disconnection/reconnection of systems should be limited to minimize the risk of complications.

References:

- Novak-Jankovic, V. *Infectious complications of regional anaesthesia and analgesia. Periodicum Biologorum.* VOL.113, No 2,247-250,2011

- *Practice Advisory for the Prevention, Diagnosis and Management of Infectious Complications Associated with Neuraxial Techniques. Anesthesiology* 2010;112:000-000

Learning points: Daily inspection and prompt removal of catheter should be done on any suspicion of infection or if no longer clinically necessary, as even healthy patient can develop infection, as in our case. Fortunately the situation was controlled only with antibiotics.

03AP09-1

Comparison of four epidural puncture training devices - which is best to feel the "Loss of Resistance"?

[Pedersen T.H.](#)¹, [Seidl C.](#)¹, [Meuli J.](#)¹, [Kleine-Bruegggeny M.](#)², [Theiler L.](#)¹, [Greif R.](#)¹

¹*Bern University Hospital Inselspital, University of Bern, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland,* ²*Barts Health NHS Trust, Department of Perioperative Medicine, Barts Heart Centre, London, United Kingdom*

Background and Goal of Study: Epidural anaesthesia is difficult to learn, with a success rate of barely 80% after 90 attempts. The feeling of "Loss of Resistance" (LOR) can be trained either with commercially available devices (>1000€), or with the "Greengrocer's Model", which simply requires a banana. While it has been shown that the epidural puncture skill can be achieved with a banana, and the banana is the best fruit for simulating the feel of LOR, no studies have directly compared the banana to commercially available devices. The goal of this study was to compare 3 commercially available epidural puncture training simulators and a banana, regarding their ability to simulate LOR.

Materials and Methods: 55 consultant anaesthesiologists participated in this blinded randomized controlled study. The participants performed an epidural puncture and inserted an epidural catheter on 4 different epidural puncture training devices: 1. Lumbar Puncture Simulator II (Kyoto Kagaku, Kyoto, Japan); 2. Lumbar Epidural Injection Trainer (Erler-Zimmer, Lauf, Germany); 3. Normal Adult Lumbar Puncture / Epidural Tissue (Simulab Corp., Seattle, WA, USA); and 4. A banana. For blinding purposes all 4 devices were placed in identical wooden boxes. Primary study outcome: The feel of LOR rated on a 100mm Visual Analogue Scale (VAS), where "0" represented "completely unrealistic feel" and "100" represented "indistinguishable from a real patient".

Results: The analysis of the results showed that the LOR in the 4 devices were rated significantly different (Table 1), but all in the VAS range of 50 - 60. Pairwise comparisons showed only moderate effect sizes (Table 2).

	1: KYO	2: ERL	3: SIM	4: BAN	p-value
Loss of resistance, VAS (SD)	60 (25)	50 (29)	64 (24)	49 (32)	<0.001

[Table 1. Visual Analogue Scale (VAS) Scores (mm) for LOR]

	Mean difference (mm)	95% CI	p-value	Effect size
KYO vs. ERL	10.5	3.5 - 17.4	<0.001	0.39
KYO vs. BAN	11.2	4.2 - 18.1	<0.001	0.39
SIM vs. KYO	3.6	-3.4 - 10.6	1.000	na
SIM vs. ERL	14.1	7.1 - 21.1	<0.001	0.53
SIM vs. BAN	14.8	7.8 - 21.8	<0.001	0.52
ERL vs. BAN	0.7	-6.3 - 7.6	1.000	na

[Table 2. Pairwise comparisons of the loss of resistance]

Conclusion: 2 of the 3 commercially available epidural simulators were rated more realistic regarding LOR than the banana, but some participants preferred the banana over the other 3 simulators. Considering the price for a banana compared to commercially available simulators, we suggest using a banana to learn and train the technique of LOR for epidural puncture.

03AP09-2

Syringe sizes and injection techniques in regional anaesthesia - Does it really matter?

[Al-Ani T.](#), [Staber M.](#)

Inverclyde Royal Hospital, Dept of Anaesthesiology & Intensive Care, Greenock, United Kingdom

Background and Goal of Study: Forceful needle-nerve contact and injection may result in nerve damage. We tested the hypothesis that a larger diameter syringe combined with a low-pressure injection technique can more readily detect high opening injection pressures (OIPs) ≥ 15 PSI.¹

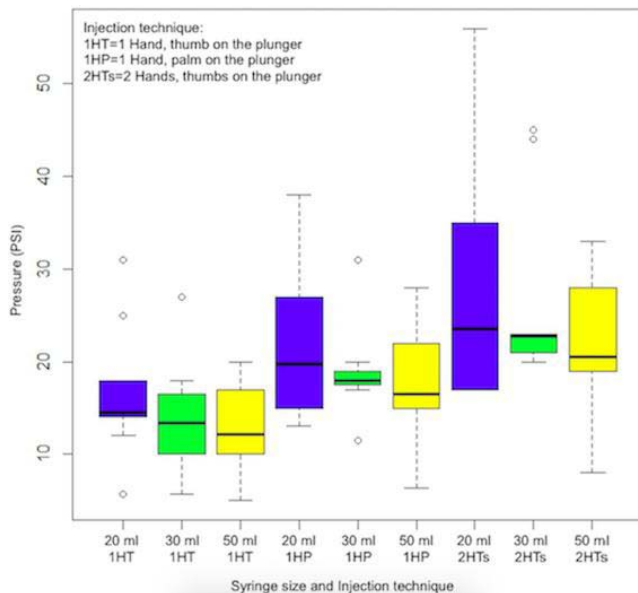
Materials and Methods: In a prospective observational study thirty anaesthetic staff were randomly allocated to 3 syringe sizes: 20ml, 30ml and 50ml. Each participant was asked to inject local anaesthetic during manikin-based

simulated nerve block. The distal end of a non-distensible injection line was hidden and connected to a 3-way tap and manometer (Fluke DPM4). First, participants were asked to inject 3 ml while the 3-way tap was open to atmosphere, then to simulate high OIPs the 3-way tap was closed and they were asked to inject further 5 ml. Using their allocated syringe size, peak injection pressures were recorded for three injection techniques:

1. "Single hand, thumb on the plunger"
2. "Single hand, palm on the plunger"
3. "Two hands, thumbs on the plunger"

The participant's own injection technique was recorded first, then randomly allocated to the other two techniques. Injection technique 1 and the 20 ml syringe were used as references for data analysis using the mixed effects model.

Results and Discussions: Regardless of syringe size, injection techniques 2 and 3 recorded higher pressures ≥ 15 PSI compared to technique 1 ($p < 0.001$). No significant pressure differences were recorded for syringe sizes 30ml and 50ml when compared to 20ml [$p < 0.2261, 95\% \text{ CI } -9.69, 2.46$] and [$p < 0.1330, 95\% \text{ CI } -10.90, 1.52$], respectively. In figure (1) below the first three boxes are for technique 1, the next for 2 and the final for 3.



[Figure 1]

Conclusions: Within the measured parameters, syringe size does not appear to significantly affect OIPs.

The 'one hand, thumb on the plunger' injection technique is superior to the other techniques in limiting high injection pressures, however this does not completely eliminate the risk of high OIPs and forceful injections.

References: 1. Gadsden J et al. Reg. Anesth. Pain. Med. 2016; 41:50-5.

03AP09-3

Intelligent epidural needle placement by fiber-probe OCT

Ting C.-K.¹, Kuo W.-C.², Kao M.-C.²

¹Taipei Veterans General Hospital and National Yang-Ming University, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China, ²National Yang-Ming University, Institute of Biophotonics, Taipei, Taiwan, Republic of China

Background: Incorrect placement of the needle causes medical complications in the epidural block, such as dural puncture or spinal cord injury. This study proposes a system which combines an optical coherence tomography (OCT) imaging probe with an automatic identification algorithm to objectively identify the position of the epidural needle tip and thus reduce the complication rate of epidural needle insertion.

Methods: Three quantitative features were continuously extracted from each two-dimensional (2D) OCT image as the needle tip was progressively inserted from the skin surface toward the epidural space (ES). The differentiation of the needle tip inside of the ES or outside of the ES was automatically evaluated by

using three classifiers: k nearest neighbor (KNN), linear discriminant analysis (LDA), and support vector machine (SVM). Sensitivity, specificity, and accuracy of each testing data set were then evaluated using the receiver operating characteristic (ROC) curve.

Results: 200 *in vivo* OCT images were obtained from 4 anesthetized piglets. Half of these images were obtained from inside of the ES and half from outside of the ES. The combination of all image features, including the mean value of intensity, gray level ratio, and limited range of depth gray level ratio, showed the highest differentiating performance. SVM classification was found to yield the highest sensitivity (95%), specificity (93%), and accuracy (94%) among the three classifiers.

Conclusions: We provide an intelligent method for objective identification of the ES, which can increase the success rate of epidural needle insertion.

03AP09-4

A pilot study to investigate effects of haptic feedback training on injection pressure during simulated regional anaesthesia

Williams D.J.¹, Ford S.M.², Kyriazis D.²

¹ABMU NHS Trust & Swansea University, Dept of Anaesthesiology & Intensive Care, Swansea, United Kingdom, ²ABM University Health Board, Swansea, Dept of Anaesthesiology, Swansea, United Kingdom

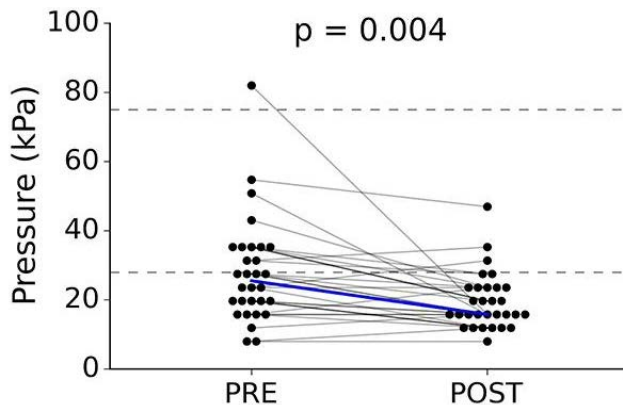
Background and Goal of Study: Nerve injury is a rare but devastating complication of regional anaesthesia, and is associated with excessive injection pressures.¹ Injection pressures < 26 kPa indicate perineural needle placement; pressures < 75 kPa include intraneural injections with no neurological sequelae; pressures > 103 kPa are associated with needle nerve contact.^{1,2} We assessed the effect of haptic training with a sealed air-filled 20 mL syringe (which was previously calibrated in gauge pressure (kPa) using Boyle's law and validated against an industrial precision pressure transducer)³ (Fig 1) on injection pressures exerted by volunteers.



[Fig 1. Improvised haptic training device]

Materials and Methods: 30 volunteers exerted what they considered to be a maximum 'safe' pressure on the syringe in 5 blinded attempts both before and after a 5 minute period of training on the device with feedback. The truncated mean of each group of 5 attempts was taken to exclude outliers, and a 2-tailed paired t-test was performed.

Results and Discussion: A significant reduction in individual mean injection pressures occurred after training (t-statistic: 3.148; $p = 0.004$); and the overall mean pressure for the group decreased from 28.0 kPa to 19.6 kPa (Fig 2). The number of volunteers exerting mean pressures >75 kPa fell from 1 before training to 0 after training; and the number exerting pressures >26 kPa fell from 11 before training to 3 after training.



[Fig 2. Mean pressures before and after training]

Conclusion(s): Training with a simple haptic feedback device significantly reduces injection pressures, and therefore may help prevent nerve injury during regional anaesthesia.

References:

1. Reg An Pain Med 2004;29(5):417-23
2. Anesthesiology. 2014;120(5):1246-53
3. EJA 2015; 32(eSupp 53):94

03AP09-6

Ultrasound for intrathecal injections in pediatric patients with severe scoliosis: isolated use or common practice?

García B.¹, Reinoso F.¹, Fernández E.¹, Huercio I.¹, Martínez M.²

¹Hospital Universitario La Paz, Dept. of Paediatric Anaesthesiology & Intensive Care, Madrid, Spain, ²Hospital Universitario La Paz, Dept. of Physical Medicine and Rehabilitation, Madrid, Spain

Background: Previous reports show that 60 to 80% of spastic quadriplegia patients develop scoliosis. Baclofen has been shown to improve quality of life for these patients.

Case report: The patient is a 12-year-old male weighing 15 kg, ASA III, with a history of encephalopathy, Smith-Lemli-Opitz syndrome, severe congenital scoliosis and increased spasticity. The patient's existing regimen of baclofen 10 mg q8h and botulinum toxin every 3 months was replaced by intrathecal injection of baclofen performed under deep sedation using a face mask and 1 to 2% Sevoflurane, with spontaneous ventilation.

Methimazole was administered following the procedure. Ultrasound was used to facilitate intrathecal injection, performed with a 22 gauge needle in the suspected L4-L5 space. The successful trajectory deviated significantly from the classical midline or paramedian approach.

The procedure was completed successfully and without complication in 18 minutes after only one attempt. Spasticity improved after approximately 25 minutes; thus intrathecal pump implantation was recommended.

Discussion: Ultrasound or fluoroscopy can be considered as an adjunct for accurate localization of vertebral level in challenging patients (Level I)1. Further research is needed to establish a safe, effective procedure for intrathecal access to the subarachnoid space in paediatric scoliosis patients.



[Ultrasound scan]

References: 1. The Second ASRA Practice Advisory on Neurologic Complications Associated with Regional Anesthesia and Pain Medicine Executive Summary 2015 Joseph M. Neal, Michael J. Barrington, Richard Brull, et al. Reg Anesth Pain Med 2015; 40: 401-430.

Learning Points: The use of ultrasound has the potential to reduce procedure time and the incidence of multiple punctures. Furthermore, ultrasound is portable, safe, relatively inexpensive and free of ionizing radiation. Confirming accurate anatomic localization during the baclofen test is crucial, as the success of this test determines indication for pump implantation—a standard tool for improving these patients' quality of life.

03AP09-7

An original miniature automated ultrasound-based system for spinal anaesthesia against usual sonography: preliminary case-serie

Van Hecke D., Pandin P., Naik H., Estruch I., Van Obbergh L.

CUB Erasmus Hospital / ULB, Dept of Anaesthesiology & Intensive Care, Brussels, Belgium

Background and Goal of Study: Blinded spinal anaesthesia (SA) remains a gold standard. Alternatively, a preliminary ultrasound (US) scan may improve safety and efficacy¹, but a few anaesthetists currently perform it (lack of understanding of spinal sonoanatomy¹ using poor US imaging low-frequency sonography², S).

A miniature automated ultrasound-based system (MAUBS), as anatomical structure tracker, might be a solution for Dura mater (D) location during SA. The MAUBS (Accuro™, Rivanna™) principle is to detect first the facet joints in the US field, measure their depth and then, fuse (SpineNav3D™ technology) with a 3D spine anatomical model (Fig1) for real-time 3D lumbar navigation to facilitate needle insertion. We report a preliminary case-series comparing MAUBS data against BW 2D S and depth measurement on the needle.

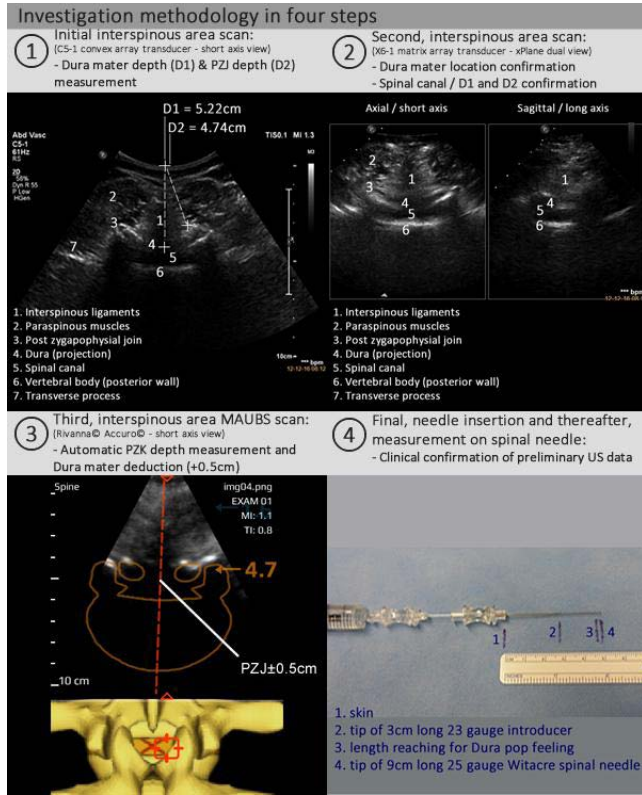
Materials and Methods: Ten patients (orthopaedic surgery) were included (2.5ml HB bupivacaine 0.5% + Suf 5µg SA with 90 vs 150mm long 25G Witacore needle). The Fig. 1 displays the 4 steps methodology regarding the multimodal D depth assessment (steps 1-3) and verification on SA needle (step 4).

Results and Discussion: SA always succeeded. The patients' data and results about technique are listed in Table. The individualization of three distinct patterns (spinous process, vertebral laminae and facet joint with D) was always possible whatever the US technology was. The Fig. 2 displays the respective individual depth measurements regarding facet joint and D. Finally the intra-individual inter-measurement comparison confirmed the measures' similarity between the technologies.

Conclusion: These conclusive results encourage the study of the MAUBS learning curve and its impact on SA practice.

References:

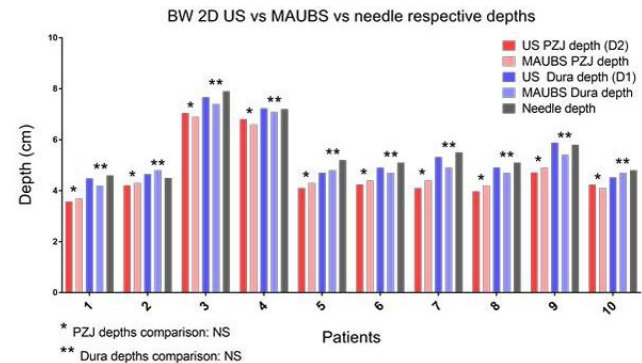
1. Br J Radiol 2012; 85: e262-e269
2. Med Ultrason 2014; 16: 356-63



[Methods - 4 steps methodology]

Demographics	SA position (S vs DL)	Interspinous level	MAUBS angulation simulation for needle insertion	Time-duration (sec)	Needle insertion attempt number
-ASA			-Cephalad (Ceph)	-Step1	
-Weight			-Caudad (Caud)	-Step2	
-Height			-Right	-Step3	
-BMI			-Left	-Step4	
Pat1 - 26yo ASA1/72kg/174cm/BMI23.8	1. S/L4L5	1.No		1.170/120/105/125 [1]	
Pat2 - 56yo ASA1/76kg/178cm/BMI24	2. DL/L4L5	2.Ceph		2.155/110/105/145 [1]	
Pat3 - 35yo ASA2/145kg/169cm/BMI 50.8	3. S/L4L5	3.Ceph/Right		3.175/150/155/160 [1]	
Pat4 - 53yo ASA2/126kg/168cm/BMI 44.6	4. S/L5S1	4.Left		4.172/126/174/172 [2]	
Pat5 - ASA2 83yo/72kg/174cm/BMI23.8	5. DL/L4L5	5.Ceph/Right		5.187/111/128/188 [1]	
Pat6 - ASA2 82yo/70kg/170cm/BMI24.4	6. S/L4L5	6.Ceph/Left		6.179/96/195/220 [2]	
Pat7 - 23yo ASA2/68kg/180cm/BMI21	7. S/L5S1	7.Right		7.146/144/100/167 [1]	
Pat8 - ASA2 60yo/97kg/169cm/BMI34	8. S/L4L5	8.No		8.186/121/144/212 [1]	
Pat10 - ASA2 52yo/74kg/164cm/BMI27.5	9. S/L5S1	9.No		9.177/158/151/174 [1]	
Pat10 - ASA2 42yo/102kg/190cm/BMI28.3	10. S/L4L5	10.Ceph/Right		10.167/134/169/184 [1]	

[Individual data & technical results]



[Results - Individual data patient by patient]

03AP09-9

Epidural catheter breakage during insertion; a cause of failed epidural?

Panteleou K., Serchan P., Tzima M., Zaimi D., Katsanouas K., Katsika E.

Hippokratio General Hospital of Thessaloniki, Dept of Anaesthesiology, Thessaloniki, Greece

Background: Epidural catheter breakage during insertion is a rare but worrisome complication. Guidelines for the prevention of the complication exist, but recommendations regarding whether or not a new epidural catheter should be placed are lacking.

Case report: Epidural catheter placement was required for labor analgesia of a primigravid parturient 30-year-old, 1.73-cm and 86-kg. Loss of resistance with air technique was used at the L3-L4 space in the sitting position. The epidural space was identified at 4 cm from the skin with a 18-gauge Tuohy needle. The catheter was advanced up to 9 cm after which resistance was encountered. It was then decided to remove the catheter through the needle, when a tear of about 3mm X 0.4mm at the catheter's radio-opaque tip was noticed. The Tuohy needle was removed and the process stopped. Surgeon and patient were informed. Neurological examination was normal. After labor, X-rays of lumbar spine in antero-posterior and lateral position were unable to detect the retained catheter. Neurosurgeon suggested a CT and MRI scan, but the fragment was again not visualized. The patient remained asymptomatic and was informed to report any adverse symptoms in the future.

Discussion: In order to prevent epidural catheter breakage the equipment must be examined before placement for manufacturing defects. During placement, when resistance is encountered excessive force should be avoided, the catheter should be withdrawn along with the needle and the maximum length in the epidural space should be 5 cm. When the catheter breaks, imaging exams are not helpful in locating the catheter. The fragment remains in place as long as there are no neurological symptoms. Reviewing the literature epidural catheter placement has been performed after breakage, uneventfully, at another inter-vertebral space in awake, asymptomatic patients.

References:

1. Üşar P, Kar AA, Çitak G, Maral J, Canlı Ş. Breakage of an epidural catheter inserted for labor analgesia. Turk J Anaesthesiol Reanim. 2015 Aug;3(4):282-4.
2. Ritu S, Zia A, Ravi P, Karthik P, Brijbihari K. Broken epidural catheter; a rare complication. Journal of Case Reports in Practice (JCRP). 2014; 2(3): 72-73.

Learning Points: If the catheter breaks during placement, the patient should be informed. If asymptomatic, it is safe to leave the fragment in place. It seems that epidural anesthesia can be performed at another inter-space in awake, asymptomatic and well-informed patients after obtained consent.

03AP10-1

Chest wall rigidity associated with use of subarachnoid sufentanil and sedation with fentanyl

Haddad Silveira C., Mateus Marcelino Serzedo P.S., Barbin Zuccolotto E., Helfenstein E.

CARP, Dept of Anaesthesiology, Ribeirão Preto, Brazil

Background: The use of fentanyl and other opioids is associated with some complications such as chest wall rigidity. The objective of the present report is to discuss chest wall rigidity after the use of subarachnoid sufentanil associated with sedation with fentanyl in a patient undergoing ureterolithotripsy.

Case report: A 32-year-old woman, P1 according to the ASA classification, 62 kg, subjected to ureterolithotripsy. Monitored with SpO2, NIBP and ECG (DII and V5). EV sedation with midazolam (0.05 mg/kg) and fentanyl (2 mcg/kg), spinal block using a Quinke 27G needle between L3-L4, after sterilization and antisepsis with 15 mg of hyperbaric bupivacaine and 7.5 mcg of sufentanil. After uneventful lumbar puncture, the patient was placed in the lithotomy position.

Soon after the beginning of the procedure, the patient evolved with a progressive drop in oxygen saturation, decreased respiratory rate, and increased respiratory range. Her chest wall became rigid and the ventilation movements ceased associated with lowering of consciousness level. Ventilatory support was initiated with a bag valve mask, however the procedure was troublesome and tracheal intubation was required for airway preservation and EV naloxone was administered at 0.2 mg/kg. The condition was rapidly controlled and respiratory efforts resumed associate with awakening and extubation of the pa-

tient. The patient was taken to the anesthetic recovery room and discharged after the intensive clinical observation period and reaching hemodynamic stability.

Discussion: The syndrome known as chest wall rigidity, chest tightness and breathing difficulties can occur during anesthetic induction with opioids and has been reported since 1953. In the case at hand, since the opioids used, i.e., subarachnoid sufentanil and EV fentanyl, are highly liposoluble, their actions were leveraged and triggered this syndrome.

References: Warren DT, Neal JM, Bernardis CM. Neuraxial Anesthesia, in: Longnecker DE, Brown DL, Newman MF et al. Anesthesiology, 2 ed. New York, McGrawHill Medical, 2012; p. 786-807. Liu S, McDonald S - Current Issues in spinal anesthesia. Anesthesiology, 2001;94:888-906.

Learning points: The anesthesiologist must be always alert to identify the syndrome and provide management and treatment in the most accurate and effective manner. The anticipation of possible complicating events as well as a good relationship with the surgical team are key factors for achieving a safe procedure.

03AP10-2

Continued intercostal Branches Block in MidAxillary Line (BRILMA) as pain control technique for unilateral and severe thoracic trauma patients with non-invasive mechanical ventilation

Gomez Martin A.¹, García González N.², Gutiérrez González C.², Álvarez Arias C.², González Humberiro J.A.³, Posada Mesa L.F.¹
¹Hospital San Agustín, Dept of Anaesthesiology & Intensive Care, Aviles, Spain, ²Hospital Universitario Central de Asturias, Dept of Anaesthesiology, Oviedo, Spain, ³Hospital San Agustín, Dept of Anaesthesiology, Avilés, Spain

Background and Goal of Study: Multiple trauma is the leading cause of mortality in people under 40 years in our region. Thoracic trauma (pulmonary contusion, multiple rib fractures, flail chest, Mechanical Ventilation (MV) related Pneumonia...) represent between 35-45% of the morbidity and mortality. The introduction of Non-invasive Mechanical Ventilation (NIMV) improves mortality rates associated with chest trauma, but severe pain makes the establishment of these techniques difficult.

Carry out a project in order to observe and evaluate the continuous pain control by Intercostal Branch Block in MidAxillary Line (BRILMA) in patients with severe chest trauma (contusion / multiple rib fractures, flail chest) in need of restoration NIMV therapy.

Materials and Methods: Observational study from May-September 2016, 53 patients with serious multiple trauma.

We collected age, sex, ISS, SAPS3, associated injuries with hemodynamic/neurological compromise, VAS at rest, VAS with inspiration after NIMV application and after BRILMA catheter placement with Ropivacaine 0.2% infusion up to 10ml/h.

Results and Discussion: 39 of 53 patients admitted in ICU with multiple injuries. Polytrauma patients with severe head injury, chest trauma and/or hemodynamic instability requiring Invasive MV (IMV), were discarded. Only 6 of the 14 patients remaining, required NIMV (42%).

Patients are mostly men with average age of 32 years. Patients requiring NIMV have lower index of gravity (ISS and SAPS3) bearing no associated lesions (severe cranean injury, multiple fractures with hemodynamic compromise,...). At rest, average values of VAS were close to 7 +/-2. After introduction of NIMV, increased values of VAS 8 +/-1.4 without statistical significance.

We observed the decreasing in values of VAS after BRILMA block, with average values of 3 +/-1.7 and this remains stable within the next 24 hours, with EVA average values of 3'5 +/-2.

Conclusion: Continuous BRILMA block is an effective pain control technique in patients with unilateral thoracic trauma requiring NIMV therapy.

There are two key points: control of respiratory function and patient analgesia, so optimization and individualization based on injury and severity is compulsory.

The introduction of NIMV contributes to lower rates of morbidity and mortality so the proper pain control allows better tolerance of NIMV, avoiding IMV and its adverse consequences.

03AP10-3

The analgesic efficacy of intravenous regional anesthesia (IVRA) with a forearm versus conventional upper arm tourniquet: a systematic review

Dekoninck V.¹, Hoydonckx Y.², Dubois J.¹, Ory J.-P.¹, Jamaer L.¹, Stessel B.¹

¹Jessa Hospital, Dept of Anaesthesiology & Intensive Care, Hasselt, Belgium, ²Jessa Hospital, Dept of Anaesthesiology & Pain Medicine, Hasselt, Belgium

Background and Goal of Study: IVRA is a simple and effective anesthetic technique for surgery of the distal extremity. Traditionally, one uses an upper arm tourniquet to sequester the local anesthetic and to create a bloodless surgical field.

Application of a forearm tourniquet however may offer several advantages, including a decrease to non-toxic levels of the dosage of local anesthetic required to produce an equal quality of analgesia and longer tolerance of the tourniquet.

The optimal anesthetic technique for surgery of the distal extremity is still undecided. Therefore, we performed a systematic review and meta-analysis of randomized controlled trials to compare the analgesic efficacy of IVRA with a forearm versus an upper arm tourniquet in an adult population.

Materials and Methods: We performed a literature search in MEDLINE, EMBASE and Cochrane databases for relevant studies published in English, French, Spanish, German and Dutch until December 2015.

Search term was "intravenous regional anesthesia". Two independent authors reviewed all titles and abstracts of articles identified through our search. Reference lists of reviews and retrieved articles were screened for additional studies. Potentially relevant papers were retrieved in full and assessed for eligibility. Disagreements between the reviewers were resolved by a third author.

Results and Discussion: We identified 1227 records. After removing 494 duplicates, we screened 733 records of which 644 were excluded based on the title. We then read the abstracts of the remaining articles (n=89) for eligibility. One article was retracted and 73 articles were excluded. After screening 15 full-text articles, 3 studies were included in the quantitative synthesis. Data of those 3 studies

(146 patients) were pooled for meta-analysis.

In 2 of 3 studies, the dosage of local anesthetic was halved in the forearm tourniquet group.

Analgesic efficacy is not statistically different between the two groups: RR = 0.99 [0.94, 1.04] without identifiable heterogeneity (I² = 0%).

Conclusion(s): This systematic review demonstrates that the analgesic efficacy of IVRA with a forearm tourniquet is high and comparable with the analgesic efficacy of IVRA with a conventional upper arm tourniquet. Moreover, IVRA with forearm tourniquet seems safer since the dosage of local anesthetic required, can be halved to non-toxic levels.

03AP10-5

Postoperative analgesia requirements after propofol anaesthesia with intercostal nerve block versus sevoflurane and opioids for breast cancer surgery

Lopez V., Cassinello F, Moris L., Aravelo J., Vasquez M., Muñoz L.
Fundacion Jimenez Diaz University Hospital, Dept of Anaesthesiology, Madrid, Spain

Background: Breast cancer surgery is one of the most frequently performed surgeries. Even relatively minor breast surgery can be associated with significant postoperative pain. Thoracic epidural analgesia, paravertebral blocks and other regional techniques are commonly used as analgesia associated to general anaesthesia. Intercostal nerve block is an alternative, described by his author as particularly useful for ambulatory patients.

Goal of Study: The aim of the study was to demonstrate that Intercostal nerve block and propofol anaesthesia (IBP) provides better postoperative analgesia, with less nausea and vomiting (PONV) and better patient satisfaction than sevoflurane and opioids. (SAO).

Materials and Methods: 20 women with diagnosis of breast cancer were randomized to receive either IBP (chirocane 0.25% 25 ml) performed under ultrasound guidance, or SAO. The following data were collected: intraoperative and postoperative fentanyl consumption, postoperative VAS pain scores at 1 and 24 h postoperative, PONV scores and postsurgical hospital stay.

Results: Patient demographics and hospital stay were comparable for both groups (Table 1). IBP group had no need of opioids in the recovery room and presented significantly lower VAS pain scores and less PONV. There was no difference in hospital stay or intraoperative fentanyl. (Table 2)

Variable	Sevoflurane/opioids	Propofol/PEC	p
AGE(yr)	55,9±14,1	64,3±17,0	0,212
WEIGHT(IMC)	25,4±4,4	25,7±3,4	0,762
HOSPITAL STAY (Days)	1,5	2,15	0,253

[Table 1]

Variable	Sevoflurane/opioids	Propofol/PEC	p
NSAI (%)	100	100	1
intraoperative fentanyl (mcgr/median)	254,5	257,5	0,201
postoperative fentanyl (mcgr, median)	40	0	0,033
EVA 1	3,7±1,7	1,3±1,3	0,005
EVA 18H	1,7±1,8	0,9±1,1	0,305
NAUSEA AND VOMITING (%)	30	0	0,211
ONDASETRON(%)	20	0	0,474

[Table 2]

Conclusion: Propofol and intercostal nerve block provides better postoperative analgesia with less PONV than sevoflurane and opioid anaesthesia.

References:

- Pectoral nerves I and II blocks in multimodal analgesia for breast cancer surgery: a randomized clinical trial. Bashandy et al. *Regional anesthesia and pain medicine*, 2015; 40(1)68-74
- Bloqueo de las ramas cutáneas laterales y anteriores de los nervios intercostales para analgesia de mama. Pérez, M; *Cirugía mayor ambulatoria*, 2012; 17 (3)95-104

03AP10-6

Scalp Nerve Block Using Lidocaine or Levobupivacaine Both Provide Good Hemodynamic Control during the Cranial

Fixation of Cervical Spine Surgery

Cheng H.-L.

National Taiwan University Hospital, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China

Background: There are several previous studies demonstrating that regional scalp nerve block provides better hemodynamics, acute and chronic pain control for brain surgery. Many cervical spine surgery also require cranial fixation which often cause significant hemodynamic change. Aim of this study is to exam if scalp nerve block provides similar benefit as well.

Methods: We reviewed all consecutive adult patients underwent elective cervical spine surgery during 2015/05 and 2016/04. All patients received endotracheal general anesthesia induction with fentanyl, propofol/ thiomyal and cisatracurium/ rocuronium followed by sevoflurane/ desflurane/ propofol maintenance. If a patient was selected to receive regional scalp nerve block by his/her anesthesiologist, 0.5% levobupivacaine or 2% lidocaine about 3ml was injected each side for auriculotemporal and lesser occipital nerve after general anesthesia induction. We do not perform greater occipital nerve block to avoid possible cervical nerve damage when positioning. Heart rate and blood pressure were monitored during cranial fixation, if significant hemodynamic change was noticed, increasing anesthesia depth and/ or adding fentanyl/ antihypertensive drugs was selected by the anesthesiologist.

Results: During these 12 months, there were 214 elective adult cervical spine surgeries, 94 of them required cranial fixation. All 94 were put into prone position with head fixed with Mayfield skull clamp. Seventeen patient received regional scalp nerve block and 77 didn't. The baseline HR, SBP, DBP were 79.0 vs 79.6, 146.8 vs 146.1, 81.8 vs 83.8 in control and nerve block group. After cranial fixation, the HR, SBP, DBP were 92.0(+16.5%) vs 87.6(+10.1%), 138.4(-5.7%) vs 121.8(-16.6%), 86.1(+5.3%) vs 73.9(-7.2%) in control and nerve block group. The DBP change value and percentage were both significantly different (p-value 0.016 and 0.014). In nerve block group, 6 patients received 2% lidocaine, 10 patients received 0.5% levobupivacaine, and 1 patient

received 1:1 mixture. The HR, SBP, DBP difference were not significant between lidocaine and levobupivacaine subgroups. There was no adverse event caused by regional scalp nerve block.

Conclusion: In patients with regional block to auriculotemporal and lesser occipital nerve, the hemodynamic control, especially DBP is better than patients without regional scalp nerve block. It is an effective and safe technique for cervical spine surgery requiring cranial fixation.

03AP10-7

Peribulbar block for corneal transplantation: efficacy and safety

Xavier J., Gonçalves G., Sa J., Ferreira L., Cavaleiro C., Machado H.

Centro Hospitalar do Porto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Corneal transplantation (CT) requires complete akinesia of the extra-ocular muscles and deep anaesthesia of the surgical site. This can be achieved with general (GA) or regional anaesthesia (RA). In our institution, CT has usually been performed under GA, due to fear of the 'open-sky' situation. In the last few years, there has been a growing trend towards using peribulbar block (PBB). Evidence regarding the comparative merits of each technique is scarce. We believe that PBB can achieve good surgical conditions with a low complication rate and minimal post-operative analgesic requirement. The aim of our study was to evaluate the efficacy and safety of peribulbar block for CT.

Materials and Methods: We conducted a retrospective audit to evaluate CT under PBB in our institution between June and November 2016. Clinical data collected on each patient included age, sex and American Society of Anesthesiologists physical status. Surgery-specific data included procedure and anaesthesia lengths, characteristics of peribulbar block and analgesic drug administration. Postoperative data included analgesic need in the post-anaesthesia care unit and within 24 hours of stay and clinical outcome at 15 days.

Results and Discussion: Between June and November 2016, 76 CT were carried out, 20 under PBB. Of these, 1 was a penetrating keratoplasty and 19 were lamellar keratoplasties. All patients received an inferotemporal injection and 14 (70%) received an additional injection, either superomedial or caruncular. 1% ropivacaine was the only local anaesthetic used, with a mean dose of 65mg (40-90mg). Most patients received additional systemic analgesia, usually paracetamol 1g (90%) and/or fentanyl 0.05mg (35%), mostly to provide perioperative comfort. There was 1 case of partial block failure, requiring significant systemic analgesia (paracetamol 1g, tramadol 200mg and fentanyl 0.05mg) during the intra-operative period. 1 patient suffered an episode of bradycardia and hypotension shortly after the block injections, which resolved with the administration of 30mg ephedrine. No patient required conversion to GA. No serious complications were observed at 15-day follow-up.

Conclusion: PBB appears to be a safe and effective technique for CT. Further evidence from prospective and randomised trials is required to compare PBB with GA.

03AP10-8

Peribulbar block with akinesia: how to do it?

Martins P., Amorim J., Carvalho A.P., Guerreiro L., Carneiro J., Resende A.

Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background and Goal of Study: Peribulbar block (PB) is a safe and easily performed regional anaesthetic technique. Some factors may influence the levels of akinesia in PB, namely the volume (V) of the local anaesthetic injected. On the other hand, large volumes may affect intra-ocular pressure. The goal of our study is to compare akinesia after PB with the volume of local anaesthetic, number and the site of injection and complications.

Materials and Methods: A prospective observational study was performed between May and October 2016. With 22mm needle, the PB was done with 1% ropivacaine or 1% ropivacaine +2% lidocaine with injection site at inferotemporal (IT), superonasal (SN), superotemporal (ST) and/or lacrimal car-

uncle (LC). A pressure of 30mmHg was applied for 5-10 min and akinesia of each rectus muscle was evaluated 15 minutes after injection as "0-total", "1-partial", "2-no akinesia".

Results and Discussion: Sixty-seven patients were recorded, mean age of 72.52 years; 49.3% female; 68.7% ASA 2, 29.9% ASA 3 and 1.5% ASA 4. The surgical procedures were 14.9% vitrectomies (VPP), 76.1% phacoemulsification with intraocular lens implantation (PIL), 3% VPP and PIL, 4.5% trabulectomy and 1.5% ahmed valve revision. A mean of 2.13 injections were performed. The mean volume at SN was 1.79mL, IT 3.31mL, LC 1.02mL, ST 0.75mL and total volume (Tv) 5.23mL.

Internal akinesia 0 was found in 43.3%, 1 in 37.3% and 2 in 19.4%; external akinesia 0 in 38.8%, 1 in 43.3% and 2 in 17.9%; inferior akinesia 0 in 56.7%, 1 in 31.3% and 2 in 11.9%; superior akinesia 0 in 56.7%, 1 in 23.4% and 2 in 14.9% of all patients. For all quadrants, 0 was observed in 23.9%, 1 in 68.6% and 2 in 7.5%.

With the univariate analysis we verify that, for the superior akinesia the IT volume was statistically significant (p 0.006), for the external akinesia the IT volume (p 0.0001) and the Tv (p 0.002) were statistically significant. For the type of procedure, the Tv (p 0.004), number of injections (p 0.001) and SN volume (p 0.003) had statistical significance. There were no block-related complications.

Conclusion(s): Our results show that the IT volume is important for superior and external akinesia and the Tv for external akinesia. About the type of procedure, the SN volume, the Tv and the number of injections affect the degree of akinesia. Multicenter studies with larger population and alternative techniques of PB are necessary to improve the degree of akinesia.

03AP10-9

Anesthetic management of the patient with laryngeal hyperresponsiveness

Álvarez Garoña M., Galiana Ivars M., Estañ Pérez A., Aristy Ortiz C.A., Tárraga Honrubia C., Company Teuler R.J. Hospital General Universitario de Alicante, Dept of Anaesthesiology & Intensive Care, Alicante, Spain

Background: Laryngeal hyperresponsiveness (LHR) or irritable larynx is a rare entity that is described as the state of laryngeal hyperreactivity and hyperfunction following exposure to a wide variety of specific trigger stimuli (1). Its presence may make the anesthetic management difficult, requiring the use of other anesthetic strategies rather than general anesthesia.

Case report: A 47-year-old woman with a diagnosis of LHR and multiple allergies and intolerances (latex, lidocaine, chlorhexidine, alcohol...) was scheduled for lower right limb melanoma exeresis. Whereas she had been operated in other occasions without incidents, in her last surgery severe laryngospasm occurred after removal of the laryngeal mask, which was resolved by means of a positive pressure face mask ventilation and administration of succinylcholine without requiring intubation.

After preanesthetic evaluation we decided to add salbutamol and ipratropium in aerosol and actocortin iv 1 hour before surgery. General anesthesia was excluded due to LHR and we decided to choose locoregional anesthesia avoiding the use of lidocaine. Lumbar puncture was performed at L3-L4 level with 25 G Whitacre needle and 60 mg mepivacaine 2%. No incidents were recorded.

Discussion: A few months later, the patient needed to be reoperated to remove melanoma margins and sentinel ganglion. We develop the same anesthetic technique and again, there were no complications.

It is important to adequately balance the risks and benefits individually to establish the most appropriate anesthetic technique. The use of another local

anesthetic and the maintenance of the locoregional approach may be an optimal option in selected cases.

References:

1. Ortegat A. Síndrome de laringe irritable. Rev. Med. Clin. Condes - 2009; 20(4) 505 - 509
2. anestcritic.appstor.io

Learning Points: Faced with a patient with LHR, we recommend (2):

1. Adequate evaluation and pre-anesthetic preparation using intravenous corticosteroids and aerosols
2. Avoid possible triggers (GER, stress, irritants)
3. Minimize the manipulation of the airway area using, if necessary in this order: facial mask, laryngeal mask, endotracheal tube
4. Choice of the most adequate and safe anesthetic technique for the patient, ie prioritizing locoregional techniques as far as the intervention allows it and leaving general anesthesia for those cases where it is strictly necessary
5. In those cases, the anesthesiologist must know the algorithm for action in a laryngospasm.

03AP10-10

Ultrasound peripheral nerve blocks in carpal tunnel syndrome surgery in hemodialysis

Djennane A.¹, Boudjouref N.², Grainat N.¹

¹Batna, Dept of Anaesthesiology & Intensive Care, Batna, Algeria,

²Batna, Dept of Surgery, Batna, Algeria

Background and Goal of Study: Carpal tunnel syndrome may be performed under general anesthesia (GA), regional anesthesia (RA) or local anesthesia. The aim of our study is to evaluate the efficacy and safety of peripheral nerve blocks (PNB) in carpal tunnel syndrome (CTS) surgery in hemodialysis.

Materials and Methods: Prospective study of hemodialysis patients admitted for CSC surgery in 2015. The parameters studied were: age, sex, block used, volume of local anesthetic (LA) used, success, complications.

Results and Discussion: We included 9 patients (5 men and 4 women), the mean age was 51 years [41,65]. The surgery was on the same side of the arteriovenous fistula in 5 cases (surgery without tourniquet). The block performed was an axillary block (AXB) in 7 cases and two truncular blocks under ultrasound, the average volume of LA was 21 ml, the total success was in 8 cases and with sedation in one case. Only one case of minor toxicity of IA, and one case of mechanical paresthesia.

The prevalence of CTS in hemodialysis patients is 9% to 42.7% depending on the series, most often on the fistula side. When the surgery is indicated, the gesture is performed open-ended or endoscopically. The incised zone is theoretically dependent only on the median and ulnar nerves. PNB of the upper limb seems to offer the best compromise between effective anesthesia of the surgical site, Low risk of complications and rapid street aptitude. If distal blocks have the disadvantage of poor tourniquet tolerance, proximal blocks (supra and infraclavicular blocks) are more likely (Pneumothorax, phrenic paralysis and hematoma in a non-compressible region; with high risk when Disorders of hemostasis as for one of our patients).

The axillary approach because of its efficiency, simplicity and low complication rate seems the reference solution. However, it is not completely destitute, such as the vascular punctures. Fortunately, the vessels in this region can be manually compressed. But ultrasound makes it possible to visualize the vascular structures and thus decrease the number of punctures. By identifying the anatomical variations, it also reduces the risk of lesions as well as the volume of LA, which went from 40ml to 21ml.

Conclusion(s): The ultrasound PNB seem to offer the best risk-benefit for surgery for carpal tunnel syndrome in hemodialysis patient.

Obstetric Anaesthesiology

04AP01-1

Safe performance of neuraxial block for delivery in women with severe thrombocytopenia - a retrospective cohort study

Levy N.¹, Goren O.¹, Cattani A.¹, Weiniger C.F.², Matot I.¹

¹Tel Aviv Souraski Medical Center, Dept of Anaesthesiology & Intensive Care, Tel Aviv, Israel, ²Hadassah Hebrew University Medical Center, Dept of Anaesthesiology & Intensive Care, Jerusalem, Israel

Background and Goal of Study: Thrombocytopenic women in labor present a unique challenge for the anesthesiologist, weighing the risks of rare but potentially catastrophic complications versus the benefits of neuraxial block (NB) for delivery. In recent years a platelet count acceptable by most anesthesiologist for NB is >75-80X10⁹/l. Still, for this patient population, more so for those with very low platelet counts (<80X10⁹/l) data regarding the use of regional interventions, complications and outcome are insufficient. We assessed the anesthetic management of women with moderate to severe thrombocytopenia (L-PLTS), the safety of regional anesthesia, and the implications on the method of delivery.

Materials and Methods: A retrospective analysis of anesthetic and obstetric data of women with platelets <100X10⁹/l admitted for delivery during 2011-2014 in a single referral center, with 12,000 annual deliveries. Women were divided according to their platelet counts into mild (80-99X10⁹/l), moderate (51-79X10⁹/l) and severe (<51X10⁹/l) L-PLTS groups. Obstetric history, anesthetic method, etiology of L-PLTS, rates and urgency of cesarean delivery (CD) and length of hospital stay (LOS) were compared.

Results: L-PLTS incidence was 1% (471 women), the most frequent cause was gestational (77.5%). No spinal epidural hematoma occurred after 308 NB, of which 60 were performed in women with platelet count <80X10⁹/l. Compared to women with mild L-PLTS, women with moderate to severe L-PLTS were less likely to receive NB, were more likely to receive general anesthesia for their CD, and had a higher rate of urgent CD. Blood products transfusion was more frequent in the moderate-severe L-PLTS groups. LOS was significantly longer for the severe L-PLTS group.

parameter/platelet count	<51 X10 ⁹ /l (n=20)	51-79 X10 ⁹ /l (n=119)	80-99X10 ⁹ /l (n=332)	p-value
Neuraxial block, n (%)	5 (25.0)	55 (46.2)	248 (74.7)	<0.0001
Cesarean delivery, n (%)	10 (50.0)	42 (35.3)	135 (40.7)	0.37
urgent cesarean delivery, n (% of surgeries)	7 (70.0)	32 (76.0)	63 (45.0) ^λ	0.003
General anesthesia for cesarean delivery, n (% of surgeries)	7 (70.0)	17 (40.5)	15 (11.1)	<0.0001
Length of stay - days (mean ± SD) σ	6.1 ± 3.3	3.6 ± 1.9	3.7 ± 3.8	0.004
Women administered with blood products, n (%) ω	5 (25.0)	9 (7.6)	17 (5.1)	0.025

Data presented are mean (SD); number (percentage); ^λ Two cases of unreported urgency of surgery; ^σ Difference was significant also when comparing length of stay between the severe L-PLT (<51X10⁹/l) to each of the groups separately; ^ω Packed red cells, fresh frozen plasma, cryoprecipitate, platelets.

[Cesarean delivery and outcome variables]

Conclusions: The data provide support for the safe use of regional interventions for delivery in women with L-PLTS, more so in those with the moderate-severe form who might benefit from a reduction in the rates of general anesthesia and shortening of hospital stay.

04AP01-2

Thrombocytopenia in obstetric patients

Alkholany M.

Central Manchester University Hospitals, Dept of Anaesthesiology, Manchester, United Kingdom

Background: Obstetric patients presenting with low platelet count always constitutes a debate about which platelet count level is safer, whether the same level applies for spinal and epidural, whether the experience of the operator constitutes a factor in the specification of this safe level in addition to lack of high quality evidence.

Methods: Retrospective Audit, studying obstetric patients with thrombocytopenia during pregnancy in St Mary's hospital, Central Manchester university hospitals, between late 2012 and early 2013. It studied type of anaesthesia/analgesia they received with respect to their platelet count at time of presentation and whether this followed the agreed joint care plan which doesn't recommend neuroaxial techniques with platelet count below 80,000/ml, and if there was an increase in the rate of GA.

Results: See flow chart.

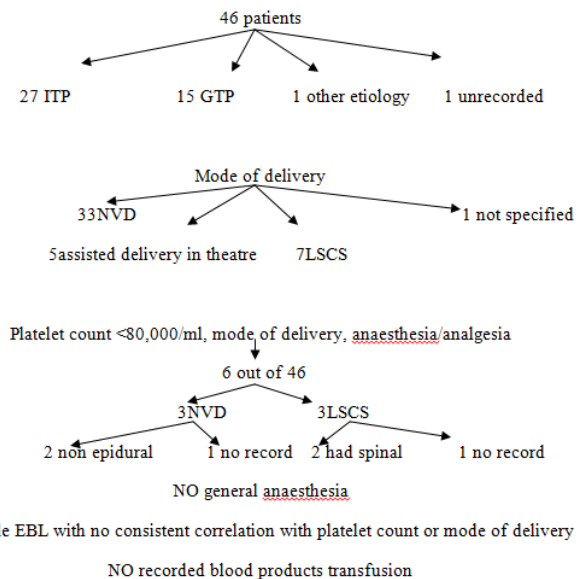
Conclusion: The decision to administer neuroaxial blockade to obstetric patients is more complex than just platelet count and needs more evidence based decision making because current evidence depends on expert opinion.

Recommendations:

1. Reaudit cycle in line with AAGBI guidance which came to life 2013, the time when the patient sample was selected and extrapolate evidence from NAP 3 project whose report came to life in 2009.
2. Redefine standards to be met in terms of anaesthesia/analgesia care of obstetric patients with low platelet count.
3. Liaising with Hematology service to redefine and standardize safe platelet count level for performance of Neuroaxial block in obstetric patients.
5. Improve recording of details of care to tail plans for similar patients based on complication rate.

References:

1. Regional anaesthesia and patients with abnormalities of coagulation: The association of anaesthetists of great Britain and Ireland, the obstetric anaesthetists' association and regional anaesthesia UK. November 2013.
2. NAP 3: National Audit of Major Complications of Central Neuraxial Block in the United Kingdom



[Results]

04AP01-3

Outcome of laboring women with severe thrombocytopenia: retrospective case control analysis

Levy N.¹, Goren O.¹, Weiniger C.F.², Cattan A.¹, Matot I.¹

¹Tel Aviv Souraski Medical Center, Dept of Anaesthesiology & Intensive Care, Tel Aviv, Israel, ²Hadassah Hebrew University Medical Center, Dept of Anaesthesiology & Intensive Care, Jerusalem, Israel

Background and Goal of Study: Most anesthesiologists would hesitate before performing neuraxial block (NB) for delivery in women with severe thrombocytopenia (L-PLTS), despite the rarity of an adverse event such as spinal-epidural hematoma (SEH). We assessed the anesthetic management and obstetric outcome of laboring women with L-PLTS in a single tertiary center with 12,000 annual deliveries.

Materials and Methods: Case-control study of women with L-PLTS (platelet count $<80 \times 10^9/l$), singleton delivery during 2011-15. Each woman with L-PLTS was matched according to age, parity, gravidity and gestational age to 3 or 4 controls (platelet count $>100 \times 10^9/l$) who delivered within the same six months. Obstetric characteristics and outcome, anesthetic details, pre-eclampsia, transfusion of blood products and length of hospital stay (LOS) were compared.

Results: One hundred fifty eight women with L-PLTS delivered during the study period; control group comprised 506 non-thrombocytopenic women (mean platelet count \pm SD: $69 \times 10^9/l \pm 22 \times 10^9/l$ vs. $212 \times 10^9/l \pm 59 \times 10^9/l$, respectively). Case and control groups were similar for demographic and obstetric characteristics. NB was performed in 58 (36.7%) women with L-PLTS (platelet count range: $40-79 \times 10^9/l$) without evidence of SEH or other neurologic complications. Women with L-PLTS were less likely to receive NB (36.7% vs. 75.9% in control group, $p < 0.0001$), had higher rates of cesarean delivery (27.8% vs. 19.2% in the control group, $p < 0.004$), more of which under general anesthesia (21/44, 47.7% vs. 8/102, 7.8% in the control group, $p < 0.0001$). Women with L-PLTS had higher rates of pre-eclampsia and were at higher risk for blood product transfusion. Apgar scores and LOS were similar for women with L-PLTS vs. controls and so was the rate of urgent/emergent cesarean deliveries.

A sub-group analysis according to the method of anesthesia did not reveal a significant effect of severe thrombocytopenia on Apgar scores, urgency of cesarean delivery, LOS, or blood product transfusion.

Conclusions: Women with severe thrombocytopenia receive less neuraxial blocks for labor. The data suggest the need to be prepared for general anesthesia for cesarean delivery and for blood product administration. Nevertheless, when compared to matched non-thrombocytopenic women having the same analgesic/anesthetic method, the outcome of women with severe thrombocytopenia is not significantly different. Larger studies are needed to confirm these results.

04AP01-4

Incidence of complications during labour epidural technique procedure depending on the position of the patient

Costa C., Martí A., Gonzalez M., Jimenez Y., Moret E., Canet J.
Hospital Universitari Germans Trias i Pujol, Dept of Anaesthesiology & Pain Medicine, Badalona, Spain

Background and Goal of Study: Epidural analgesia for labour can be performed in different positions of the patient. The aim of this study was to analyse the incidence of complications during epidural technique procedure depending on the position of the patient.

Materials and Methods: In this single-centre, prospective, randomised study pregnant women in labour were randomised over a period of 15 months into 2 groups: G1 procedure performed in sitting position and G2 in left lateral decubitus position. Exclusion criteria were: non-adult patients, BMI >35 , previous accidental dural puncture (ADP) or back surgery.

Variables recorded were: BMI, age, labour stage, experience of anaesthesiologist, previous epidural technique, palpation of anatomic structures, pain scores at beginning and end of procedure, technique duration, number of attempts, ADP, intravascular puncture, catheter lateralization, patchy analgesia and procedure tolerance. Data are presented as absolute numbers, percentages or median \pm standard deviation values.

Results and Discussion: A total of 154 pregnant women were collected, 73 in G1 and 81 in G2. 11 patients needed position changes. Both groups were comparable in terms of BMI, labour stage, experience of anaesthesiologist, previous epidural technique, palpation of anatomic structures, technique duration, number of attempts, vascular puncture, catheter lateralization, patched analgesia, procedure tolerance and pain scores at different times.

Position changes were associated with a difficult palpation of anatomic structures ($p=0.02$) and with a longer technique duration: 70% of the patients who needed position changes needed more than 5 min minutes compared to 21% in the group that did not change position ($p=0.001$) due to the increased number of attempts. 30% of patients who needed position changes required 3 attempts or more compare to 8.9% who did not change position ($p=0.069$). Position changes were associated with the following complications: ADP, catheter lateralization, patched analgesia, vascular puncture and bad tolerance during procedure ($p < 0.01$).

No differences among groups were found.

Conclusion(s): Position for performing one labour epidural technique was not related to complications. Position changes were associated with difficult palpation of anatomic structures, higher duration of the technique and required more attempts. Patients who needed position changes presented more complications.

04AP01-5

Obstetric anaesthesia and analgesia related complications in Czech and Slovak Republics: National observational survey in 2015

Stourac P.¹, Blaha J.², Noskova P.², Grochova M.³, Fирment J.³, Schwarz D.⁴, OBAAMA-INT Study Group

¹University Hospital Brno and Medical Faculty of Masaryk University, Department of Paediatric Anaesthesiology and Intensive Care Medicine, Brno, Czech Republic, ²1st Medical Faculty of Charles University, General University Hospital in Prague, Dept of Anaesthesiology & Intensive Care, Prague, Czech Republic, ³University Teaching Hospital of Louis Pasteur and Medical Faculty of University of Pavol Josef Šafárik, Dept of Anaesthesiology & Intensive Care, Kosice, Slovakia, ⁴Masaryk University, Institute of Biostatistics and Analyses, Brno, Czech Republic

Background and Goal of Study: In the year 2011 OBAAMA-CZ study described anaesthesiological practice for obstetric anaesthesia and analgesia in the Czech Republic. One of the objectives of the OBAAMA-INT study performed in the year 2015 was to describe obstetric anaesthesia and analgesia related complications in the Czech (CZ) and Slovak Republics (SR).

Materials and Methods: OBstetric Anaesthesia and Analgesia Month Attributes International (OBAAMA-INT) was held on anaesthetic departments throughout the CZ and SR. With Ethical Committees Approval we aimed to enroll all 149 obstetric departments in CZ and SR and to monitor every case of anaesthetic care in peripartum period and all anaesthesia and analgesia related complications during November 2015.

Data were recorded to Case Report Form with two parts (Demography 2014 and Case Report) into CLADE-IS (Masaryk University, CZ). The data were described descriptively (mean, median, SD). Fisher's exact test was used in case of categorical variables (SPSS 23, IBM).

Results and Discussion: During the study period, we enrolled 105 participating centers (70 in CZ; 35 in SR) and 3 590 valid cases. Caesarean Section (CS) was recorded in 2 548 cases (71.0%), 1158 cases (31.4%) were obstetric analgesia and 181 cases (5.0%) were early postpartum procedures. The most preferred type of anaesthesia for CS was neuraxial anaesthesia (62.5%); spinal in 87.5%.

Most frequent complications related to general anaesthesia were difficult airways (1.4%) at the induction, hypertension (7.9%) and tachycardia (5.2%) during the anaesthesia. Complications related to spinal or epidural anaesthesia were more than 1 attempt to achieve neuraxial space (23.6%; 16.1%), blood in the needle (1.9%; 1.0%), paresthesia (1.3%; 1.0%) and high blockade (0.4%; 0.5%).

Epidural labor analgesia rate was 11.1%. For epidural labor analgesia the most frequent complication was more than 1 attempt to achieve epidural space (15.5%), blood in the needle or catheter (3.1%) and unattended dural puncture (0.7%). Postpuncture headache was recorded in 1.2% overall. In case of epidural labor analgesia it was more frequently associated with multiple attempts ($p=0.007$) and unattended dural puncture ($p < 0.001$).

Conclusion: There are no previously published Czech and Slovak national data available, hence presented data are very important starting point for future improvement.

Acknowledgement:

Financial support grant: CSARIM201501.

ClinicalTrials.gov ID: NCT02380586

04AP01-6

Management of a postpartum neurological deficit - a case report

Santos Carvalho C.¹, Castanheira C.², Pinto R.², Neves M.²,
Mendes Coelho F.²

¹Hospital Beatriz Angelo, Dept of Anaesthesiology, Loures, Portugal,

²Hospital Beatriz Angelo, Dept of Anaesthesiology, Lisboa, Portugal

Background: Neurological deficits following delivery may occur in up to 1 in 100 women. Nonanaesthetic causes account for most of the situations; it resolve spontaneously within days to weeks.

Neurological complications due to neuraxial blocks (CNB) are rare: the incidence is 5.9/10 000 and 2.0/10 000 for spinal and epidural (Ep) techniques, respectively.

Neuropathy results from mechanical trauma (needle/catheter damage) producing stretch, compression, or transection of the nerve tissue. Compromise of the blood supply, or the presence of a neurotoxin are other causes.

Case report: A healthy 32 years old woman presents for induction at 41 weeks of gestation. In 2013 she had an eutocic delivery under Ep analgesia - difficult technique.

An Ep catheter was placed easily in the second stage; analgesia was efficacious. Phase 3 was a prolonged shoulder dystocia. The new-born had 4 380 g and good vitality.

In Day 1 (D1) the mother presented paraesthesia on the medial hip face bilaterally, and lack of force compromising ambulation. History and observations pointed for obturator injury. Consulting for neurology was demanded.

The MRI shows: vertebral bodies block L2-L3-L4, with an inversion of lumbar curvature; anterior epidural hematoma (EH) from L5-S1 with no signs of root compression. Neurosurgical advice was requested.

In D3 symptoms were null except a slight hypoesthesia in the medial face of the right hip.

In the D4 the mother was discharged.

Discussion: Prompt recognition and management are fundamental to reduce the risk of permanent neurological deficits. A flowchart is fundamental for sparing time in emergencies and to reassure all the parts.

The congenital vertebral block L2-L3-L4, and the lumbar kyphosis, explain both the difficulty and easiness in both CNB. Ultrasonography (US) should help in these situations.

The anterior Ep hematoma has no direct liaison with a CNB and was an erroneous alarming factor that led the case to be conducted with excessive care.

References:

- Duncan A, Patel S. Neurological complications in obstetric regional anaesthetic practice. *J Obstet Anaesth Crit Care* 2016;6:3-10.
- Boyce H, Plaaf F Post-natal neurological problems. *Contin Educ Anaesth Crit Care Pain*, 2013.
- Loureiro R, et al. Nascer em Portugal: estudo nacional descritivo. *Arq Med vol.28 no.6 Porto dez. 2014*

Learning points:

- A flowchart for the management of a postpartum neurological deficit is essential.
- US is a fundamental skill in difficult CNB

04AP01-7

C-section on patient with secondary paraplegia resulting from spontaneous spinal epidural hematoma and acquired FXIII deficiency. A case report

Kampel M.A., Figar A., Mc Loughlin S., Bonofiglio F.C.

Hospital Italiano de Buenos Aires, Dept of Anaesthesiology, Ciudad Autónoma de Buenos Aires, Argentina

Background: Spontaneous spinal epidural hematoma (SSEH) in a pregnant patient is an extremely rare clinical condition and requires emergency surgical evacuation, while termination of pregnancy depends on fetal viability status¹. Etiology includes hemorrhagic diathesis, autoimmune inflammatory vasculitis, anticoagulant therapy, vascular malformations, and tumors. Pregnancy is considered a risk factor for SSEH. Below is a patient with SSEH and acquired FXIII deficiency (FXIII D) as a sole finding.

Case report: A 37 year old, gravida 3 para 2, 28 weeks of gestation was transferred to our hospital with symptoms of progressive paraplegia over 72 hours. MRI showed spinal lesion due to spontaneous epidural hematoma, emergency decompression followed with a T1-T5 laminectomy. A hemorrhagic episode required transfusions up to 4 RBCs and 2 FFPs during the laminectomy, neither FXIII nor Tranexamic acid (TXA) was given on that occasion. The neurological examination showed flaccid paraplegia, with sensitive level at T3. Test results showed normal values except in FXIII-A concentration 28% (60-160%). No other major bleeding cause could be determined aside from the FXIII D. Two months later, she had a c-section performed at 36 weeks of gestation. Intravenous plasma-derived FXIII (pdFXIII) concentrate 2500 IU was given preoperatively along with TXA 1g. General anesthesia using propofol for induction and sevoflurane for maintenance was administered, no muscle relaxants or opioids were necessary. Videolaryngoscopy was used for orotracheal intubation. Bleeding was between normal ranges. There was no need for RBC transfusions. A healthy female baby was born with a 8/9 Apgar score and 2,840 grams. Post-operative FXIII-A level was 69%.

Discussion: There are merely a few dozens of pregnant SSEH cases reported in the literature. Regional anesthesia for paraplegic condition is advised as the best technique to prevent autonomic dysreflexia; although general anesthesia seems more appropriate to prevent further spinal complications in patients with hemorrhagic diathesis².

References:

1. Krishnan P, et al. *Neurol India*. 2014;62(2):205-7.
2. Jones BP, et al. *Can J Anaesth*. 2000;47(11):1122-28.

Learning points: General anesthesia is an adequate anesthesia technique for paraplegic patients with FXIIID. FXIII should be tested even if coagulation test results are normal, and preoperative pdFXIII administration is probably the best way to prevent severe bleeding as well as TXA in these patients.

04AP01-8

Unexpected, delayed sensory-motor block after epidural analgesia for labour: a case of subdural block

Alves D.R., Antunes C., Amim S., Aquino E.

Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal

Background: Low-dose epidural analgesia has been well established for the management of labour pain, but clearly it is not devoid of risks. Subdural block is a possible complication, estimated to occur in the range of 1 in 4200 epidurals.

Case report: 37 year old, 39 week pregnant patient, presenting to the hospital in labour. Her past medical history was uneventful except for controlled asthma and migraine.

A lumbar epidural was placed at the L3-L4 level, using the loss-of-resistance technique with saline. After catheter placement, there was a very slow oozing of a cold, clear liquid, consistent with the injected saline. We proceeded to administer 3 cc of a mixture of 0,2% levobupivacaine with sufentanil 0,01mg as a test dose, obtaining no cardiovascular, sensory or motor changes after 5 minutes, after which the remainder of a total volume of 10cc (20mg levobupivacaine and sufentanil) was administered. There was complete relief of pain within 12 further minutes. However, 2 hours later the Anaesthesiology team was called because the patient had developed asymmetric motor block in both lower limbs, as well as a patchy sensory block with areas of anaesthesia extending up to T4 but with sacral sparing. The complaints reverted com-

pletely in a further 3,5 hours, at which time there was need for further analgesia, prompting removal of the previous epidural catheter and repetition of the technique at the L2-L3 level.

Discussion: Subdural blocks typically take 20-40 minutes to occur³, leading to a higher block than expected which is often patchy and asymmetric, but with sacral sparing, as occurred in our patient. Block height is often unpredictable, and can extend into the upper limbs and face, with high blocks presenting a greater risk of progressive respiratory depression. Differential diagnosis should be made, not only with subarachnoid block but also with the possibility of a spinal haematoma, which is a surgical emergency.

Learning points: The time frame of clinical symptoms, neurologic examination and reversibility usually help make the differential diagnosis. It should be kept in mind that even when a subdural block is assumed, additional complications such as gradual respiratory depression should be kept in mind, prompting close clinical vigilance and anticipation of possible corrective measures.

04AP01-9

Management of Von Willebrand disease in obstetric procedures

Machado Ortiz S.¹, Renart Lopez I¹, Robledo Algarra R²

¹ Dept of Anaesthesiology, Hospital Francisco de Borja, Gandia Valencia, Spain, ² Dept of Anaesthesiology, University Hospital La FE. Valencia, Spain

Background: Von Willebrand Disease (VWD) is an hereditary bleeding diathesis. It is caused by a deficiency in the quality or quantity of Von Willebrand Factor (VWF).

We report a patient with a non classified VWD type and a mild deficiency of the coagulant factor XII (F-XII). She underwent revision of the uterine cavity (curettage) 15 days after childbirth with the diagnosis of remaining fragments of the placenta.

Case report: A 32 years old multigravida woman (G3 P2 A1) was referred to the hospital for a uterine cavity revision because of postpartum hemorrhage. Diagnosed of VWD and low deficiency of F-XII at the age of 14 after severe bleeding during a tooth extraction. She also presented during her second pregnancy moderate postpartum hemorrhage and vaginal lacerations, she was treated with a transfusion of two units of red blood cells.

In this case the laboratory parameters were as follows: platelet count 336.000/microL, Hb 12,7 g/dl, PT 13,5 " (rank 11-13,5"), APTT 39,3" (Rank 20-33") which means a mild deficiency of VWF, so the VWF antigen and its activity quantification were not required. For the uterine cavity revision we administered intravenous tranexamic acid (25mg/kg) and desmopressin (0.3mcgr/kg) according to the recommendations of the Hematology Department. The anesthesia underwent with sedation (propofol and fentanyl). The patient was discharged from PACU after 4 hours without bleeding complications.

Discussion: During the second trimester of pregnancy VWF tend to increase, but after 14 days of delivery factor levels come back to normal values. It is important that women be made aware of this and be advised of the possibility of postpartum hemorrhage.

VWD treatment includes treatments transfusional therapy with blood products containing FVIII and VWF to raise FVIII and VWF plasma levels transiently and nontransfusional treatments (synthetic antifibrinolytic amino acids: epsilon aminocaproic acid and tranexamic acid).

During pregnancy and delivery a multidisciplinary approach to management, which involves obstetrician-gynecologists, anesthetists and hematologists, results in optimal treatment outcomes.

Anaesthetist should be aware of this disease, diagnosis and management in order to provide a high quality anaesthesia in pregnant women with VWD.

Bibliography:

- 1.- Stone ME et al. *Curr Opin Anesthesiol* 2014, 27:353-358
- 2.- Breivi H et al. *Acta Anaesthesiol Scand* 2010; 54: 16-41

04AP01-10

Management of Fournier's gangrene in a woman after episiotomy

Kamoun I., Chaouch O., Taghouti S., Ammous A., Cherif A.

Faculty of Medicine of Tunis, Dept of Anaesthesiology & Intensive Care, Tunis, Tunisia

Background: Fournier's gangrene is a fulminate form of infective necrotizing fasciitis usually affecting the perineum and the genitals. It is caused by a mixture of aerobic and anaerobic microorganisms. It commonly occurs in men, but it can rarely affect women.

Case report: A 26-year-old woman was referred to our intensive care unit with septic shock signs, two days after a childbirth. The presentation was a FG with a necrosis of the perineum's soft tissues. That was a complication of an episiotomy during the labor. The initial resuscitation was done with orotracheal intubation and physiologic monitoring. Vasopressors were introduced. An urgent surgical debridement of all necrotic tissue was done and high doses of broad spectrum intravenous antibiotic therapy were directed toward aerobic, anaerobic, and gram-positive and negative organisms. The correction of hypovolemia, electrolyte imbalances and hyperglycemia were also taken into consideration. Colostomy was done because of severe perineal involvement. Hyperbaric oxygen therapy was done to improve the local results. Extubation was carried out carefully three weeks later. The young mom had got psychological and nutritional support and a plastic reconstruction is planned for her.



[Fournier's gangrene in a woman after episiotomy]

Discussion: Although rare, FG remains a life-threatening disease. The cornerstones of its treatment are intensive care, urgent surgical debridement as well as high doses of broad-spectrum antibiotics. Bacteriological tests are usually negative. The debridement is repeated until the cleaning of the cutaneous hurts. Urgent resuscitation with fluids, blood transfusions and vasopressors may be needed. The rectal diversion decreases the number of germs in perineal region and improves wound healing. Hyperbaric oxygen therapy should be done to a better result.

Reference: Lipsker, *Progrès FMC*, 2014

Learning points: FG is a serious emergency with a high mortality rate. Although it can be lethal, it is still a challenging situation in the field of surgical infections and needs special attention. Early diagnosis and treatment decrease its morbidity and mortality. Physicians should consider this disease in women and manage it methodically.

04AP01-11

Spina bifida occulta: a challenge for obstetric anaesthesia?

Barros Silva J., Lareiro N., Ribeiro C., Neves A., Saraiva L.
Centro Hospitalar do Baixo Vouga, Dept of Anaesthesiology, Aveiro,
Portugal

Background: Spina bifida occulta (SBO) is part of a spectrum of congenital abnormalities resulting from failure of closure of the neural tube. It's incidence is between 10-25% of the population. It is frequently diagnosed by chance, on radiologic tests performed for other reasons. Neuraxial anesthesia might be challenging in these patients, due to changes in sacrolumbar anatomy and the increased risk of dural puncture when performing epidurals.

Case report: 33 years old woman, 1.63m and 80kg, ASA II, G1P0, admitted for caesarean section at 40w due to fetal pelvic position. On her past medical history, she was diagnosed 3 years ago with SBO at the L5-S1 level, with sporadic episodes of lumbar pain, treated with NSAIDs. After ASA standard monitoring, regional anaesthesia was the approach of choice. We performed a combined spinal-epidural technique at the L3-L4 level, with the patient in the sitting position, using 18G Tuohy and 27G Quinck needles for catheter placement and spinal anaesthesia, respectively. The technique was uneventful and 7.5mg of levobupivacaine + 2.5 mcg sufentanil was administered, reaching sensitive blockage at the T4 level after 15 minutes. The parturient had an episode of hypotension treated with 200 mcg of phenylephrine, and remain otherwise stable. No need for dose adjustment. No complications reported. Effective analgesia achieved through epidural boluses of 16mg ropivacaine 0.2% + 1mg morphine every 8h. NRS 0 at rest and 2 with movements. The catheter removed after 48h, uneventfully.

Discussion: There are very few cases in literature describing the anaesthetic approach of obstetric patients with SBO. Spinal approach is not contraindicated in these patients, keeping in mind that they frequently have associated spinal deformities, altered dural permeability and reduced epidural spaces, which makes local anaesthetic spread unpredictable. Spina bifida is also associated with difficult intubation and restrictive respiratory disease, so general anaesthesia should be avoided in these patients whenever possible. Finally, spina bifida patients might have an increased risk of latex allergy.

Learning points: SBO is a congenital spinal column defect, usually diagnosed by chance; Very few reports of anaesthetic management of these patients; Regional anaesthesia is the approach of choice in these patients; Changes in the sacrolumbar anatomy, increased dural puncture risk and unpredictable anaesthetic spread are its main challenges.

04AP02-1

Retrospective cohort study to assess the impact of early versus later term planned cesarean delivery on maternal and neonatal outcomes

Weiniger C.¹, Eventov-Friedman S.², Mankuta D.³, Krichevsky A.⁴

¹Hadassah Hebrew University Medical Center, Dept of Anaesthesiology & Intensive Care, Jerusalem, Israel, ²Hadassah Hebrew University Medical Center, Neonatology, Jerusalem, Israel, ³Hadassah Hebrew University Medical Center, Obstetrics and Gynecology, Jerusalem, Israel, ⁴Hadassah Hebrew University Medical Center, Medical School, Jerusalem, Israel

Background and Goal of Study: Elective cesarean delivery (CD) should be performed after 39 complete weeks in order to minimize the risk of neonatal respiratory morbidity.^(1,2) This strategy of waiting to perform elective CD could be hindered by onset of labor, that necessitates urgent delivery, with potential impact on maternal morbidity. We aimed to assess maternal and neonatal morbidity including need for general anesthesia and hemorrhage for early versus later term planned CD.

Materials and Methods: Retrospective cohort with IRB approval included women who booked and planned CD in a single tertiary medical center (2012-2015). Early term planned CD (n = 370, 37+0to38+6wks) was compared for maternal and neonatal morbidities versus later term planned CD (n=300, 39+0 to 40+6wks) using descriptive statistics, p<0.05 is significant.

Results and Discussion: The early term CD group comprised older, multiparous women with more prior CD, Table 1. Respiratory morbidity was higher among neonates born at early (2.7%) versus later term (0.3%) p=0.03. The risk of spontaneous onset of labor/rupture of membranes, out-of-hours delivery and urgent CD were significantly higher for the later term group. We

found no significant difference in maternal morbidity (anesthesia complications, anesthesia mode, hemorrhage, surgical complications) between the groups, Table 2.

Conclusion(s): Early term CD was associated with increased neonatal respiratory morbidity. Waiting for later term to perform CD significantly increases the risk of urgent and out of hours CD, however did not increase anesthesia, hemorrhage and other measures of maternal morbidity in our population.

References:

1. Hansen AK et al. BMJ 2008; 336:85-7
2. Chioffi G et al. Obstet Gynecol 2013; 121:561-9

	Early term CD N=370	Late term CD N=300	P value
Maternal age, years T	33.9 (5.4)	32.8 (5.8)	0.015
Parity U ^f	3 (2-4) [1-10]	2 (2-3) [1-9]	<0.001
Primiparous	48 (13.0%)	64 (21.3%)	0.004
Number of prior CD T	1.4 (1.3)	0.8 (0.9)	<0.001
Gestational diabetes mellitus p	27 (7.3%)	14 (4.7%)	0.158
Gestational Hypertension f	2 (0.5%)	3 (1.0%)	0.661
Chronic maternal illness*	37 (10%)	30 (10%)	1.000

T = T test, mean (standard deviation); f= Fisher's exact chi square test

p = Pearson chi square test; U^f = Mann Whitney U test test, median (interquartile range)

[range]; *Chronic maternal illness: Diabetes mellitus, hypertension, hypothyroidism, SLE, APLA, blood clotting disorders.

[Table 1: Maternal characteristics according to early or later planned Cesarean delivery]

	Early term CD N=370	Later term CD N=300	P value
Spontaneous onset of labor +/- or ROM p	67 (18.1%)	85 (28.3%)	0.002
Urgent CD p	85 (23.0%)	101 (33.7%)	0.002
Out of hours CD* p	64 (17.3%)	101 (33.7%)	<0.001
Anesthesia complications f	1 (0.3%)	3 (1.0%)	0.24
General anesthesia	24 (6.5%)	19 (6.3%)	0.94
Excessive bleeding p	16 (4.3%)	11 (3.7%)	0.67
Uterine atony p	13 (3.5%)	9 (3.0%)	0.71
Surgical complications f	2 (0.5%)	4 (1.3%)	0.25
Postoperative complications p	8 (2.2%)	11 (3.7%)	0.24
Severe maternal morbidity f	5 (1.4%)	0 (0.0%)	0.07

f= Fisher's exact chi square test; p = Pearson chi square test

Excessive bleeding = Perioperative blood loss > 1000 mL; Packed red blood cells transfusion; iliac artery ligation; B-lynch suture. Severe maternal morbidity = Hysterectomy; uterine rupture; >4units packed red blood cells; death

*Out of hours = before 08:00 AM or after 16:00; CD = cesarean delivery; ROM = rupture of membranes

[Table 2: Maternal outcomes according to early or later planned Cesarean delivery]

04AP02-2

Salivary a-amylase level reflects stress intensity in pregnant women undergone Cesarean Section under spinal anesthesia

Shifman E.¹, Dyaktyarev E.², Tikhova G.³, Kulikov A.⁴

¹M.F. Vladimirovskiy Moscow Regional Research Clinical Institute, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation, ²Amur Regional Clinical Hospital, Perinatal Center, Dept of Anaesthesiology & Intensive Care, Blagoveschensk, Russian Federation, ³Petrozavodsk State University (PetrSU), Dept of Anaesthesiology, Petrozavodsk, Russian Federation, ⁴The Ural State Medical University of the Russian Ministry of Health, Dept of Anaesthesiology & Intensive Care, Yekaterinburg, Russian Federation

Background and Goal of Study: Chronic or acute stress before spinal anesthesia (SA) for Cesarean Section (CS) may induce intraoperative hypotension and other complications due to increased sympathetic activation. It seems valuable to find objective and non-invasive measure of stress intensity in order to predict adverse events during surgery. Many studies conducted among hospital patients indicate that salivary a-amylase level (AAC) is significant

marker of stress. The goal of the study was to estimate significance and magnitude of changing of AAC in pregnant woman before and after CS performed under SA and to study its relationship with stress intensity.

Materials and Methods: Prospective study included 30 women, 20-41 years old, full-term pregnancy, undergone CS under SA. Exclusion criteria: multiple pregnancy, severe extragenital pathology, preeclampsia/eclampsia. Primary endpoints including AAC and verbal subjective estimate of stress (VSES) were registered 3 times for each patient: at baseline (at the admission), on the operating table before performing of SA and during 1st hour after delivery. Saliva sampling was followed by registering of patient's grade of current stress, from 0 (no stress) to 3 (intensive stress). AAC (ME/l) was defined using automatic biochemical analyzer Labio 200 (Mindray). Statistical analysis included descriptive methods, ANOVA and χ^2 -criteria. Results are performed as $M \pm m$.

Results and Discussion: AAC mean values differ significantly among 3 sampling points ($p < 0.01$). ACC mean before delivery was extremely higher than that at baseline (5926.0 ± 202.8 vs. 4689.7 ± 150.4 , respectively). AAC mean after CS (5419.5 ± 191.3) was lower than before delivery but didn't reach baseline level. The highest VSES mean was revealed before CS (2.8 ± 0.2). The estimates of stress intensity at baseline and after delivery were statistically equal (1.9 ± 0.2). Mean increase of AAC from baseline (%) was 26.8 ± 2.3 before CS and 15.6 ± 1.6 after CS ($p < 0.01$). AAC means differ significantly between VSES grades within each sampling point. Higher AAC value corresponds to the higher VSES grade. The most apparent AAC difference between VSES grades was observed before CS: 4763.7 ± 142.7 and 6279.7 ± 211.3 for VSES equaled to 2 and 3 respectively.

Conclusion: AAC levels significantly correlate with stress intensity in pregnant women undergone CS under SA. ACC is simple objective and non-invasive measure of the patient's stress status before delivery and postpartum.

04AP02-3

Assessment of application of cricoid pressure in maternity setup: a comparison of table tilt versus wedge insertion on SimMom

Sud A., Robbins M., Hughes J., Selvan D., Ahmad A., Bhardwaj M. *Wexham Park Hospital, Dept of Anaesthesiology, Slough, United Kingdom*

Background: The OAA/DAS guidelines¹ advocate applying cricoid pressure (CP) during obstetric general anaesthesia. However, poorly applied CP can impede laryngoscopy and not prevent regurgitation. Using a novel CP device, we assessed cricoid application by Operating Department Practitioners (ODPs) on SimMom (obstetric manikin), when using either left lateral tilt or wedge insertion to relieve aortocaval compression.

Materials and Methods: 12 experienced ODPs who consented to the study, applied CP on SimMom using novel device. The sensor-based device measured amplitude of force applied (N) (ODPs not blinded to this), as well as equilibrium of force applied between thumb and finger (ODPs blinded to this). Standardised setup: fixed table height; CMAC C-blade videolaryngoscope; same laryngoscopist (SimMom baseline grade 1 larynx). Once 30N force achieved by ODP, videolaryngoscopy was performed, and laryngoscopy grade and equilibrium of cricoid force recorded. Study performed firstly with left lateral table tilt (17°) and then with table flat and wedge insertion (30°) under right hip. Study was repeated with ODP standing either side of SimMom using left and right hand for CP respectively.

Results and Discussion: With ODP on left side of SimMom, there was no significant difference in laryngoscopy grade between table tilt or wedge insertion. However, with ODP on right side of SimMom, mean laryngoscopy grade was 2.4 with table tilt compared with 1.1 with wedge insertion. Furthermore, equilibrium of force was best achieved with ODP on left side of SimMom (with wedge 9/12 and table tilt 6/12). Differences observed between ODP standing on the left or right of SimMom are likely due to vector of CP and ability to compensate for left tilt in these different positions.

ODP stood on LEFT side of manikin, using LEFT hand				ODP stood on RIGHT side of manikin, using RIGHT hand			
Table tilted 17 degrees		Wedge 30 degrees		Table tilted 17 degrees		Wedge 30 degrees	
Equality of force	No. of ODPs	Videolaryn goscopy grade (mean)	Equality of force	No. of ODPs	Videolaryn goscopy grade (mean)	Equality of force	No. of ODPs
F<T	3	1.3	F<T	1	1.0	F<T	0
T>F	3	1.0	T>F	2	1.0	T>F	7
F=T	6	1.0	F=T	9	1.0	F=T	5
Total	12	1.1	Total	12	1.0	Total	12

F is finger, T is thumb.

[Cricoid pressure application: tilt vs. wedge]

Conclusion: We conclude that CP was more effectively and evenly applied with aortocaval compression relieved by wedge insertion compared with lateral table tilt. Use of a real-time CP device facilitates optimal CP application, in terms of force applied and equilibrium of force. A further study in real patients is needed to confirm our findings.

References: 1. Mushambi MC et al. *Anaesthesia* 2015; 70:1286-306.

04AP02-4

Ultrasound measurements of anterior soft tissue thickness to predict difficult laryngoscopy in pregnant patients

Solak H.E., Yilmaz C., Karasu D., Karaduman I., Korfali G. *University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Dept of Anaesthesiology & Intensive Care, Bursa, Turkey*

Background and Goal of Study: Obstetric patient airway management is becoming important, because of anatomical and physiological changes in the airway related to the pregnancy. The aim of our study was to compare the ultrasound (USG) measurements of 5 different levels of anterior neck soft tissue and other clinical screening tests for determination of difficult laryngoscopy in patients who underwent cesarean section operation with general anesthesia.

Materials and Methods: Prospective, observational study included 140 pregnant women (18-45 years old, ASA I-II) who underwent elective cesarean section under general anesthesia. Mallampati test, mouth opening, sternalmental distance, thyromental distance, upper lip bite test, neck circumference were recorded. The distance from the skin to the anterior aspect of the trachea was measured at five different levels: hyoid bone (zone 1), thyrohyoidmembrane (zone 2), vocal cords (zone 3), thyroid isthmus (zone 4) and suprasteral notch (zone 5). An anaesthesiologist who were unaware of the clinical screening variables and USG results performed laryngoscopy. When second attempt for intubation was failed, to use of other difficult intubation equipments were planned.

Results: 120 patients were evaluated statistically. According to Cormack and Lehane's scale, patients were divided into two groups: a grade 1 or 2 was accepted easy laryngoscopy, whereas a grade 3 or 4 was considered difficult laryngoscopy. 30 patients were classified as having difficult laryngoscopy (25%). All of the patients were intubated successfully. Among the other clinical screening tests for difficult laryngoscopy: limited mouth opening (<3cm), high Wilson's Risk Score (>2), large neck circumference (>40 cm), unable to bite the upper lip, and high mallampati score (III-IV) were found higher in the difficult laryngoscopy group ($p < 0.05$). Also, BURP maneuver, useage of gum elastic bougie, high intubation difficulty score (IDS ≥ 5), three more intubation attempts, airway difficulty rate were significantly higher in the difficult laryngoscopy group ($p < 0.05$).

Conclusion(s): We thought that USG measurement of anterior neck soft tissue has no influence on determination of difficult laryngoscopy in pregnant patients.

04AP02-6

A national survey of remifentanyl patient controlled analgesia use in Irish maternity units

Rooney G.¹, Murphy C.² *¹Mercy University Hospital, Dept of Anaesthesiology & Intensive Care, Cork, Ireland, ²Rotunda Hospital, Dept of Anaesthesiology, Dublin, Ireland*

Background and Goal of Study: The role of remifentanyl patient controlled analgesia (PCA) in labour analgesia as an alternative, but not equivalent, to epidural analgesia is well documented albeit controversial^{1,2,3}. The goal of this survey was to investigate remifentanyl PCA use in Irish maternity units.

Materials and Methods: An online survey pertaining to remifentanyl PCA was completed by a consultant anaesthetist in each of the 19 Irish maternity units. **Results and Discussion:** Remifentanyl PCA for labour analgesia is available in 37 percent (7/19) of Irish maternity units. All respondents estimated average use of less than 5 times per month. Only one unit offers remifentanyl PCA as a first-line alternative to epidural analgesia. Indications for use are coagulopathy, thrombocytopenia, anti-coagulation and spinal cord pathology. Four units include sepsis and failed epidural as routine indications. Concomitant

continuous SpO₂, respiratory and CTG monitoring is required by all users. Routine supplemental oxygen is administered in 5 maternity units, whilst two respondents stated only when desaturation occurs. Bolus doses of 40 mcg (4/7 maternity units), 25 mcg (1 maternity unit), and 20 mcg (2 maternity units) are prescribed. One service bases bolus dose on booking weight below or above 60 kg (32 mcg or 40 mcg respectively). Lockout times are 2 minutes (5 maternity units) and 3 minutes (2 maternity units). Two respondents reported single sedation and respiratory-related events.

Conclusion(s): Lack of national guidelines, safety concerns, midwife training and manpower limit establishing de novo Remifentanil PCA services for labour analgesia or its routine use as an alternative to epidural analgesia in Ireland.

References:

- Freeman L, Bloemenkamp K, Franssen M et al. Patient controlled analgesia with remifentanil versus epidural analgesia in labour: randomised multicentre equivalence trial. *BMJ* 2015;350:h846
- Schnabel, Alexander; Hahn, Niklas; Broscheit, Jens et al. Remifentanil for labour analgesia: a meta-analysis of randomised controlled trials. *EJA* 2012;29:177-85
- Van de Velde M, Carvalho B. Remifentanil for labor analgesia: an evidence-based narrative review. *IJOA* 2016;25:66-74

04AP02-7

Severe maternal hypovolemic shock immediately after general anesthesia induction for a category 1 cesarean section due to fetal distress

Hosokawa Y, Kato R., Okutomi T.

Kitasato University, Dept of Anaesthesiology, Sagami-hara, Japan

Background: Acute-onset maternal abdominal pain accompanied with abnormal cardiotocogram (CTG) is often caused by placental abruption, but there may be rarer causes.

Case report: A 36-year-old nulliparous woman at 27th weeks of gestation presented with acute-onset epigastric pain. CTG showed poor variability and late decelerations. Placental abruption was suspected. Her systolic blood pressure was 80 mmHg and heart rate was 120 beats/min. Fetal heart rate was estimated 70 bpm on ultrasonography. The obstetricians requested an anesthetic team for a category 1 cesarean section (CS). Six minutes after her arrival at the hospital, she was rushed to the operating room. General anesthesia was induced with a rapid sequence induction technique. Immediately after induction, her blood pressure dropped to 50/30 mmHg. Fluid infusion, non-cross-matched red cell transfusion, and vasopressor administration successfully stabilized her hemodynamics. Massive hemoperitoneum due to left ovarian vein rupture was discovered. A live girl weighing 1036 g was rapidly delivered, with Apgar score 1 and 2 at 1 and 5 min. The total blood loss was 2,850 g. The patient received 840-mL packed red cells and 240-mL fresh frozen plasma. She recovered uneventfully and was discharged on the 8th postoperative day.

Discussion: Spontaneous ovarian vein rupture can induce maternal hypovolemic shock, fetal bradycardia, and intrauterine fetal death. Maternal and fetal mortalities are as high as 40% and 30%, respectively. Although diagnosis can be made via ultrasonography or computed tomography, it is rarely reached prior to laparotomy. Our patient's vital signs strongly suggested hypovolemic shock. However, the obstetrician focused on fetal conditions, so the maternal shock remained unnoticed. Tauchi reported the clinical utility of focused assessment with sonography for obstetrics (FASO)—a modification of focused assessment with sonography for trauma (FAST), which is a primary assessment tool for a trauma patient. Had FASO been applied in our patient, hemoperitoneum could have been detected on admission, and subsequent preoperative fluid loading could have prevented the severe maternal hypovolemic shock after anesthetic induction.

Learning points: Fetal distress can sometimes represent utero-placental hypoperfusion secondary to maternal shock. The anesthesiologist should be aware that severe maternal condition can go unnoticed in category 1 CS with fetal distress.

04AP02-8

Fetal impact with the use of phenylephrine intravenous infusion used as prophylaxis of arterial hypotension after intradural anesthesia at elective cesarean

Gil Bona J., Peña Calvo P, Rovira Flores E., Borque Martin J.L., Martínez Ubieto J., Muñoz Rodríguez L.

Miguel Servet University Hospital, Dept of Anaesthesiology, Zaragoza, Spain

Background and Goal of Study: To assess the fetal repercussion, both in the Apgar test and in cord blood gas analysis, of the use intravenous phenylephrine as prophylaxis for hypotension after intradural anesthesia in elective cesarean.

Materials and Methods: We performed a prospective study including all elective cesarean performed from November 2012 to March 2015. We excluded the presence of uterine dynamics and the suspicion of maternal-fetal pathology. All patients underwent an intradural anesthesia with 0.5% hyperbaric bupivacaine.

All newborns were submitted to an apgar test at 5 minutes of life, as well as arterial and venous blood from umbilical cord was taken for determination of gasometry.

We made a comparative analysis evaluating pre and post intradural anesthesia data according if patients were administered a infusion of phenylephrine (2mcg/Kg/min) (53 patients) or not (52 patients).

To correlate different variables we used the chi square of Pearson or Fisher test for discrete variables and t-student or U Mann-Whitney test for continuous variables. Significance at $p < 0.05$

Results and Discussion:

DATA	Control group (n=52)	Prophylaxis group (n=53)	P=
Age (years)	34.1(4.8)	33.7(4.8)	0.657a
BMI(Kg/m ²)	27.4(4.1)	28.2(4.1)	0.344a
Gestational age(weeks)	38(37-39)	38(37-39)	0.385b
Fetal extraction time(sec)	73.5(45-105)	68(46.5-87.5)	0.582b
Apgar after 5 minutes=9	3(6%)	4(7%)	0.735b
Apgar after 5 minutes=10	48(94%)	49(93%)	0.735b
Umbilical cord arterial ph	7.29(7.25-7.33)	7.29(7.26-7.32)	0.690b
Umbilical cord arterial pCO ₂	54.5(52-59)	57(55-61)	0.018b
Umb.Cord art. Lactic acid	2.05(1.7-2.9)	1.7(1.5-2.4)	0.022b

[Comparative analysis.Phenylephrine Vs No Phenylep.]

DATA	Control group (n=52)	Prophylaxis group (n=53)	P=
Umb.Cord art. Glucose	50(46-56)	50(46-55)	0.705b
Umb.Cord art. HCO ₃	26(25.2-27.3)	27.6(26.2-28.4)	0.003b
Umbilical cord arterial SO ₂	6(3-13.5)	8(3.5-12)	0.746b
Umbilical cord venous ph	7.37(7.31-7.39)	7.35(7.31-7.39)	0.377b
Umbilical cord venous pCO ₂	43(39-47)	45(41-49)	0.252b
Umb.cord ven. Lactic acid	1.7(1.5-2.1)	1.6(1.3-1.9)	0.053b
Umb.cord ven. Glucose	61(57-69)	60(56-64)	0.145b
Umb.cord ven. HCO ₃	24.1(23.5-24.8)	24.3(23.6-25.4)	0.313b

[Comparative analysis.Phenylephrine Vs No Phenylep.]

a- Values expressed as means (+/- typical deviation) and compared using the Student's T-test

b- Values expressed as medians (interquartile range) and compared using the U-Mann-Whitney test

Conclusion(s): Prophylaxis of arterial hypotension with phenylephrine in intravenous infusion at 2 mcg / kg / min, did not present a significant impact at the fetal level, assessed by Apgar test and cordometric gasometry.

04AP02-9**Risk factors of arterial hypotension after intradural spinal anesthesia in cesarean**

Gil Bona J., Peña Calvo P., Rovira Flores E., BorqueMartin J.L., Ortega Lucea S., Muñoz Rodríguez L.
Miguel Servet University Hospital, Dept of Anaesthesiology, Zaragoza, Spain

Background and Goal of Study: The objective of this study was to assess the risk factors for arterial hypotension after intradural anesthesia in elective cesarean

Materials and Methods: We performed a prospective study including elective caesarean from November 2012 to March 2015. We excluded the non-acceptance of participation in the study, the presence of uterine dynamics or the suspicion of maternal-fetal pathology. All patients underwent an intradural anesthesia with 0.5% hyperbaric bupivacaine.

Basal Systolic blood pressure (SBP) was defined as an average of three consecutive measures. Control pressures were taken with a left tilt of 15°. Hypotension was defined as any decrease in SBP below 80% of baseline SBP. We made a comparative analysis evaluating data according patients had or not arterial hypotension after intradural anesthesia.

To correlate different variables we used the chi square of Pearson or Fisher test for discrete variables and t-student or U Mann-Whitney test for continuous variables. Significance at $p < 0.05$. To calculate the odds ratio for each of the risk factors we applied a multivariate binary logistic regression model with confidence interval of 95%

Results and Discussion:

DATA	NoArterial Hypotension (N=19)	Arterial Hypotension (N=33=)	P=
Age (years)	32.0(4.5)	35.3(4.7)	0.02a
BMI(Kg/m2)	25.8(3.5)	28.2(4.1)	0.042a
Gestational age(weeks)	39.0(38.0-39.0)	38.0(37.0-39.0)	0.009b
Anesthesia time (min)	15.0(12.0-16.0)	16.0(11.5-20.0)	0.368b
Fetal extraction time(sec)	75.0(40.0-100)	70.0(55.0-105)	0.488b
Baseline SBP	98.0(92.0-106)	99.0(92.0-108.0)	0.977b
Baseline HR	81.0(75.0-86.0)	82.0(74.0-90.0)	0.725b
Variation SBP (DL-SD)*	9.5(4.0-16.25)	9.0(2.5-12.5)	0.490b
Variation HR (LD-SD)*(bpm)	0.5(-2.25 - 3.75)	6.0(-0.5 - 11.0)	0.021b

[Arterial hypotension after intradural anesthesia.]

a- Values expressed as means (+/- typical deviation) and compared using the Student's T-test

b- Values expressed as medians (interquartile range) and compared using the U-Mann-Whitney test

*Change from lateral decubitus to supine

Data	coefficient	Odds Ratio (95% CI)	P=
Age (Years)	0.230	1.26(1.04-1.56)	0.02
BMI(Kg/m2)	0.236	1.27(1.01-1.58)	0.036
Gestational age(weeks)	-1.194	0.3(0.12-0.79)	0.014
Variation HR(LD-SD)bpm	0.175	1.19(1.03-1.38)	0.019

[Multivariate binary logistic regression model]

Conclusion(s): Maternal age, body mass index, gestational age, and change in heart rate when the patient moved from the lateral decubitus to the supine position are confirmed as independent predictors of the risk of hypotension following intradural spinal anesthesia in cesarean.

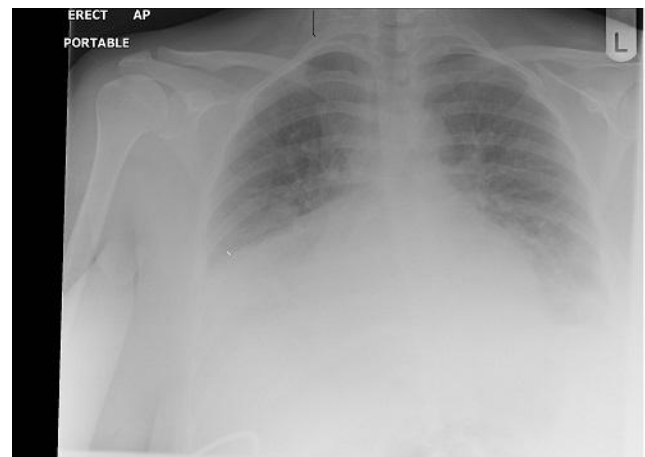
04AP02-10**Management of a parturient with acute respiratory distress for caesarean delivery using spinal anaesthesia supported with novel respiratory support measures (CPAP, HFNV)**

Leong M., Kamaraj K., Kalidindi R.

Medway Maritime Hospital, Dept of Anaesthesiology & Intensive Care, Gillingham, United Kingdom

Background: Pre-eclampsia and respiratory diseases are significant contributory factors for maternal cardiac arrest (1). We report the management of a parturient undergoing emergency C/S with acute respiratory distress secondary to both pre-eclampsia and influenza.

Case report: An 18year- old prima gravida of 38+5/40 gestation presented with a 3 day history of cough and feeling unwell which was managed with HDU care and sepsis bundle. Following clinical improvement labour was induced. Labour analgesia was provided with remifentanyl PCA. In the following hours she became tachypnoeic, tachycardic, acidotic with dropping saturations, (RR 22, HR 127, Spo2 91%, BE -9). Laboratory data showed raised urine protein (++), PCR (68mg/mmol), and CRP (97) with dropping albumin (33). Chest X ray revealed right lower zone consolidation with pleural effusions. Spinal anaesthesia was administered for emergency caesarean section. Additional respiratory support was given with 15 degree head up position, application of CPAP via the face mask and HFNC with for maintenance of oxygenation post operatively. A live baby with Apgar score 9/10 was successfully delivered. Further management included surgical HDU, Tamiflu (+ve for Influenza), and intravenous antibiotics.



[Chest Xray]

Discussion: Pre-eclampsia, influenza infection, asthma, and respiratory depression from remifentanyl all contributed to rapid deterioration. Many studies have confirmed regional anaesthetic techniques reduce morbidity and mortality in emergency caesarean section. Regional anaesthesia when supplemented with additional respiratory support measures could be used to avoid general anaesthesia, improve outcomes and reduce need for prolonged ventilatory support.

References:

1. MBRRACE-UK Report December 2016
2. Clinical Anaesthesiology, Sept 13, 2016 :Rare but Devastating: Study Examines Maternal Cardiac Arrest Rates.

Learning Points: The role of non-invasive respiratory support (HFNC, CPAP) to facilitate safe regional anaesthetic techniques for emergency C/S in patients with respiratory compromise should be considered.

04AP02-11**Influence of saline based hydroxyethyl starch on umbilical cord blood electrolytes**

Yatabe T., Nishigaki A., Nakagoshi N., Yokoyama M.

Kochi Medical School, Dept of Anaesthesiology & Intensive Care, Nankoku, Japan

Background and Goal of Study: Hydroxyethyl starch (HES) is widely used to prevent and treat spinal anesthesia-induced hypotension during cesarean section. However, the use of saline-based HES might lead to hyperchloremia. This study aimed to clarify the effects of saline-based HES on umbilical cord chloride level at delivery.

Materials and Methods: The study participants were 93 consecutive single-pregnancy patients who underwent cesarean section with combined spinal-epidural anesthesia, at no sooner than 37 weeks of gestation, from January 2014 through March 2016. We divided the patients into two groups, depending on the use of saline-based 6% HES 130/0.4. Patients in group A received saline-based HES, and those in group B did not receive saline-based HES. The other solutions used in both groups were acetate Ringer's solution, bicarbonate Ringer's solution, and saline to dissolve the antibiotic. Data on the intraoperative volume of infusion were collected from the anesthesia records, and patient data were collected from the medical records. The major outcome was chloride levels in the umbilical cord at delivery. We defined the difference of 2.5 mmol/l or more as clinically significant considering 15% of the normal range. We also evaluated the following additional outcomes: levels of other electrolytes (Na⁺, K⁺), pH, base excess (BE), and Apgar score (at 1 and 5 min).

Results and Discussion: There were 43 patients in group A and 50 patients in group B. Age, body mass index, gestational week, time to delivery from operating room admission, the total amount of infusion, blood loss, and urine volume were not significantly different between groups. The volume infused from admission to the operating room to the point of delivery was also not significantly different between groups; 461 ± 167 ml of saline-based HES was administered in group A. The umbilical cord chloride level at delivery was significantly higher in group A than in group B (108 ± 2 vs 107 ± 2 mmol/l, P = 0.02). No differences were observed in the Apgar score and other umbilical cord laboratory data at delivery (Na⁺, K⁺, pH, BE). In terms of the risk-benefit balance, anesthesiologists may consider 500 ml of saline-based HES as the upper limit for routine use.

Conclusion: We suggest that although the use of up to 500 ml of saline-based HES during cesarean section influences umbilical cord blood electrolytes, the effect is not of a clinically significant magnitude.

04AP03-1**Degree of pain relief following induction of epidural analgesia and its correlation to pain alleviation during labor and delivery**

Nevo A.¹, Aptekman B.¹, Goren O.¹, Matot I.¹, Weinger C.²

¹Tel-Aviv Sourasky Medical Center, Division of Anaesthesiology, Pain and Intensive Care, Tel Aviv, Israel, ²Hadassah Hebrew University Medical Center, Department of Anesthesiology and Critical Care Medicine, Jerusalem, Israel

Background: The relationship between speed of labor epidural analgesia (LEA onset) and pain experience during labor has not been reported. We aimed to determine the relationship between speed of LEA onset and pain during labor and delivery.

Methods: Observational prospective cohort of nulliparous pregnant term women recruited in a single-center tertiary hospital. Following informed consent, women who requested LEA received lumbar patient controlled epidural analgesia (PCEA) according to our standard protocol of bupivacaine 0.083% with fentanyl, 1.67mcg/ml. We recorded maternal characteristics, and LEA details. Our primary independent variable was time from initiation of LEA (infusion of first epidural bolus until a Numerical Verbal Rating Score (NVRS) ≤ 3. The primary study outcome was NVRS during contraction at 60 and 120 minutes post LEA initiation and we reported no. PCEA requested and received. We performed tests for non-parametric data; Spearman's rank for correlation and Mann Whitney U, 5% significance.

Results: We recruited 105 nulliparas; maternal age 31 ± 4.1 years; gestational age 39.8 ± 1.2 weeks; body mass index 22.2 ± 3.3 kg/m². Spearman Rank correlation showed a positive correlation between time to NVRS ≤ 3 and NVRS 60

min post LEA initiation, Rsquare 0.286, p=0.003, but not at 120 min, Rsquare=0.03, p = 0.76. There was a correlation between time to NRS ≤ 3 and no. PCEA requests 120 minutes after LEA initiation, Rsquare=0.32, p=0.001 but not to average no. PCEA requests/hr, Rsquare=0.12, p=0.28, nor to average bupivacaine consumption during stage 1 (Rsquare=0.19, p=0.08). In a linear regression model NVRS at 60 min was independently associated with cervical dilatation at 60 mins and no. of education years. Average no. PCEA requests and bupivacaine consumption per hour during the first stage of labor were positively correlated with NRVS at 60 min, Rsquare=0.318, p=0.003 and Rsquare=0.4, p<0.001 respectively.

Conclusion: We found a significant correlation between LEA onset time and NVRS at 60 minutes after LEA initiation that was not sustained at 120 minutes. This may be related partially to more PCEA requests by some women during this period. Since NVRS at 60 minutes predicts analgesia requests and consumption during the entire labor, evaluation of NVRS at this point of time may be useful to identify women at risk for greater pain intensity later in labor.

04AP03-2**Programmed Intermittent Epidural Bolus (PIEB) versus Patient Controlled Epidural Analgesia (PCEA) plus background infusion for labour analgesia. A randomised double blind clinical trial**

Diez-Picazo L.D.¹, Guasch E.¹, Alvar E.¹, Diez J.², Schiraldi R.¹, Gilsanz F.¹

¹University Hospital La Paz, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²University Hospital La Paz, Research and Development Department, Madrid, Spain

Background and Goal of Study: The aim was to compare PIEB vs PCEA for labour analgesia measuring the incidence of breakthrough pain (BP). The influence of the neuraxial block (NB) was also assessed.

Materials and Methods: A randomised double blind clinical trial was conducted on nulliparous women (18-40 yrs old), with cervical dilation < 4 cm at singleton term pregnancy (Clinical Trials NCT 02768272). Systemic disease or contraindicated NB were exclusion criteria. Patients were randomised to receive epidural analgesia (EA) + PCEA (group 1), EA + PIEB (group 2), combined spinal-epidural (CSE) + PCEA (group 3), or CSE + PIEB (group 4). All patients had a 5 ml/h background epidural infusion (0.125% levo-bupivacaine + 1.45 mcg/ml fentanyl). PCEA pumps were set up to dispense 10 ml boluses (20 min lockout interval). Patients in PIEB groups received 10 ml bolus per hour (20 min lock time with PCEA). BP was defined as ≥ 4 in visual analog scale (VAS) and treated with a 10 ml epidural top-up. Block failure (BF) was diagnosed as a VAS > 3 sixty minutes after the NB and patients were excluded from the analysis. The anaesthesiologist who performed the NB was blinded for the selected group and pain was assessed by other colleague blinded for the NB and group.

Results: 175 patients were randomized. 22 were not analysed due to BF (12%). A relevant reduction of BP episodes was observed in PIEB (mean 0.45 ± 0.8 in group 2; 0.71 ± 1.3 in group 4) compared with PCEA (2.4 ± 1.7 in group 1; 2.9 ± 1.7 in group 3) (P < 0.01). 65% patients in PIEB groups had no BP episodes whereas only 13% in PCEA had no pain (P < 0.01).

Epidural top-ups volume was significantly lower in PIEB (mean 4.1 ± 8.2 ml in group 2; 6.2 ± 13 ml in group 4) compared with PCEA (25.9 ± 20.5 ml in group 1; 25.5 ± 17.9 ml in group 3) (P < 0.01).

Time from epidural to first BP episode was higher in PIEB (mean 213.6 ± 197.2 ml in group 2; 317.3 ± 177.3 ml in group 4) compared with PCEA (145.2 ± 60 ml in group 1; 157.7 ± 64.6 ml in group 3) (P < 0.01).

No differences were observed between CSE vs EA in BP episodes and top-ups. VAS were lower in CSE vs EA at 30 min (P < 0.001), but they were similar after 60 min and the rest of labour.

Conclusion: PIEB reduces the incidence of BP in labour compared to PCEA. Pain scores in CSE vs EA are similar after the first hour despite PIEB or PCEA.

04AP03-3

Impact of intrathecal clonidine on labour progression and maternal foetal wellbeing: our experience

Aversano M.¹, Nardo G.¹, Valenti F.², Claroni C.¹, Todde C.¹, Frigo M.G.¹

¹San Giovanni Calibita Fatebenefratelli Tiberin Island Hospital, Obstetric Anaesthesia Unit, Rome, Italy, ²University of L'Aquila, Dept of Anaesthesiology & Intensive Care, L'Aquila, Italy

Background and Goal of Study: Many studies demonstrated excellent analgesic action of intrathecal clonidine, which acts in synergy with local anesthetics and opioids^{1,2}. The high number of α_2 -adrenergic receptors on the myometrium makes clonidine able to interact with the labour dynamics. Purpose of this study was to evaluate the impact of intrathecal clonidine addition in spinal-epidural analgesia on labor progression, local anesthetic consumption and maternal-fetal well-being.

Materials and Methods: 107 ASA I nulliparous parturients, between 18-40 years old, singleton were enrolled. Parturients were assigned randomly into two groups: C (IT 2mcg Sufentanil+20mcg clonidine) and S (IT 2mcg sufentanil). Data about duration of the I and II stage and the time from admission to delivery were recorded. We compared the cervical dilatation and the duration of the second stage and create curves of cervical dilatation and foetal presenting part descent. A P <0.05 was considered significant.

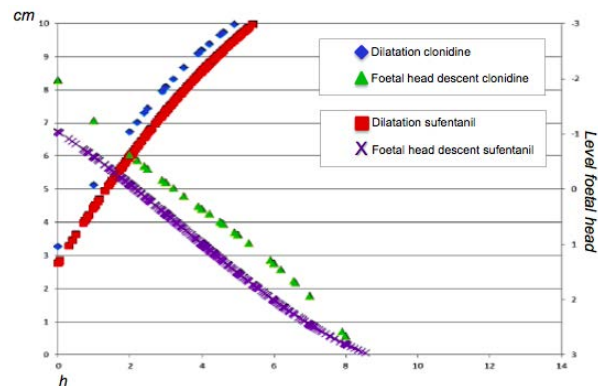
Results and Discussion: Data relating to duration of I, II stage and the time from admission to delivery are shown in Table 1.

	Clonidine	Sufentanil	P
I stadium (h)	4,01(1,9)	5,49(1,43)	*0,001
II stadium (h)	1,33(0,89)	1,29(0,78)	0,0872
TfA to childbirth (h)	5,33(2,16)	6,78(1,73)	*0,006

Duration of I, II stage and time from admission to delivery. All data are expressed as mean (SD). *Significant.

[Table 1]

The foetal descent curve of the group C has a more linear trend compared with the control curve.



[Figure 1. Comparison of the dilation curve and descent of the foetal head through the CSE using intrathecal sufentanil and with the addition of 20mcg of clonidine to sufentanil]

The average consumption of local anaesthetic from the beginning of analgesia until the expulsive phase in the two groups (group C: 35.4 mg, S group: 8.51 mg, p 0.029) was statistically significant.

Conclusion(s): Reduction of first stage duration respect to the control group suggests a clonidine positive interaction with the myometrial dynamic. The curve obtained from the analysis of cervical dilatation and descent of foetal presenting part shows that intrathecal clonidine may be characterized by an its specific pattern of labour progression. Relating to its analgesic effect, clonidine confirms excellent analgesia in labour from the beginning, with no increase in side effects.

04AP03-4

Safety of different local anaesthetics and their doses, used for labour pain relief with PCEA for primiparas: a randomized double blind controlled trial

Baliuliene V., Motiejaitis M., Rimaitis K., Macas A. Lithuanian University of Health Sciences, Dept of Anaesthesiology, Kaunas, Lithuania

Background and Goal of Study: It is supposed that lower LA concentration is associated with rarer side effects and better obstetric outcomes. The goal of the study was to find out the effect of different low concentrations of LA, used for labor pain relief with PCEA, on new-born condition and maternal side effects.

Materials and Methods: A randomized controlled trial of healthy primiparas was carried at 2014 - 2016 in the Maternal unit of a teaching hospital. Labor pain was relieved with LA and opioid fentanyl. The patients were allocated into 6 groups according to used LAs and concentrations: B1-bupivacaine (B) 0.0625%, B2-B 0.1%, B3- B 0.125%, L1-levobupivacaine (L) 0.0625%, L2-L 0.1%, L3-L 0.125%.

Results and Discussion: 202 patients were included. Groups were similar according to ASA class, age, gestational age, BMI, cervix dilation, oxytocin use, duration of delivery stages (I,II), birth weight and Apgar score in 1 and 5 minutes (p=0.35, p=0.61, p=0.59, p=0.46, p=0.24, p=0.39, p=0.41, p=0.54, p=0.86, p=0.21, p=0.75 respectively). Total doses of LA: B1-47(34) mg, B2-73(30) mg, B3-85(58) mg, L1-46(34) mg, L2-74(45) mg, L3-89(48) mg. The total doses significantly differs between groups B1 and B2, B1-L2, B1-L3, B1-B3, L1-L2, L1-L3, L1-B3 (p=0.03, p=0.008, p=0.0001, p=0.0001, p=0.04, p=0.0001, p=0.0001 respectively).

The level of sensory block between groups doesn't differ (p=0.358). It is a strong tendency that rate of motor block is different between groups: B1-36.7%, B2-58.8%, B3-51.4%, L1-27.3%, L2-31.3%, L3-42.4% (p=0.074) and it is statistically significantly different between B 49.5% and L 33.7% (p=0.017).

	B1	B2	B3	L1	L2	L3	p
Nausea/vomiting	15.6	24.2	13.9	24.3	12.5	9.1	0.11
Itching	16.7	24.2	20	27.3	28.1	33.3	0.69
Shivering	20	27.3	28.6	27.3	15.6	21.2	0.79
Retention of urine	36.7	51.5	51.4	30.3	31.3	36.4	0.27
Temperature >37°C	66.7	66.7	71.4	57.6	81.3	57.6	0.77
Temperature ≥38°C	6.7	9.1	5.7	9.1	6.3	12.1	0.58

[Side effects(%)]

Fetal bradycardia occurred for 17%, meconium in amniotic fluid was for 8.3% and oxygen request was for 6.2% new-borns, but according to these parameters difference between 6 groups is statistically insignificant (p=0.633, p=0.86, p=0.13 respectively).

Conclusion(s): Different low concentrations of LA determine significantly different total dose of LA infused, but the effect on mode of delivery, their side effects for parturient and new-born doesn't differ. Rate of motor block depends on LA and its concentration.

04AP03-5

The effect of labor analgesia on breastfeeding outcomes

Orbach-Zinger S.¹, Landua R.², Ovad O.¹, Liron C.¹, Hoshen M.³, Eidelman L.¹

¹Rabin Medical Center, Beilinson Hospital, Dept of Anaesthesiology, Petach Tikva, Israel, ²Columbia University, Dept of Anaesthesiology, New York, United States, ³Clalit Research Institute, Research and Development Department, Tel-Aviv, Israel

Background: The effect of labor epidural analgesia (LEA) on breastfeeding remains controversial due to variability in epidural dosing and outcome measures used to evaluate successful breastfeeding. We examined the effect of LEA on breastfeeding at 3 days and 6 wks, in a cohort of women receiving standardized LEA and lactation protocols. We hypothesized that LEA would not influence breastfeeding maintenance at 6 weeks, when taking into account women's parity and intention to breastfeed.

Materials and Methods: With IRB approval, the study was conducted in a tertiary university hospital with 10,000 annual deliveries, on women delivering vaginally from 06/2015 to 03/2016, Demographic data, intention to breastfeed and use of LEA were recorded postpartum. Breastfeeding status was assessed by phone interview 3 days and 6 wks postpartum.

Results and Discussion: Of 1588 women approached for participation, 1326 women were included. Intention to breastfeed was lower among women with LEA (70%) than among those with no LEA (30%), and was 90% vs 94% respectively ($p=0.043$). At 3 days, the breastfeeding rate among women with LEA was lower than among women with no LEA (81% vs 89% respectively, $p<0.001$), and was also lower at 6 weeks (67% vs 79% respectively, $p<0.001$). Exclusive breastfeeding at 6 wks was also lower among women with LEA vs those with no LEA (47% vs 59%, $p<0.001$).

Using multivariable logistic regression to predict breastfeeding at 6 wks, parity, intention to breastfeed, use of LEA, instrumental delivery, diabetes, neonatal birth weight, and marital status were evaluated. Using a forward stepwise model ($p_{in}=0.05$ and $p_{out}=0.1$), the final model included parity, intention to breastfeed and LEA. Intention to breastfeed was a strong predictor (OR 36.6, 95%CI 18.8-71.2; $p<0.001$); LEA was associated with reduced (OR 0.6, 95%CI 0.43-0.83; $p=0.001$) and multiparity with increased (OR 1.15, 95%CI 1.03-1.29; $p=0.013$) odds for breastfeeding at 6 weeks.

Conclusion(s): In this large observational study, multiparity was a strong predictor for maintained breastfeeding. Breastfeeding rates at 6 wks was lower among women receiving LEA with bupivacaine and fentanyl than among women delivering without LEA; however due to study design, we cannot validate that this association is causal. Further studies evaluating neonatal and maternal factors, and maternal psychosocial profiles, are needed to examine all biopsychosocial pathways that may explain this association.

04AP03-6

The optimal concentration of local anaesthetics for labour pain relief with PCEA for primiparas: a randomized double blind controlled trial

Baliulienė V., Rimaitis K., Zavackienė A., Macas A.
Lithuanian University of Health Sciences, Dept of Anaesthesiology, Kaunas, Lithuania

Background and Goal of Study: The challenge is to find a balance between efficacy and patient satisfaction when low concentrations of LA are used to relieve a labor pain. The goal of the study was to evaluate the effectiveness of different low concentrations of LA for labor pain relief with PCEA.

Materials and Methods: A randomized controlled trial of healthy primiparas was carried at 2014-2016 in the Maternal unit of a teaching hospital. Labor pain was relieved with LA and opioid fentanyl. The patients were allocated into 6 groups: B1-bupivacaine (B) 0.0625%, B2-B 0.1%, B3-B 0.125%, L1-levobupivacaine (L) 0.0625%, L2-L 0.1%, L3-L 0.125%. Scale from 1 to 10 was used to evaluate the satisfaction.

Results and Discussion: 202 patients were included. Groups were similar according to ASA class, age, gestational age, BMI, cervix dilation, oxytocin use, duration of delivery stages (I,II), birth weight, Apgar in 1 and 5 minutes, mode of delivery ($p=0.35$, $p=0.61$, $p=0.59$, $p=0.46$, $p=0.24$, $p=0.39$, $p=0.41$, $p=0.54$, $p=0.86$, $p=0.21$, $p=0.75$, $p=0.16$ respectively).

Total doses of LA: B1-47(34) mg, B2-73(30) mg, B3-85(58) mg, L1-46(34) mg, L2-74(45) mg, L3-89(48) mg. The total doses significantly differs between groups B1 and B2, B1-L2, B1-L3, B1-B3, L1-L2, L1-L3, L1-B3 ($p=0.03$, $p=0.01$, $p=0.0001$, $p=0.0001$, $p=0.04$, $p=0.0001$, $p=0.0001$ respectively).

The incidence of pain breakthroughs (VAS \geq 6): B1-45.5%, B2-16.7%, B3-20%, L1-48.5%, L2 -15.6%, L3-21.2%, was significantly different between groups ($p=0.003$).

	PKA used (%)	Demand (median (IQR))	Given (median (IQR))
B1	96.7	4(5)	3.5(2)
B2	78.8	6(8)	4(3)
B3	77.4	3.5(5)	3(4)
L1	97	7(10)	5(4)
L2	87.5	3(7)	3(6)
L3	87.9	2(9)	2(3)
p	0.015	0.054	0.037

[Patient controlled boluses]

The request of rescue boluses was significantly different between groups: B1-23.3%, B2-27.3%, B3-11.4%, L1-57.6%, L2-12.5%, L3-15.2% ($p=0.001$).

Satisfaction with labor doesn't differ between groups: B1-10(1), B2-9(1), B3-10(1), L1-10(1), L2-10(1), L3-10(1) ($p=0.132$).

Conclusion(s): Labor pain breakthroughs, the request for patient controlled and rescue boluses are more frequent using very low concentrations of LA, but different lower concentrations of LAs determines significantly different total dose of LA infused and doesn't affect patient satisfaction.

04AP03-7

Complications and effectiveness of neuroaxial anesthesia for labor in patients under 17 years old in a tertiary university hospital

Diaz A., Martin A., Guasch E., Gredilla E., Gilsanz F.
Hospital Universitario La Paz, Dept of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Due to the changing sociocultural conditions in recent years, early pregnancy has become a major public health problem extending to the pediatric age.

The aim of our study was to analyze the complications and effectiveness of the neuroaxial anesthesia (NA) as an analgesia labor (L) technique in pregnant women under 17 years old.

Materials and Methods: A retrospective observational study was performed with our own database records for a year (1/12 / 2015-1 / 12/2016) in women under 17 years old with NA for L.

Results and Discussion: The total number of NA during the studied period was 4154 of which 27 (0.65%) were on women under 17 years old: 16 years = 23 (85,19%); 15 years = 3 (11.11%); 14 years = 1 (3.70%). Only one patient presented uncontrolled pregnancy (age = 16 years). The 27 patients (100%) requested NA themselves; A total of 25 (92.59%) women received an epidural analgesia (EA) and 2 (7.41%) combined spinal and epidural analgesia (CSE). Complications during the procedure were: paresthesias $n = 4$ (14.81%) and hematic puncture $n = 1$ (3.70%). There weren't any accidental dural puncture in women under 17 years old.

Complications at 24 hours were: pain at the puncture site $n = 3$ (11.11%) and lumbar pain $n = 1$ (3.7%). One patient ($n = 1$, 3.7%) presented unilateral femoral hypoesthesia that was resolved after 48 hours.

Regarding effectiveness: one patient needed a catheter resite due to failure, performing a CSE ($n = 1$, 3.7%); and 2 patients required a rescue bolus ($n = 2$, 7.41%). Global satisfaction was $\geq 7/10$ in 100% of patients.

In our hospital the rate of neuroaxial block repuncture is 1.8%⁽¹⁾, comparable to the studied group. Other series describe failure rates between 0.7%⁽²⁾ and 23%⁽³⁾, with no bibliographic data in women under 17 years.

Conclusion(s): The NA for LA is as safe and effective in under 17 population as in the general group. Plus demand of this procedure is very high in this group.

References:

- Gredilla et al. Medicina Preventiva 2008; 14: 22-37.
- De Blas et al. Rev Esp Anesthesiol Reanim 2007; 54, 78-85.
- Thangamuthu et al. IJOA 2013; 22, 310-5.

04AP03-8

Prostaglandins for labour induction and chronic postpartum back pain after labour epidural analgesia

Jaunberga Z.¹, Vasilevskis E.¹, Ozolina A.², Liepina E.¹, Vanags I.²
¹Jurmala Hospital, Dept of Anaesthesiology & Pain Medicine, *Jurmala, Latvia*, ²Riga Stradin's University, Dept of Anaesthesiology, *Riga, Latvia*

Background and Goal of Study: Induction of labour is used all over the world when continuation of pregnancy is hazardous to the mother and/or her fetus. Prostaglandins remain the most effective induction agents with well established proinflammatory properties. In a previous multicentre study (Jaunberga Z. et al. The association of postpartum lower back pain and epidural analgesia. Proceedings Baltic Society of Regional Anaesthesia 2nd Conference, 2016) we found a difference in the incidence of postpartum low back pain at the 1st postpartum day (41.9% vs.17%, $p=0.00003$), at 6-8 weeks (50.7% vs.29.8%,

$p=0.02$) and after 3 months (38.6% vs. 24.1%, $p=0.02$) between patients who benefited from an epidural analgesia during labour and those who did not. We hypothesised that prostaglandins used for labour induction might have contributed to the increased incidence of acute and chronic postpartum low back pain.

Materials and Methods: The study has been approved by local Ethical Committee. We performed an additional analysis of data from non-randomised, prospective, multicentre study done previously. Nulliparous singleton parturients of legal age after full term labour, who received epidural analgesia, were included in study group ($N=106$) and, those who did not receive epidural analgesia were the control group ($N=141$). Statistical analysis was done in with t-test, F test. Exclusion criteria: history of prolonged low back pain before pregnancy.

Results and Discussion: Prostaglandins were used in 20 cases in study group and in 11 cases in control group. There is no significant difference in age of parturients, labour duration, use of oxytocin during labour and baby weight in study and in control groups with and without induced labour. There is no significant correlation between prostaglandins use and pain incidence at 1st postpartum day ($p=0.85$ in study group and $p=0.97$ in control group). Further, prostaglandins use did not effect pain intensity at 1st postpartum day in study group ($p=0.47$) and in control group ($p=0.99$). There is a significant correlation between prostaglandins use and pain incidence 3 months postpartum in study group ($p=0.004$), in control group no correlation was found ($p=0.67$).

Conclusion(s): Prostaglandins for labour induction do not increase the incidence of acute postpartum pain, but might increase the incidence of chronic postpartum low back pain.

04AP03-9

An observational study investigating the positioning of epidural catheters and their function during labour analgesia

Muggleton E.R., Muggleton T., Bergman P.

Rotkreuzklinikum München, Dept of Anaesthesiology & Intensive Care, Munich, Germany

Background: The carrying out of epidural anaesthesia remains an essentially blind process. Despite optimal technique the performing anaesthetist can never be confident that the epidural catheter will lie appropriately. This leads to inadequate analgesia in up to 25% of patients, failure to convert to surgical anaesthesia in up to 21%. The exact reason for the failure is often not clear until catheter removal. Epidural catheters are nylon and flexible at body temperature leading to distortion of the epidural catheter which persists after removal. This can be used as a surrogate method to retrospectively determine the position of the epidural catheter. This may provide indications of the reasons for epidural success or failure to aid decision making with an inadequate epidural.

Materials and Methods: A retrospective analysis of 48 epidural catheters for labour analgesia to determine the physical changes that had occurred. We questioned the women to correlate the catheter shape with its effectiveness. We recorded the angle that the catheter was bent in both a cephalic-caudal direction as well as a medial-lateral direction. We could then calculate the average position of the epidural tip as well as determine the characteristics of an effective epidural catheter.

Results: The most common level of insertion was L3/4 (42/48), average 1.17 attempts. The tip lay caudally to the insertion point in 10% of the patients (5/48). The mean tip position was practically central (0.008 mm left of midline) although it varied from 46mm to the left of the midline to 32mm to the right of the midline. The mean tip lay 10mm away from the midline. Also of interest was that the average distance from the midline was greater in patients with sensory disturbance versus those without (14.5mm vs. 2.6mm). The depth of the tip of the catheter correlated reasonably with the deviation from the midline ($R=0.65$) whilst the depth of LOR did not.

Conclusion: More emphasis should be made on methods assisting accurate placement of the epidural catheter tip. Deviation of the tip away from the midline is significantly correlated with additional sensory disturbances and inadequate analgesia. As well as restricting the amount of catheter inserted into the epidural space it may become possible in future to determine where the catheter lies before using it. For example, using electrical stimulation of the epidural catheter.

04AP03-10

Association between epidural space depth and body habitus features

Maor A.S., Weiniger C.

Hadassah Hebrew University Medical Center, Dept of Anaesthesiology & Intensive Care, Jerusalem, Israel

High body mass index (BMI) is a predictor of difficult epidural placement, (1) yet any BMI is associated with diverse body shapes, depending on location of fat deposits. We aimed to identify body shape factors associated with increased epidural depth (up to 6 or ≥ 6 cm), as greater epidural depth is associated with difficult neuraxial block placement.

Methods: Prospective observational study with IRB approval of pregnant women, at term who received neuraxial blockade. We recorded maternal and obstetric characteristics and self-reported BMI. We measured actual height and weight, arm and subscapular fatpad thickness (digital caliper, mm) and epidural depth (ultrasound, cm). We used logistic regression to evaluate factors associated with epidural depth up to 6 or ≥ 6 cm.

Results: We recruited 124 women, 33.1 ± 5.5 years old; gestational age 38.4 ± 1.2 weeks; parity 2 [1-3] and BMI 30.3 ± 5.5 kg/m².

We found a statistical difference between the actual and reported measures for BMI, height and weight, with mean differences -0.78 (95% CI -1.0 to -0.5) kg/m² $p < 0.0001$, -1.6 (95% CI -2.1 to -1.0) cm $p < 0.0001$ and 0.4 (95% CI 0.1 to 0.7) kg $p = 0.02$ respectively. Univariate analysis demonstrated that higher actual BMI, and greater arm and subscapular fatpad thickness were significantly associated with epidural depth ≥ 6 cm.

In the multivariable regression model, greater subscapular fatpad thickness was significantly associated with epidural depth ≥ 6 cm, Odds Ratio 1.14 (95% CI 1.01-1.30), Table.

Conclusions: In the logistic regression model, only thick subscapular fatpad was associated with epidural depth ≥ 6 cm. BMI is often used to predict outcomes such as epidural placement difficulty, however obesity may be expressed by various body shapes, and other measures of body size may be important to consider for neuraxial block placement.

1. Bamgade OA et al. Obstetric anaesthesia outcome in obese and non-obese parturients undergoing caesarean delivery: an observational study. *Int J Obstet Anesth.* 2009;18:221.

	OR	95% CI
Actual BMI	1.24	0.98 - 1.56
Subscapular fatpad thickness (mm)	1.14*	1.01 - 1.30
Mid-arm fatpad thickness (mm)	0.97	0.85 - 1.12

BMI = body mass index kg/m²; OR = Odds Ratio;
CI = confidence interval; *significant

[Table: Multivariable logistic regression model of body habitus features associated with epidural depth measured by ultrasound (below 6 cm or ≥ 6 cm)]

04AP03-11

Identification of the epidural space: a double blind comparison between the CompuFlo® Epidural Computer Controlled System and the standard LOR to saline technique in obstetrics

Coccoluto A., Chiarenza F., Camorcia M., Capogna G.

Citta di Roma Hospital, Dept of Anaesthesiology & Intensive Care, Rome, Italy

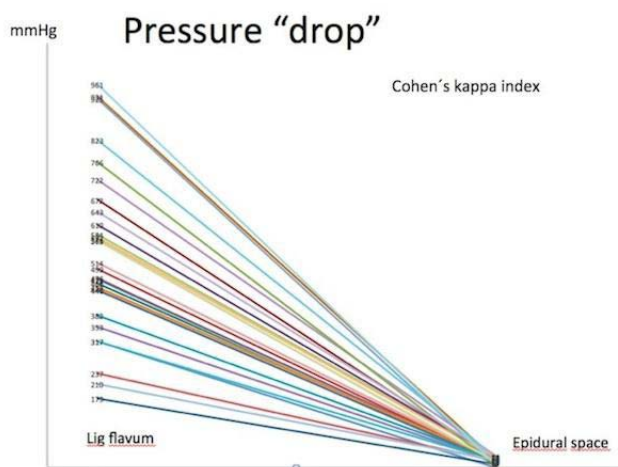
Background and Goal of Study: Current techniques for identifying the epidural space rely on the subjective perception of the operator on loss of resistance to air or saline as the needle passes from the ligamentum flavum into the epidural space. Some pilot studies suggest the use of the CompuFlo® Epidural Computer Controlled System (CF) for the correct identification of the epidural space(1). The purpose of this study was to evaluate the inter-rater agreement between the standard LOR to saline technique and the CF for the epidural space verification in pregnant patients.

Materials and Methods: After IRB approval and informed consent, we enrolled 29 healthy parturients undergoing elective C section or labor analgesia with the epidural technique.

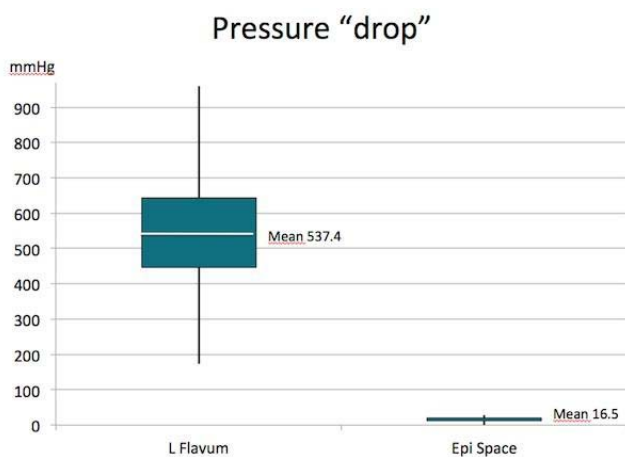
Epidural anesthesia (EA) was performed in the lateral position using a 16G Tuohy needle at the L3-L4 or L4-L5 interspace. A 3 way stopcock was connected to the epidural needle with the in-line port of the stopcock attached to a 10 mL saline filled LOR syringe. A 122 cm arterial pressure tubing connected the side port to another 20mL saline filled syringe loaded into the injection pump. The stopcock was then opened toward the in line LOR syringe and the injection pump to allow the performance of the EA in the standard fashion and the pressures to be recorded continuously. The compuFlo device was set to deliver normal saline at a rate of 0.050 ml/s with a maximum pressure limited to 200 mmHg. When the epidural space was reached, the pressure drop reading was recorded for 5 seconds. The agreement between the two raters (the expert's reported sensation during needle advance in the ligament and epidural space) and the variation of pressure given by CF were analyzed using Cohen's kappa index.

Results and Discussion: In all cases EA was performed successfully. We observed that pressures observed in the ligamentum flavum were significantly higher than in the epidural space with a drop greater than 96% (SD0.2) in all cases (Figures 1 and 2). The Cohen K index was 1 indicating a perfect agreement between the two raters.

Conclusion(s): This preliminary study indicates that CF might be effectively used for the identification of the epidural space in the obstetric population.



[Figure 1]



[Figure 2]

References: 1. Ghelber O et Al. RAMP 2008

04AP04-1

Preeclampsia significantly increases the future risk of coronary heart disease in women undergoing Caesarean section delivery

Chao Y.-M., Huang C.-J.

Taipei Tzu Chi Hospital, Dept of Anaesthesiology, New Taipei City, Taiwan, Republic of China

Background and Goal of Study: This population-based cohort study elucidated whether preeclampsia significantly increases the future risk of coronary heart disease (CHD) in women undergoing Caesarean section (CS) delivery.

Materials and Methods: We analyzed data retrieved from Taiwan Longitudinal Health Insurance Database. All of the CS women between 2002 and 2007 in Taiwan, according to Diagnosis-Related Group codes, were included. The study endpoint was the primary diagnosis of CHD after delivery. Only subjects received treatment of CHD for at least twice were enrolled for analysis. The hazard ratios (HRs) and the 95% confidence intervals (CIs) were estimated using multivariate Cox proportional-hazards regression models.

Results and Discussion: A total of 290736 CS women were included (preeclampsia: n=8383; non-preeclampsia: n=282354). During 1 to 6 years of follow-up, the incidence of CHD of the preeclampsia was significantly higher than that of the non-preeclampsia (0.2% vs. 0.1%; $P<0.001$).

The preeclampsia and the non-preeclampsia were significantly different in age as well as the incidences of having general anaesthesia, multiple gestation and CS by maternal request (all $P<0.001$).

The preeclampsia and the non-preeclampsia were also significantly different in the incidences of CHD-related prognostic factors, including diabetes mellitus, chronic hypertension, hyperlipidemia, obesity, chronic obstructive pulmonary disease (a proxy for smoking), thrombophilia or coagulopathy, and disorders of fluid, electrolytes and acid-base balance (all $P<0.05$). The incidences of pregnancy-related complications, including pregnancy-related hypertension, antepartum haemorrhage, postpartum haemorrhage, early or threatened labour, and preterm and low birth weight were also significantly different between the preeclampsia and the non-preeclampsia (all $P<0.001$). After adjusting for the above-mentioned factors that differed significantly between the preeclampsia and the non-preeclampsia, the preeclampsia showed a significantly higher subsequent risk of developing CHD than the non-preeclampsia (HR = 2.77, 95% CI = 1.62 - 4.73, $P<0.001$).

Conclusion(s): CS women with preeclampsia had at least twice the risk of developing coronary heart disease when compared to those CS women without preeclampsia during 1 to 6 years of follow-up.

04AP04-2

Maternal cardiac diseases and pregnancy: maternal, obstetrical and neonatal outcomes: a systematic literature review

Bonnet V.¹, Simonet T.¹, Labombarda F.², Dreyfus M.³, Hanouz J.-L.¹

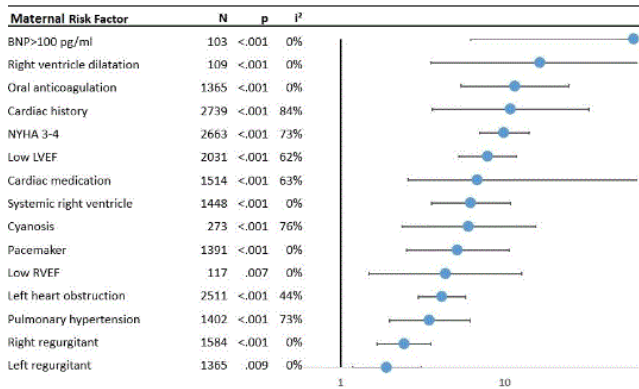
¹University Hospital Caen, Dept of Anaesthesiology & Intensive Care, Caen, France, ²University Hospital Caen, Department of Cardiology, Caen, France, ³University Hospital Caen, Department of Gynaecology, Obstetric and Reproductive Medicine, Caen, France

Background and Goal of Study: Management of cardiac diseases, both congenital and acquired, has greatly improved over the last decades. Thus, a vast number of fertile women with heart disease become pregnant each year and cardiac diseases became the second cause of maternal mortality. The aim of this study was to provide an up-to-date estimation of maternal, obstetrical and neonatal outcomes of those high risk pregnancies.

Material and methods: The keywords "(heart disease) AND (pregnancy OR delivery)" were used to search Pubmed, Medline and the Cochrane Database. Studies reporting any outcome of pregnancy in women with pre-existing heart disease, congenital or acquired, were included. Two practitioners independently selected studies, to assess quality of evidence and extract data. The odds ratio associated to every risk factor were calculated separately for the three outcomes. Separate analysis were performed for occidental studies and prospective studies.

Results and Discussion: 59 studies reporting 14407 pregnancies were included, including 8 prospective studies. Maternal mortality and maternal, obstetrical and neonatal complications were higher than in the general population. Their incidences depended on the baseline cardiac condition. The meta-

analysis confirmed that Eisenmenger syndrome and cardiomyopathies were associated with the highest complications rates (63.5% 95%CI [50.5-76.5] and 35.9% 95%CI [29.4-42.4] respectively). The present literature review gives an updated estimation of the respective weight of all known risk factors of maternal cardiac complication



[Maternal risk factors]

and proposes a new stratification of maternal cardiovascular risk, based on the World Health Organization classification. Lastly, this study highlighted two periods especially at risk of maternal cardiac decompensation: the third trimester and the post-partum period.

Conclusions: Risk estimation prior to pregnancy seems achievable, however no strong per pregnancy predictors of decompensation were found.

04AP04-3

Cardiovascular disease in pregnancy classified after the WHO risk-index: a retrospective observation of different anaesthetic methods during cesarean sections

Wittmann M., Guttenthaler V., Baumgarten G.

University Hospital Bonn, Dept of Anaesthesiology & Intensive Care, Bonn, Germany

Background and Objective: Heart diseases increase the risk of maternal and neonatal complications in pregnant women. The treatment of this patient group from preconceptional counseling to postnatal monitoring increasingly attract attention as growing numbers of pregnant women present with heart diseases.

Methods: In this retrospective observatory monocenter study all pregnant women with heart diseases that gave birth at the University Hospital of Bonn within a timespan of ten years and their newborns were included. Maternal outcome parameters were the length of hospital stay (LOS) and an eventual postpartal stay in the intensive care unit (ICU). The APGAR score, the pH-value and the Base-Excess-value of the umbilical cord were evaluated as primary outcome parameters for the newborn. The patients were categorized according to the WHO risk index modified by Thorne (Thorne et al, 2006). The outcome parameters were analyzed in dependency to the patients' WHO risk class and, if applied, the chosen anaesthetic method during cesarean section.

Results: 65 women with 77 pregnancies were studied. Applying the Kolmogorov-Smirnov-test we found a significant relationship between the LOS and the anaesthetic method during a cesarean section ($p = 0.043$). The Kruskal-Wallis-test showed that the LOS and the WHO risk class ($p = 0.02$) were correlated significantly. For the newborns a significant relationship between the WHO risk classes of the mother and the APGAR scores after 5- and 10-minutes ($p = 0.041$ and $p = 0.017$ respectively) was observed. There was no significant influence of the chosen method of anaesthesia during a cesarean section on the pH-value of the umbilical cord or the Base Excess (BE)-value of the newborn.

Conclusions: This study could confirm the results of other trials showing that cardiovascular diseases have negative effects on the outcome of mother and newborn. The modified WHO risk index seems to be an adequate tool to classify the patients with cardiac diseases and might be applicable for anaesthesiologic risk assessment. The validity of the outcome values is limited due to the small number of available patients. Due to the retrospective design of the study, a long term follow up could not be carried out. A prospective multi-

center study could provide more sustainable evidence to support guideline development on peripartum anaesthetic management of women with cardiovascular disease.

04AP04-4

Vascular Ehlers-Danlos syndrome (vEDS): complications and anesthetic management during pregnancy

Rosa A.¹, Fischer C.¹, Cordier A.-G.², Benachi A.², Franck M.³, Mercier F¹

¹Hopital Antoine Bécélère, Dept of Anaesthesiology, Clamart, France,

²Hopital Antoine Bécélère, Dept of Obstetrics, Clamart, France,

³Hopital Européen Georges Pompidou, Vascular Disease Center, Paris, France

Background and Goal of Study: vEDS is an inheritable connective tissue disorder responsible for high morbidity and mortality, especially during pregnancy, due to vascular, digestive, uterine and respiratory complications. Few data are available regarding general and epidural or spinal anesthesia complications, making medical care difficult. This study presents the analysis of anesthetic management and specific complications of vEDS during pregnancy.

Materials and Methods: An observational retrospective study (1990-2012) on medical management of vEDS patient's pregnancies followed at hospital Européen Georges Pompidou.

Results and Discussion: We described 29 patients and 40 pregnancies. Maternal mortality was 3.4% at 40 days and 6.9% at one year. Severe complications occurred during 21 vaginal delivery: perineal lesions (38.1%), vascular complications (10.3%) including one death. Cesarean sections (18) complications were post-partum hemorrhage (38.8%) and visceral rupture (6.9%) without subsequent severe morbidity. We reported no complication involving general or spinal and epidural anesthesia. The insertion of a peripheral catheter was frequently difficult (73.3%). Use of opiates at the time of anesthetic induction decreased hemodynamic variations during surgery.

Conclusion(s): vEDS pregnant patients need multidisciplinary management. Elective cesarean section seems to be the best approach to avoid severe complications. Whereas spinal or epidural anesthesia might be discussed in some cases, general anesthesia is a reasonable choice for hemorrhage risk management.

References:

- Perdu J et al. [Vascular Ehlers-Danlos syndrome]. *Presse Médicale Paris Fr* 1983. 2006 Dec;35(12 Pt 2):1864-75.
- Pepin M et al. Clinical and genetic features of Ehlers-Danlos syndrome type IV, the vascular type. *N Engl J Med*. 2000 Mar 9;342(10):673-80.
- Lurie S et al. The threat of type IV Ehlers-Danlos syndrome on maternal well-being during pregnancy: early delivery may make the difference. *J Obstet Gynaecol J Inst Obstet Gynaecol*. 1998 May;18(3):245-8.
- Dubruc E et al. [Pregnancy and Ehlers-Danlos vascular syndrome: patients' care and complications]. *J Gynécologie Obstétrique Biol Reprod*. 2013 Apr;42(2):159-65.
- Jamard A et al. [Vascular Ehlers-Danlos syndrome and pregnancy: an obstetrical specific support]. *J Gynécologie Obstétrique Biol Reprod*. 2012 Nov;41(7):676-8.

04AP04-5

Women with Caesarean section delivery have a higher risk of subsequent coronary heart disease than women with vaginal delivery

Yuan H.-B., Huang C.-J.

Taipei Tzu Chi Hospital, Dept of Anaesthesiology, New Taipei, Taiwan, Republic of China

Background and Goal of Study: This population-based cohort study was conducted to elucidate the impact of Caesarean section (CS) delivery on the future risk of coronary heart disease (CHD) in pregnant women.

Materials and Methods: We analyzed data retrieved from the Longitudinal Health Insurance Database 2010, which includes medical claims data and registration files for 1 million enrollees randomly selected from the 2010 Registry for Beneficiaries ($n = 23.7$ million) of the National Health Insurance program

in Taiwan. Subjects with a newly diagnosed CHD after delivery were identified with ICD-9-CM codes between January, 2000 and December, 2012. At least two separate inpatient or outpatient medical record diagnosis of CHD were included in this study to confirm the accuracy of the diagnosis. Multivariate Cox proportional-hazards regression models were performed to estimate the hazard ratios (HRs) and the 95% confidence intervals (CIs).

Results and Discussion: A total of 52322 pregnant women were included (CS delivery: n=18153; vaginal delivery: n=34169). During 1 to 13 years of follow-up, the incidence of having subsequent CHD in women with CS delivery was significantly higher than that in women with vaginal delivery (1.4% vs. 0.9%; $P < 0.001$). The between-group differences in age and length of hospital stay as well as the incidences of CHD-related prognostic factors, including diabetes mellitus, chronic hypertension, hyperlipidemia, obesity, chronic obstructive pulmonary disease (a proxy for smoking), and thrombophilia were significantly different (all $P < 0.05$). The between-group differences in the incidences of pregnancy-related complications, including preeclampsia, pregnancy-related hypertension, antepartum haemorrhage, early or threatened labour, and preterm and low birth weight were also statistically significant (all $P < 0.001$). After adjusting for the factors that were significantly different, the CS delivery women showed a significantly higher subsequent risk of CHD (HR = 1.32, 95% CI = 1.11-1.58, $P < 0.001$) than the vaginal delivery women.

Conclusion(s): Women with CS delivery had an increased risk of a subsequent CHD comparing to those women with vaginal delivery.

04AP04-6

Anesthesia and maternal hypertensive disorders - analysis of a tertiary maternity center

Rego S., Lima M., Silva C., Alves C., Carvalhas J.
Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology & Pain Medicine, Coimbra, Portugal

Background and Goal of Study: Hypertension is the most common medical problem complicating 2-3% of pregnancies (1). Maternal hypertensive disorders and their implications, are a growing reality faced by the obstetric anesthetist.

The aim of this study is to characterize the obstetric patients with hypertensive disorders admitted in a tertiary maternity from June 2015 to June 2016, and analyse their anesthetic/analgesic management.

Materials and Methods: A retrospective analysis was carried out by reviewing clinical data of consecutive patients diagnosed with chronic hypertension, gestational hypertension, preeclampsia, and severe preeclampsia and HELLP syndrome, in our maternity in the considered time frame. A descriptive analysis was performed. Continuous variables were reported as mean (standard deviation).

Results and Discussion: In this period there were 2670 deliveries and the incidence of hypertensive pathology was 3,9% (n=104), which is in agreement with the literature.

The average age was $34 \pm 4,7$ years, 44% were nulliparous and 6,7% had multiple pregnancies. Sixty one percent were obese.

The most common maternal hypertensive disorder was preeclampsia (31,7%), followed by chronic hypertension (29,8%), gestational hypertension (29,8%) and severe preeclampsia/HELLP syndrome (8,7%).

The overall incidence of preterm deliveries was 41% (n= 43), and in 17 of these (39,5%), the gestational age was under 34 weeks.

The percentage of neuroaxial techniques for labor analgesia was very high (94%).

The caesarean section rate in the hypertensive pathology group was 52,9% (n=55). Severe preeclampsia and HELLP syndrome had the highest rate, 80% and 100% respectively. General anesthesia was performed in 27,3% (n=15) of caesarean sections.

Conclusions: Maternal hypertensive disorders demand an interdisciplinary approach with an early involvement of the anesthetic team. We found a very high c-section rate in the studied group contrasting with the overall c-section rate (29,3%) of the maternity. Similarly, there was a high general anesthesia rate. The high neuroaxial analgesia percentage can be explained by the fact that, in our institution, epidural catheters are placed very early during labor.

References: 1- Alessia M, Sabina C, Alessandro C, et al. *J Prenat Med.* 2009 Jan-Mar; 3(1): 1-5.

04AP04-7

Cardiogenic shock associated to stress cardiomyopathy during sedation for endometrial curettage after spontaneous abortion. Case report

Masgoret P., Calvo A., Chanza M., Caballero A., Borrat X., Mercadal J.

Hospital Clinic de Barcelona, Dept of Anaesthesiology, Barcelona, Spain

Background: There are reported cases of stress cardiomyopathy (SCMP) in sedation for gastrointestinal endoscopy, occurring in elderly women. We present a case of SCMP with cardiogenic shock during sedation for endometrial curettage, which to the best of our knowledge has not been reported yet.

Case report: A 35-year-old woman with no relevant medical history underwent endometrial curettage after spontaneous abortion. She was sedated with propofol and alfentanil boluses. At the end of procedure, she suffered severe bradycardia, treated with atropine. Immediately afterwards, extrasystoles appeared, leading to salvos of ventricular tachyarrhythmia that lasted 3 seconds. Patient did neither lose pulse at any time nor needed cardiac massage or defibrillation. Blood pressure decreased to 82/45 mmHg. Amiodarone bolus was administered, extrasystoles stopped and curettage was finished. After finishing, low SpO₂ and increasing hypotension was observed. Transthoracic echocardiography (TE) showed severe left ventricular (LV) hypokinesia, without right cavities involvement. She was intubated and mechanical ventilation was started. Dobutamine was initiated and withdrawn due to tachycardia and hypotension. A more comprehensive TE under Norepinephrine (NE) infusion showed severe LV systolic and diastolic dysfunction with absence of septal and anterolateral thickening, global hypokinesia, reduced ejection fraction (EF: <25%) and dilated left ventricle. LV outflow tract velocity time integral (VTI) was 11 cm, which allowed to calculate a cardiac output of 2.4 L/min. Dobutamine was restarted. EKG showed non specific findings. Troponin I peaked at 12 hs (3.4 ng/mL) and then decreased. TE after 12 hours revealed slightly reduced motility, left ventricle with normal size and thickness, 45% EF and not altered valves.

Discussion: SCMP is related to wide range stressfull events. Our case could be related to medical procedure, drugs or a raise in endogenous catecholamines. Treatment is haemodynamic and respiratory support, inotropic and vasopressor agents and diuretics.

References: Jong Won Yu, J. Two Cases of Stress Cardiomyopathy during Esophagogastroduodenoscopy 2015, *Clin Endosc* 2016;49:76-80.

Learning Points: TE had an important role as a diagnostic tool to help defining the cause of shock, as a monitoring tool, and to guide treatment decisions (to restart dobutamine after NE initiation with final improvement).

04AP04-8

Anaesthetic challenge in parturient with systemic mastocytosis

Fernandes A., Mendonça M., Freitas S., Câmara L., Müller S.
Hospital Central do Funchal, Dept of Anaesthesiology, Funchal, Portugal

Background: Mastocytosis is a rare disease caused by the proliferation and accumulation of mast cell in various organs¹. Clinical manifestations include anaphylactic reactions and cardiovascular collapse². Multiple stimuli may precipitate the release of vasoactive substances, including stress, anxiety, pain and various drugs¹.

We present the case of a parturient with systemic mastocytosis who requests analgesia for labour, raising a dilemma: on one hand, the unpredictable potential of greater mast cell activity in response to pain and stress of labour and, on the other, the administration of drugs that possibly trigger the massive release of mast cell mediators.

Case report: 34 years old pregnant woman, admitted at 39 weeks of gestation due to premature rupture of membranes. ASA 2 - systemic mastocytosis diagnosed 2 years prior. Referred allergies to ibuprofen, acetylsalicylic acid, red fruits, seafood and chocolate. During pregnancy, she maintained therapy with ranitidine 150mg/day, without exacerbations. In the delivery room, ranitidine 200mg iv and methylprednisolone 60mg iv were administered. In a multidisciplinary discussion, epidural analgesia was decided with administration of 20mL of 0.15% ropivacaine (in 5mL boluses), followed by PIEB with 0.1% ropivacaine. The delivery was uneventful. Paracetamol was used in postpartum analgesia. The subsequent hospital stay had no complications.

Discussion: Parturients with systemic mastocytosis are at great risk of severe exacerbations. Anxiety, stress, sleep deprivation, pain and many drugs are triggers of mast cell degranulation. Early epidural analgesia is recommended, to alleviate pain effectively, giving preference to amide-type local anaesthetics¹. The anaesthetic approach should focus on avoiding the triggering agents, establishing a plan for analgesia/anaesthesia for delivery, which requires an early collaboration between Obstetrics and Anaesthesiology.

References:

1. Ulbrich et al. Anaesthetic management of emergency caesarean section in a parturient with systemic mastocytosis. *Int J Obstet Anesth.* 2013; 22: 243-6.
2. Dewachter et al. Perioperative Management of Patients with Mastocytosis. *Anesthesiology.* 2014; 120:753-9.

Learning points: Patients with systemic mastocytosis are a challenge to the anaesthesiologist. An analgesic/anaesthetic plan should be drawn up and communicated to the entire team to minimize the risk of triggering an exacerbation, avoiding triggering agents and using drugs considered safe.

04AP04-9

Anaesthetic management of a labouring parturient with Brugada syndrome

O'Flaherty D., Murphy C., Thornton P

Rotunda Hospital, Dept of Anaesthesiology, Dublin, Ireland

Background: Brugada syndrome is an autosomal dominant ion channelopathy affecting cardiac sodium ion channels, which may lead to ventricular tachyarrhythmias and ultimately sudden cardiac death. The syndrome may be unmasked by drugs used perioperatively, fever, surgical insult and vagal stimulation. Local anesthetics with slow dissociation characteristics such as bupivacaine, have been discouraged due to concerns regarding unmasking the Brugada phenotype and potential precipitation of ventricular tachyarrhythmias. Some evidence suggests lignocaine is safe when used in low dose.

Case report: A 19 year old primigravida with Type1 Brugada Syndrome was referred in early pregnancy for anaesthesia assessment. Following multidisciplinary team review, consensus regarding anaesthesia management in labour was agreed (remifentanyl PCA followed by combined spinal epidural (CSE) if required) Limited dose of bupivacaine with avoidance of background bupivacaine infusion was advised. Intermittent epidural top-up of lignocaine would be given as needed. At 38 weeks gestation the patient presented with lower abdominal pains. Following induction of labour, remifentanyl PCA was initiated. When analgesia became unsatisfactory, a CSE was performed. Intrathecal bupivacaine 2.5 mg with fentanyl 20 mcg initially provided adequate analgesia with no untoward effect. Subsequent epidural top-ups of 5mls of 1% and 2% lidocaine failed to achieve satisfactory analgesia. Following unsuccessful CSE replacement, a repeat single intrathecal dose was administered for patient distress. The patient shortly delivered a healthy baby boy. No peripartum cardiac arrhythmias were recorded.

Discussion: Brugada labouring parturients pose significant anaesthetic challenges. Evidence suggests that low dose bupivacaine is not a contraindication. Intrathecal bupivacaine for analgesia or caesarean delivery appears safe and should be considered. For this reason, a spinal catheter would seem a reasonable option for a patient with Brugada syndrome for labour ward analgesia.

References:

1. Vohra Jitendra et al. Update on the diagnosis and management of Brugada Syndrome. *Heart, Lung and Circulation*, Volume 24, Issue 12, 1141 - 1148
2. Sorajja D et al Brugada syndrome and its relevance in the perioperative period. *Ann Card Anaesth* 2015;18:403-13
3. Carey, S.M et al Brugada syndrome - a review of the implications for the anaesthetist *Anaesth Intensive Care* 2011; 39: 571-577

04AP04-10

Acute aortic dissection: a possible high risk scenario of peripartum

Galveias I.¹, Rodrigues C.¹, Damas M.², Lança F.², Encantado V.²

¹*Instituto Português de Oncologia, Dept of Anaesthesiology, Lisboa,*

Portugal, ²Hospital de Santa Maria, Dept of Anaesthesiology,

Lisboa, Portugal

Background: Aortic dissection (AoD) during pregnancy is rare and life-threatening for both mother and fetus.(1) According to the International Registry of Acute Aortic Dissections, being in the peripartum period of pregnancy confers a risk for AoD of 0,2%.(2)

Aortic dissections often develop among individuals with connective-tissue disorders associated with abnormalities of the aortic wall, such as those present in familial thoracic aortic aneurysm/dissection, Marfan syndrome, Loeys-Dietz syndrome, vascular Ehlers-Danlos syndrome, and bicuspid aortic valve disease or Turner syndrome.(3)

Type A aortic dissection is the presence of dissection proximal to the left subclavian artery (Stanford classification). Aortic dissection is considered a surgical emergency and if untreated the mortality rate is extremely high.

Case report: We present a case of a 42 year old puerpera with acute aortic dissection type A with no significant past medical history. She was submitted to a c-section at 34 weeks per non tranquilizer CTG. 24 hours after the surgery she initiated an episode of dyspnea, refractory hypoxemia and bilateral crepitations. She denied chest pain. The patient was promptly intubated, ventilated and transferred to the intensive care unit. A thoracic CT scan confirmed a Type-A dissection involving ascending aorta. The patient went to the operating room for emergent surgical intervention. Repair of aortic dissection was carried and the ascending aorta was replaced by a tubular prosthesis. Postoperative course remained benign and patient recovered fully.

Discussion: It has been reported that pain is the most common symptom or complaint at the onset of Aod. Although the patient's symptoms were not suggestive of aortic dissection the diagnosis was made in the least possible time. The echocardiography and CT scan were determinant to make a differential diagnosis from acute pulmonary embolism.

References:

1. Immer FF, Bansil AG. *Aortic dissection in pregnancy: analysis of risk factors and outcome.* *Ann Thorac Surg.* 2003; 76: 309-314;
2. Isselbacher EM. *Epidemiology of thoracic aortic aneurysms. Aortic Dissection and related syndromes.* New York: Springer; 2007:1-15
3. Braverman AC. *Acute aortic dissection: clinician update.* *Circulation.* 2010;122:184-188

Learning points: Pregnancy is an independent risk factor for aortic dissection. Although the clinical manifestations of acute aortic dissection are well described the diagnosis is often overlooked in pregnancy.

04AP04-11

Anesthesia for c-section in women with hypertensive disorders - how are we doing it?

Lima M., Rego S., Silva C., Alves C., Carvalhas J.

Centro Hospital e Universitario de Coimbra, Dept of

Anaesthesiology, Coimbra, Portugal

Background and Goals: Although pregnancy hypertensive disorders (PHD) are not an indication of c-section, many patients tend to have it for safe management of mother and neonate (1).

The aim of this study is to characterize the obstetric population with PHD who underwent c-section in a tertiary maternity from June 2015 to June 2016 and evaluate their anesthetic management.

Materials and Methods: A retrospective study was carried out by analysing the clinical data of consecutive pregnant women submitted to c-section, diagnosed with chronic and gestational hypertension, preeclampsia and HELLP syndrome in our maternity. A descriptive analysis was performed. Continuous variables were reported as mean (standard deviation).

Results and Discussion: In this period there were 2670 deliveries and the incidence of HD was 3,9% (n=104). There was a total of 55 c-sections, of which 7 were elective and 48 urgent/emergent. The c-section rate in the studied group was 52,9%. The average age was 33,8±4,6 years. According to the American Society of Anesthesiologists physical status classification, 70,9% were ASA 2, 23,6% ASA 3 and 5,5% ASA 4.

The HELLP syndrome group had the highest c-section rate, 100%, followed by severe preeclampsia 80%, preeclampsia 57.6% and chronic and gestational hypertension, each with 45.2%.

The motive of the surgery was worsening preeclampsia (38.2%), failure to progress in labor (25.4%), fetal distress (25.4%) and other causes (11%).

Epidural block was the most frequent technique (49.1%), followed by spinal block (12.7%) and combined spinal-epidural (10.9%). General anesthesia was used in 27.3% of patients. A rapid sequence induction was performed, using suxamethonium in 12 cases (80%) and rocuronium in 3 (20%).

Hypertensive crisis was the most frequent complication both during and after surgery treated with intravenous labetalol and sublingual nifedipine. The most serious perioperative complications were pulmonary oedema and hepatic insufficiency, both transient, and unrelated to the anesthetic technique.

Conclusion: In this population, c-section (52.9%) and general anesthesia (27.3%) rates were very high compared to the overall rates in our institution, 29.3% and 15.3% respectively.

Anesthetic management of hypertensive pregnant patients is challenging and the anesthesiologist should play a decisive role, preventing complications.

References: 1. Su YL, Eun CB, Eun AY, et al. *Ewha Med J* 2014; 37(1):36-40

04AP05-1

Effect of different preload crystalloid volumes on the incidence of intraoperative nausea and vomiting in women undergone cesarean section under spinal anesthesia

Shifman E.¹, Pogodin A.², Tikhova G.³, Kulikov A.⁴

¹M.F. Vladimirovskiy Moscow Regional Research Clinical Institute, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation, ²Medical Unit of Severstal, Dept of Anaesthesiology & Intensive Care, Cherepovets, Russian Federation, ³Petrozavodsk State University (PetrSU), Dept of Anaesthesiology & Intensive Care, Petrozavodsk, Russian Federation, ⁴Ural State Medical University, Dept of Anaesthesiology & Intensive Care, Ekaterinburg, Russian Federation

Background and Goal of Study: Intraoperative nausea and vomiting (IONV) associated with spinal anesthesia (SA) in cesarean section (CS) should be prevented whenever possible. Crystalloids preload may be one of effective means for prophylaxis of this complication. There is no clear algorithm to estimate the optimal preload volume for the parturient. The goal of the study was to define effect of different preload crystalloid volumes on incidence of intraoperative nausea (ION) and vomiting (IOV) as a complications due to SA during CS in parturients.

Materials and Methods: Prospective nonrandomized observational multicenter study was performed. Records of 2086 women undergone CS under SA were collected. Exclusion criteria: severe extragenital pathology. Primary endpoints included the rates of ION and IOV. Statistical analysis included descriptive methods and new method of analyzing relative risk (RR) curves developed to analyze the effect for each volume value within the total volume interval. Each point of the RR curve represented the value of RR and threshold that was used for sample subdivision for RR calculation.

Results and Discussion: Except for 2 cases all episodes of vomiting included nausea as well. The incidence of nausea was 7.19% and vomiting 1.2%. These results showed that the prophylaxis for vomiting should be studied separately. The results of RR curve analysis showed (Table) that different preload volumes affected ION and IOV rates in a different way.

Table.

RR (95% CI) values of ION and IOV for different preload volumes

Complication Preload volume (ml)

< 400 < 650 < 1000

nausea 1.04 (0.65 to 1.65) 0.63 (0.46 to 0.87) 0.50 (0.36 to 0.69)

vomiting 2.90 (1.20 to 6.94) 0.96 (0.43 to 2.12) 0.44 (0.19 to 1.01)

Conclusion(s): Different preload crystalloid volumes affected ION and IOV rate in a different way in parturients undergone CS under SA. Our results showed that the volumes less than 400 ml increased IOV rate and volumes greater than 650 ml decreased ION rate for 50%. Further clinical studies are required to enhance preload volume estimation in parturients.

04AP05-3

Comparison of efficacy and safety of two doses of intrathecal Clonidine with hyperbaric Bupivacaine in lower segment cesarean section

Kumar S., Kumar K., Naskar S.

All India Institute of Medical Sciences, Dept of Anaesthesiology & Pain Medicine, New Delhi, India

Background and Goal of Study: Clonidine has been widely used as adjuvant in spinal anaesthesia in doses ranging from 15 to 150 µg, but the ideal intrathecal dose in pregnancy is still ambiguous. therefore, we planned a study to evaluate the efficacy and safety of two low doses intrathecal Clonidine with hyperbaric Bupivacaine for Lower Segment Caesarean Section (LSCS).

Materials and Methods: After institutional ethics committee clearance 90 full term parturients presenting for elective LSCS were randomly allocated into 3 groups of 30 each. Group A received 10 mg Bupivacaine (0.5%) heavy, whereas group B and C received 15 µg and 30 µg Clonidine respectively. The onset and duration of sensory and motor blockade, postoperative analgesic requirement and haemodynamic variables were assessed in all the three groups.

Results and Discussion: The onset of sensory and motor blockade was significantly low and duration of the block was significantly high in Clonidine 30 µg group. Postoperative analgesic requirements was less but similar in clonidine groups. There was no evidence of significant difference in side effects like hypotension, bradycardia, and sedation with both doses of intrathecal Clonidine over the plain bupivacaine group.

Conclusion(s): Clonidine 30 µg has emerged as the ideal adjuvant with Bupivacaine 10 mg for subarachnoid block in LSCS.

References: 1. Elia N, Culebras X, Mazza C, Schiffer E, Tramèr MR. Clonidine as an adjuvant to intrathecal local anesthetics for surgery: systematic review of randomized trials. *Reg Anesth Pain Med* 2008;33:159-67.

04AP05-5

Use of the Totaltrack™ in unexpected difficult airway in urgent caesarean section

Gómez-Ríos M.-Á.¹, Freire-Vila E.², Martínez-Hurtado E.³

¹Complejo Hospitalario Universitario A Coruña, Dept of Anaesthesiology & Intensive Care, Coruña, Spain, ²Complejo Hospitalario Universitario A Coruña, Dept of Anaesthesiology & Intensive Care, A Coruña, Spain, ³Hospital Universitario Infanta Leonor, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Difficult intubation (DI) in obstetrics is more common than in other settings. Therefore it is important to dispose of methods that facilitate ventilation and tracheal intubation (TI) to avoid life-threatening complications in both mother and child.

Case report: The patient was a 30-year-old, 62 kg, woman at 40-weeks gestation presented for emergency CS due to severe fetal bradycardia. Preoperative airway assessment included a Mallampati grade 2 and a thyromental distance >6.5cm. After rapid-sequence induction (RSI), direct laryngoscopy, revealed an unexpected Cormack Lehane grade 4 view. The TT was inserted immediately maintaining the cricoid pressure. After obtained a 100% POGO score view TT cuff was inflated and the patient's lungs were easily ventilated with 13 cm H₂O positive pressure. Intubation through the channel guide was easily accomplished. The procedure was carried out uneventful and a healthy male infant was delivered.

Discussion: DI is a leading cause of anesthetic-related maternal death. The 'gold standard' airway management in obstetrics is a RSI with standard direct laryngoscopy to insert a styletted ETT accompanied by cricoid pressure, but this approach is not without its pitfalls. When traditional laryngoscopy is unsuccessful, the next attempt could be the use of a video laryngoscope. However it may fail prolonging the period of apnea.

After a failed second attempt at TI the use of a supraglottic device must be considered. However, they offers the lungs no protection from regurgitated gastric contents. The TT is a supraglottic airway and an anatomically-shaped bladed video-laryngoscope (VL). TT combines the advantages of VL with several additional benefits:

1. The gastric tube provides functional separation of the respiratory and gastrointestinal tracts and allows aspirate stomach content. The seal created protects the airway from aspiration until TI is accomplished;

- Optimal ventilation can be maintained throughout the process of TI, promoting the shortest apneic time;
- The conduit guides the transglottic passage of the ETT, under vision leading to a high first-attempt intubation rate;
- The blade prevents the epiglottis from down-folding.

References:

Gómez-Ríos M, Freire-Vila E, Vizcaíno-Martínez L, Estévez-González E. The Totaltrack: an initial evaluation. *Br J Anaesth* 2015;115(5):798-9.

Learning Points: TT as primary rescue device could simplify obstetric DA algorithm.

04AP05-6

Visual Analog Scale as an estimate of pain intensity and salivary α -amylase level has non-linear relationship in parturients after cesarean section under spinal anesthesia

Shifman E.¹, Dektyarev E.², Tikhova G.³, Kulikov A.⁴

¹M.F. Vladimirovskiy Moscow Regional Research Clinical Institute, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation, ²Amur Regional Clinical Hospital, Perinatal Center, Dept of Anaesthesiology & Intensive Care, Blagoveschensk, Russian Federation, ³Petrozavodsk State University (PetrSU), Dept of Anaesthesiology & Intensive Care, Petrozavodsk, Russian Federation, ⁴Ural State Medical University, Dept of Anaesthesiology & Intensive Care, Ekaterinburg, Russian Federation

Background and Goal of Study: Acute postoperative pain is one of the main reasons of stress after Cesarean Section (CS) in parturients. Visual Analog Scale (VAS) is a conventional indicator of pain intensity. Many recent studies proved that salivary α -amylase level (AAC) is significant biomarker of stress. The goal of our study was to explore and evaluate the association between VAS and AAC in parturients after CS performed under spinal anesthesia (SA).

Materials and Methods: Prospective study included 30 women, 20-41 years old, full-term pregnancy, undergone CS under SA. Exclusion criteria: multiple pregnancy, severe extragenital pathology, preeclampsia/eclampsia. Primary endpoints including AAC and VAS were registered once within 1st hour after delivery. Saliva sampling was followed by registering of patient's VAS grade, from 0 (no pain) to 10 (unbearable hard pain). AAC (ME/l) was defined using automatic biochemical analyzer Labio 200 (Mindray). Statistical analysis included correlation and linear/nonlinear regression analysis, $a=0.05$, $b=0.20$.

Results and Discussion: Linear correlation coefficient between VAS and AAC equaled to 0.361 and was not significant ($p>0.05$). Scatter plot built for combination VAS and AAC showed polynomial relationship between them. Nonlinear regression analysis was performed to define square equation parameters when dependent variable is AAC mean and independent one is VAS: $AAC = -119.7 + 2178.2 \cdot (VAS) - 187.0 \cdot (VAS)^2$.

All the regression coefficients except the intercept are statistically significant ($p<0.00001$), F-test statistic proved the model goodness of fit ($F = 19.4$, $p<0.00001$), multiple $R = 0.768$ ($p<0.05$). The obtained equation describes non-linear relation between VAS and AAC. ACC mean increases while pain intensity grows until VAS = 6 approximately. ACC mean decreases with the growing pain intensity over VAS = 6.

Conclusion(s): The relationship between VAS and AAC can be described with square regression model. The AAC mean and pain intensity grow until VAS=6, ACC mean decreases when VAS increases over 6 balls. Further studies are required to test and explain the relation between VAS and AAC.

04AP05-7

Postoperative analgesia for cesarean deliveries during CSE: technical maintenance compared

Aversano M.¹, Claroni C.¹, Valenti F.², Todde C.¹, Frigo M.G.¹

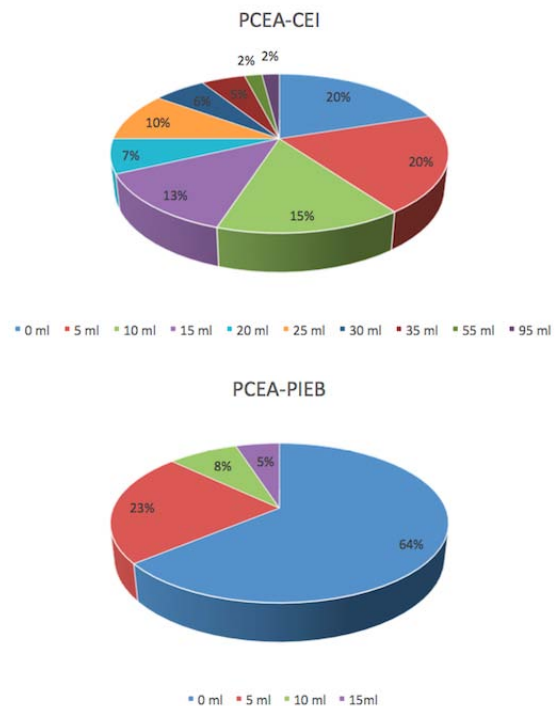
¹S.G. Calibita - Fatebenefratelli - Tiberin Island Hospital, Obstetric Anaesthesia Unit, Rome, Italy, ²University of L'Aquila, Dept of Anaesthesiology & Intensive Care, L'Aquila, Italy

Background and Goal of Study: Postoperative pain after cesarean is a moderate/intense pain, which, if not treated properly, can give negative effects not only for the mother but also for the newborn: it could prevail the survival in-

stinct about their "pain disease" rather than natural offspring caregiving¹. The aim of our study was to compare two techniques of maintaining post operative analgesia after caesarean section.

Materials and Methods: It was carried out an observational study: all patients submitted to cesarean deliveries with combined spinal-epidural anesthesia (ropivacaine 0,02% 10mg + sufentanil 3 mcg) were enrolled and divided into two groups. One group received an analgesic pump in PIEB mode (programmed intermittent epidural bolus) and the other group received a CEI pump mode (continuous epidural infusion) connected to the epidural catheter. In both cases the choice of one or the other analgesic technique was subject to the availability of the devices used in our standard clinical practice. The patients were instructed to self-administer additional boluses of medication in case of pain. The degree of analgesia satisfaction and the occurrence of side effects (such as vomiting, itching, numbness, motor block) were assessed. Data about self-administered boluses numbers registered by the analgesic pumps were analyzed.

Results and Discussion: 120 patients who underwent cesarean section were enrolled in this study, 60 in each group. The average reported pain in the CEI group evaluated according to NRS scale, is 6.3 compared with an average of 2.7 of PIEB group ($p>0.001$). The consumption in the two groups is expressed in Figure 1.



[Fig 1. PCEA use in both groups]

Conclusion(s): In our study the PIEB technique demonstrated a better pain control during 24 hours after caesarean section: in PIEB group there was a lower drug consumption compared with PCEA group and it also revealed a greater maternal satisfaction regarding pain relief.

References:

- Camann W, Brazelton TB. *Anesthesiology* 2000; 92:35.

04AP05-8

Intrathecal clonidine improves chronic pain after cesarean section, but with fetal repercussions

Fernandes H., Santos S., Ashmawi H.

Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HC/UFMUSP), Dept of Anaesthesiology & Pain Medicine, São Paulo, Brazil

Background and Goal of Study: Intrathecal clonidine prolongs spinal anesthesia. We evaluated the effects of the addition of intrathecal or intravenous clonidine (75 mcg) to standard cesarean section anesthesia, on postoperative pain and neonatal outcomes.

Materials and Methods: In a randomized placebo-controlled double-blind trial, sixty-four women scheduled for elective cesarean section under spinal anesthesia were randomly allocated to three groups: intrathecal clonidine 75 mcg, intravenous clonidine 75 mcg and placebo. Primary outcomes were acute and chronic (3 months) post-operative pain. Secondary outcomes were neonatal Apgar scores and blood gas results. A sample size of 21 individuals per group (N=63) was planned.

Results and Discussion: From April 2015 through April 2016, 78 women were recruited. No differences were found among groups in pain scores during hospital stay. Intrathecal clonidine group showed less need of analgesics after 3 months (21.1% vs. 0 vs. 15% for control, intrathecal and intravenous, respectively, $p=0.039$), worse neonate blood gas results (pH: 7.25 ± 0.06 vs. 7.2 ± 0.07 vs. 7.25 ± 0.07 for control, intrathecal and intravenous, respectively, $p=0.032$) and worse neonate serum lactate (in mg/dL: 23.55 ± 9.67 vs. 38.58 ± 23.23 vs. 25.83 ± 6.393 for control, intrathecal and intravenous, respectively, $p=0.047$).

Intrathecal and intravenous clonidine led to more sedation during the intra-operative period (RASS: -0.3 ± 0.47 vs. -1 ± 0.53 vs. -0.73 ± 0.45 for control, intrathecal and intravenous, respectively, $p<0.001$).

Conclusion(s): Intrathecal clonidine led less chronic postoperative pain, but with worse neonatal umbilical artery blood gas results (pH and lactate). Both intrathecal and intravenous clonidine caused more sedation.

04AP05-9

A mother and her baby are victims of rocuronium

Ibrahim E., Youssef H.

Menoufia University, Dept of Anaesthesiology, Shebeen ElKoom, Egypt

Case report: A fit and healthy twenty-one years old female patient was scheduled for elective caesarean section. The patient did not have any previous surgical or anaesthetic history. The lady refused regional anaesthesia and general anaesthesia was given.

General anaesthesia was induced with 120mg Propofol 1%, and 0.6mg/kg Rocuronium to facilitate tracheal intubation. Anaesthesia was maintained with isoflurane 0.6% and 40% oxygen air mixture. The baby was delivered apneic and flaccid. The routine resuscitation was failed to make the baby to breath and endo-tracheal intubation and assisted ventilation was required.

The anaesthetist started to wake up the lady after skin closure who did not regain spontaneous respiration or any muscle power after cessation of the anaesthetic agent and Neostigmine 2.5mg and Atropine 1mg intravenously. Sugammadex 2mg/kg was given to the mother. The mother immediately regained spontaneous respiration and full muscle power and extubated.

The anaesthetist suggested to the neonatologist to give sugammadex to the newborn in a dose of 2mg/kg. The newborn started spontaneous breathing as soon as sugammadex was given with eye opening, crying, and full muscle power. The newborn showed signs of full recovery and was extubated. After a year of surgery, the mother complained of repetitive attacks of difficulty in mastication, swallowing, and speech and found to have myasthenia with slide of EMG and acetylcholine receptors antibodies.

Learning points: This case contributes to the evidence that rocuronium as a muscle relaxant and use of sugammadex as a reverse are safe in myasthenia gravis patients. As anaesthetologists we should revise the safety of drugs crossing the placental barrier.

04AP05-10

Improving hypoglycaemic control in women awaiting elective Caesarean sections

de Vries T.M.¹, Tamhane P.²

¹Oxford University Hospitals NHS Foundation Trust, Dept of Anaesthesiology & Intensive Care, Oxford, United Kingdom,

²Basildon University Hospitals NHS Foundation Trust, Dept of Anaesthesiology, Basildon, United Kingdom

Background and Goal of Study: Fasting recommendations are particularly important in pregnant women due to their increased risk of aspiration. In Basildon Hospital, a medium sized district general hospital, we noted a case of hypoglycaemic collapse in a non-diabetic patient awaiting an elective

Caesarean section (LSCS). This was attributed to prolonged fasting times, having no dedicated operating list for elective LSCS. We therefore set up an audit to measure the incidence of hypoglycaemia, introduced measures to reduce this and re-audited to assess any improvement.

Materials and Methods: Non-diabetic patients awaiting LSCS between November 2014 and May 2015 were included in the initial audit. Their blood glucose level and fasting time were recorded. The patients were asked about the presence of hypoglycaemia symptoms.

After discussion at our departmental meeting, consumption of a carbohydrate rich drink two hours before surgery time was chosen as the most suitable intervention to reduce hypoglycaemia and introduced. The audit was repeated between May and October 2016. Data were analysed with SPSS, using independent samples t-test, χ^2 test, Pearson correlation and logistic regression.

Results and Discussion: Thirty women were included in the initial audit (group 1). After implementation of our intervention, 32 women were included in the re-audit (group 2). Mean blood glucose levels were 4.0 mmol/L (SD=0.50) in group 1 and 4.1 mmol/L (SD=0.49) in group 2 ($t(60)=-1.025$, $p=0.31$). Food fasting time was 16 hours in both groups ($t(60) = 0.15$, $p=0.88$). Fluid fasting time was 16 hours in group 1 and 15 hours, excluding the carbohydrate drink, in group 2 ($t(60) = 0.52$, $p=0.60$). Hypoglycaemic symptoms decreased from 47% to 31% ($\chi^2(1)=1.55$, $p=0.29$). There was a clear correlation in both groups between fluid fasting time and blood sugar value ($r=-0.33$, $p<0.01$), as well as between fluid fasting time and hypoglycaemic symptoms ($R^2=0.42$, $p<0.01$).

Conclusion: The incidence of hypoglycaemia in our audit was higher than expected, with 50% having blood glucose levels ≤ 4.0 mmol/L and 47% with hypoglycaemia symptoms. This was 38% and 31% respectively in our re-audit. Fasting times were much longer than recommended. Being an audit, our study was not powered and did not show any significant improvement. However, the clear correlation between fluid fasting time and blood glucose as well as fasting time shows the potential benefit with stricter implementation of fasting guidelines.

04AP06-1

Epidural blood patch for post dural puncture headache in a parturient with multiple sclerosis

Kovacs M., Ravindran M.

George Eliot Hospital, Dept of Anaesthesiology, Nuneaton, United Kingdom

Background: Multiple sclerosis (MS) is a chronic neurological disorder affecting the brain and spinal cord, characterised by demyelination and axonal injury. Epidural blood patch (EBP) is used to treat Post Dural Puncture Headache (PDPH) when conservative measures fail, but there is a considerable lack of evidence regarding its safety in MS patients.

Case report: A 32 year old primipara with MS presented on labour ward. Her MS was diagnosed in 2015 and her symptoms were blurred and double vision with poor balance. She had one relapse with reduced balance since then. During pregnancy she was without any neurological symptoms and she was not on any medication. She had labour epidural, which was sited in L3-L4 interspace, with no obvious signs of dural tap. 24 hours after epidural insertion she developed a postural, fronto-occipital PDPH.

She was initially treated for 24 hours with conservative management using regular pain killers. On the 2nd postpartum day we performed EBP in theatre, after weighing the risk and benefit with the patient. EBP was done in left lateral position under full asepsis using the same interspace used for the initial epidural. 30 mls of autologous blood was injected slowly, over 2-3 minutes. The patient did not experience any neurological symptoms during the procedure, and only reported mild pressure in her back at the end of injection. After 3 hours of bedrest PDPH symptoms were permanently relieved. She was followed up regularly and did not have any headache and motor or sensory function deterioration.

Discussion: We have presented a case of a successful treatment of PDPH with EBP in a MS patient. The way of performing EBP in MS has only been reported once, where it had been suggested that somatosensory evoked response monitoring should be done to quantify interference with axonal conduction.¹

The main concern with EBP is increased epidural pressure, that may interfere with the conduction of axons affected by MS.² Epidural pressure rise can be reduced by slower injection of fluid.

References:

1. Koeva V, Bar-Or A, Gendron D, Backman SB. Epidural blood patch in a patient with multiple sclerosis: is it safe? *J Can Anesth* 2013; 60:479-483.

2. Vercauteren M, Heytens L. Anaesthetic considerations for patients with a pre-existing neurological deficit: are neuraxial techniques safe? *Acta Anaesth Scand* 2007; 51:831-8.

Learning points: EBP can be a safe treatment option of PDPH in MS patients when injection is performed at a slow rate.

04AP06-2

Langerhans cell histiocytosis in pregnancy, a case series

Coleman E., Horan R., Bowen M.

Rotunda Hospital, Dept of Anaesthesiology, Dublin, Ireland

Background: Langerhans Cell Histiocytosis (LCH) is a spectrum of rare disorders of unknown cause, characterized by proliferation and accumulation of histiocytes in various tissues and organs. Typical presentation is in early childhood although adult onset is also described. The estimated incidence rate is 5/1,000,000 childhood onset and 1-2/1,000,000 for adult onset.

Case 1: (2016)

Ms NR, is a 23 year old female, POG1. She was diagnosed with LCH at age 3. She presented with craniofacial lesions and Diabetes Insipidus (DI). Cerebellar infiltration and progressive neurodegeneration confined her to a wheelchair by age 19. She also has a Growth Hormone deficiency and mild scoliosis.

Ms NR became pregnant and attended The Rotunda Hospital. She was admitted at 34+4/40 with estimated foetal weight < 5 centile. Her DI was well controlled on DDAVP and did not worsen during pregnancy.

At 36+1/40, she underwent successful LSCS under spinal anaesthesia.

Case 2: (2012)

Ms AM, is a 39 year old, P5G7. She has a 40 pack year history. She presented prior to her 5th pregnancy with a spontaneous pneumothorax. A high resolution CT Thorax showed characteristic pulmonary LCH manifestations of a nodular, pseudoemphasematous appearance. She was noted to have new onset Diabetes Insipidus requiring high dose DDAVP.

Progressive shortness of breath resulted in the decision to perform an elective LSCS at 33+3/40. This was completed successfully under combined spinal epidural anaesthesia.

4 years on Ms AM has severe functional limitation secondary to pulmonary hypertension, and is on home O₂ awaiting bilateral lung transplantation.

Discussion & Learning Points: Langerhans Cell Histiocytosis is a serious life altering disease. Smoking has been strongly linked to exacerbation of the pulmonary manifestations of LCH. In pregnancy worsening DI has been described which may be due to placental vasopressinase or impaired renal sensitivity to vasopressin².

There is potential for difficult intubation secondary to craniofacial bony deformities. Neuraxial blockade was safe and effective in both our patients. However hepatosplenic involvement may lead to thrombocytopenia or clotting disorders. This should be considered prior to instrumentation.

Reference:

1. Histiocytosis Association.(2016) *LCH in adults*. Available at: <http://histio.org/page.aspx?pid=383#>. WJZDPPmLS00(Accessed: 24 November 2016)
2. Ogburn, P et Al(1981)'Histiocytosis X and pregnancy', *Obstetrics and gynecology*. 58(4),pp.513-5

04AP06-3

Anesthesia for in utero repair of myelomeningocele: the Brazilian experience

Fernandes H., Santos S., Nani F, Haddad C.

Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HC/FMUSP), Dept of Anaesthesiology & Pain Medicine, São Paulo, Brazil

Background: The myelomeningocele is a defect of neural tube closure. With an incidence of 5-10 / 10,000 pregnancies, it is important to improve means of preventing sequelae. Intrauterine correction becomes a promising option, but with challenges to the anesthesia of the mother / fetus binomial.

Case report: Five pregnant women submitted to intrauterine correction of fetal myelomeningocele. Mean age of 33 years old; mean gestational age at correction of 23 weeks and 3 days; mean gestational age of delivery of 34 weeks and 2 days. Complications: one corioamnionitis that needed post cesarean hysterectomy, four preterm labor. Anesthetic technique: intravenous line (16-

18G), ranitidine 50mg and metoclopramide 10mg, atosiban attack dose, followed by maintenance. Monitoring (ECG, intermittent non-invasive blood pressure, SaO₂, BIS, TOF), epidural catheter, induction and oro-tracheal intubation in rapid sequence (fentanyl 6mcg/kg, lidocaine 1-2mg/kg, propofol 2mg/kg, rocuronium 1,2mg / kg), radial artery catheterization. Maintenance of anesthesia with sevoflurane 1 MAC until hysterotomy, and 2-3 MAC thereafter, and fentanyl bolus as needed. After hysterorrhaphy, MgSO₄ 5g attack in 20 minutes, followed by infusion of 1g/h, to be maintained for 24h, interruption of sevoflurane and infusion of propofol TCI. Peridural PCA (ropivacaine 0.1% + fentanyl 0.0004%, no rhythm, 4mL bolus, 15min interval, limit in 4h of 60mL), TOF-guided sugammadex, extubation upon awakening. Restrictive volume management (up to 1000mL lactated ringer).

Discussion: Open fetal surgery carry risks (preterm labor, uterine rupture, increased fetal mortality, edema and pulmonary embolism, infection and impossibility of vaginal birth). The anesthetic technique must promote uterine relaxation, maintain good placental blood flow, minimize blood loss and initiate tocolysis. Postoperative analgesia maintained through epidural PCA helps reduce the level of circulating oxytocin. The MOMS trial showed benefit of intrauterine correction, but there was an increase in prematurity. There are other surgical indications in congenital malformations and advances in surgery and fetal anesthesia require a careful analysis of maternal-fetal risk to obtain the best results for both.

References: Ferschl, Marla, et al. "Anesthesia for in utero repair of myelomeningocele." *The Journal of the American Society of Anesthesiologists* 118.5 (2013): 1211-1223

Learning points: Anesthesia for in utero repair of myelomeningocele

04AP06-5

Tiny patient, bigger troubles!

Kalamkar Y., Mehta V., Sundara Rajan R.

University Hospitals of North Midlands, Dept of Anaesthesiology, Stoke on Trent, United Kingdom

Background: Dwarfism is defined as failure to achieve height of 148cm by adulthood [1]. Anaesthetic management of a dwarf poses significant challenge with poor bony landmarks, spinal deformity and difficult airway [2].

Case report: A 33 year old primigravid dwarf was posted for emergency C-section at 27 weeks for foetal distress. She was 137cm tall, 44 kg and had kyphoscoliosis with severe restrictive lung disease. After consent, Epidural space was identified in sitting position at L3-4 space using 16g Tuohy needle with loss of resistance to saline technique at 3.5cm and catheter was secured. Patient was placed in supine position with 30 degree left lateral tilt. 3ml of Rapid mix and 100µg of Fentanyl was administered in the epidural space. Total of 15mls of Rapid mix was administered over 25 min in increments of 3ml to achieve a bilateral sensory block to T3. Caesarean section was conducted uneventfully. At the end of surgery, 2mg of Diamorphine was administered down the epidural catheter. She fully recovered within 6hrs in HDU and no complications were noted.

Discussion: There are no standard guidelines for anaesthetic management for dwarfism. After thorough preoperative assessment, we opted for slowly titrated epidural anaesthesia after considering risk of difficult airway and post-operative complications due to impaired cardiopulmonary function.

References:

1. Tyson JE, Barnes AC, McKusick VA, Scott CI, Jones GS: Obstetric and gynecologic considerations of dwarfism. *Am J Obstet Gynecol* 1970; 108:688-703 1.
 2. Berkowitz ID, Raja SN, Bender KS, Kopits SE: Dwarfs: Pathophysiology and anaesthetic implications. *Anaesthesiology* 1990; 73:739-59
- Learning Points:** We present successful anaesthetic management of a dwarf patient for emergency caesarean section. This provides instructive significance of anaesthetic management of this rare condition. (Rapid mix- Mixture of 10ml of 0.5% Bupivacaine with 1 in 200000 adrenaline + 10ml of 2% Lignocaine + 2ml of 8.4% Sodium bicarbonate)

04AP06-6**Underestimation of gas embolism during hysteroscopic surgery? How to recognise symptoms and reduce fatalities. Presentation of three cases**Storm B.¹, Andreassen S.², Hovland A.W.³, Nielsen E.W.¹¹Nordlandssykehuset, Dept of Anaesthesiology & Intensive Care, Bodø, Norway, ²Nordlandssykehuset, Dept of Gynecol. and Obstetrics, Bodø, Norway, ³Nordlandssykehuset, Dept of Cardiology, Bodø, Norway

Background: Subclinical venous air embolism (VAE) may be present during many surgical procedures including uterine surgery. Air is by far the most frequent and most dangerous gas, due to insoluble nitrogen. VAE may cause a brief and transient drop in EtCO₂; a decrease in SpO₂; and even severe organ dysfunction and death. Vague symptoms may be overlooked. Severe symptoms mimic other conditions, e.g. severe anaphylaxis, fat or tissue embolization or acute coronary syndrome.

Case report: Over a one-month period, we experienced episodes of suspected VAE in three women undergoing hysteroscopic surgery, of whom two had cardiac arrest. All patients were in lithotomy position, had their cervix dilated before insertion of a resectoscope. One woman had a drop in EtCO₂ and SpO₂ and two also had cyanosis of upper body, shock and cardiac arrest. One patient survived with no sequelae, one did not survive resuscitation and one survived after ECMO therapy, but with severe neurological damage.

Discussion: The mechanism behind VAE is complex and multifactorial; Air can be sucked into incised or open veins above heart level due to subatmospheric pressure; Pressurised distension media with air can be absorbed in all positions. Repeated instrumentation of the cervix can act like a piston and air can be pumped into the uterine cavity. Small amounts of air are mostly asymptomatic. Larger amounts of bubbles may cause a physical obstruction of the pulmonary artery leading to right heart failure. Acute reduction of left heart preload can cause PEA. Bubbles may overwhelm the filtering capacity of the lung capillary bed, and pass through to the systemic circulation - even in patients without a persistent foramen ovale. Gas can trigger an inflammatory response, causing bronchoconstriction, pulmonary capillary leakage and systemic hemoconcentration.

Gas entering the right heart can be detected peri-operatively by continuous echocardiography or by monitoring EtCO₂ meticulously. Even minor obstructions of the blood flow to the lungs cause a reduction of EtCO₂.

Learning points: VAE is probably a common perioperative complication. EtCO₂ decrease is the first symptom. Positioning the patient with surgical field below heart level, changing surgical technique and termination of surgery if EtCO₂ occurs may reduce morbidity and mortality.

04AP06-7**The effect of preoperative anxiety with depth of anesthesia during oocyte retrieval on IVF success**Hekimoglu Sahin S.¹, Copuroglu E.¹, Yamak E.², Sut N.³, Karamanoglu B.¹, Elter K.⁴¹Trakya University Medical Faculty, Dept of Anaesthesiology & Intensive Care, Edirne, Turkey, ²Cerrahpasa Medical Faculty, Istanbul University, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ³Trakya University Medical Faculty, Statistics, Edirne, Turkey, ⁴Trakya University Medical Faculty, Obstetrics and Gynecology, Edirne, Turkey

Background and Goal of Study: Successful IVF is the goal of infertile women. This status is usually accompanied by psychological and behavioral changes and can result in preoperative anxiety in women. Preoperative anxiety can have a negative impact on the depth of anesthesia and IVF success. The aim of this study was to evaluate the effect of preoperative anxiety with depth of anesthesia on IVF success.

Materials and Methods: Thirty-one patients between 25 and 43 years of age who had oocyte retrieval were enrolled in this study. The patients were divided according to Beck Anxiety Inventory (BAI): patients without anxiety were enrolled in the low-anxious group (group L) and patients with anxiety were included in the high-anxious patient group (group H). Demographic characteristics, Duration of surgery, fertilization rate and good quality embryo (GQE) rate, and adverse effects were recorded. Total propofol and fentanyl

consumption was assessed intraoperatively and the visual analogue scale (VAS) was recorded at 0, 1, 2, and 4 h post-operatively.

Results and Discussion: The fertilization rate and GQE rate were not significant between the group L and group H ($p = 0,848$, $p = 0,349$), respectively. Total propofol consumption was significantly higher in group H than in groups L ($p = 0,006$). The HR at preoperative and postoperatively and SAP at preoperative and DAP at postoperative were significantly increased in groups H than in group L ($p = 0,002$, $p < 0,046$, $p < 0,040$, and $p < 0,025$, respectively). The time for MAS to reach 9 was significantly increased in group H than in group L ($P < 0,001$). The effect of variables that were found significant in the univariate analysis (Propofol, HR_{preop}, HR_{postop}, SBP_{preop}, DBP_{postop} and MAS reach of time 9) on BAI score. BIS scores at preoperative were similar in groups L and H.

Conclusion(s): Using BIS monitoring, we think that the increase in total amount of propofol consumed due to an increase in high anxiety will not have negative effects on fertilization and embryo quality or pregnancy rate. Therefore, in the high-anxious patient group, the increased need for intraoperative the amount of propofol can be accurately provided by BIS monitoring.

04AP06-8**Ex utero intrapartum treatment (EXIT): a challenge for anesthesiology**Tébar Cuesta M.J., Zurera Plaza N., Ruiz Escobar A., Zarzuela Nuñez E., Pérez-Cerdá Silvestre F
Hospital Universitario 12 de Octubre, Dept of Anaesthesiology, Madrid, Spain

Background: EXIT procedure may be the only possible alternative for the survival of fetuses with abnormalities compromising airway. It has been established as one of the main strategies to correct fetal airway anomalies trying to minimize maternal risks. It's a great challenge for the obstetric anesthesiologist, whose main merit lies in the need to considerate two patients: mother and baby.

Case report: Our case is about a giant cervical mass collapsing fetal airway. Diagnosis was made with 2nd term prenatal routine ultrasound in a 34-year-old mother, confirmed by MRI. EXIT procedure to secure airway was performed at 37th week of pregnancy, under general anesthesia (GA) and invasive monitoring of blood pressure and cardiac output. Rapid sequence anesthetic induction (RSI) with fentanyl, thiopental and succinylcholine. GA maintenance with sevoflurane and rocuronium. Once mother stabilization achieved, fetal head and chest exposure performing fetal orotracheal intubation by direct laryngoscopy and fetus exit from uterus. After delivery, uterine contraction with oxytocin and rectal misoprostol. Maternal postoperative pain controlled with epidural catheter.

Discussion: A correct planning and an appropriate multidisciplinary approach are the keys of success for EXIT procedure, being of huge importance an optimum anesthetic maternal management. The main anesthetic issues during surgery are: RSI to prevent pulmonary aspiration, restrictive use of fluid therapy to avoid cardiogenic pulmonary edema, maintain normocapnia as possible, use of high concentration of volatile anesthetics agents (2-3 CAM) to keep an adequate uterine relaxation allowing the exit of fetal head, preserve utero-placental flow and prevent placental abruption and uterine haemorrhage. On the other hand, maintenance of fetal well-being through amnioinfusion to guarantee a correct temperature, keep and accurate uterine size and prevent umbilical cord collapse.

References: 1. Late P, Johnson MP, Howell LJ et al. Ex-utero intrapartum treatment in the management of giant cervical teratomas. *Journal of Pediatric Surgery* (2012) 47, 1208-1216

Learning Points: EXIT procedure consists of a caesarean section in which a fetal surgery outside the uterus is performed while maintaining utero-placental flow. A proper planning and a multidisciplinary team are fundamental, being the most important an adequate anesthetic management of the mother for the global success of the procedure.

04AP06-9**Ecologic monitoring of volatile organic compounds in operation room during sevoflurane anaesthesia for oocyte retrieval**Potievskaya V.¹, Ushakov I.²¹National Medical Research Radiological Center, Research and Development Department, Moscow, Russian Federation, ²Clinical Hospital Moskvorechye, Dept of Anaesthesiology, Moscow, Russian Federation

Background and Goal of Study: Ecologic problems in anaesthesiology have not been yet properly studied. Human oocytes are especially sensitive to different contaminants, so monitoring of air quality in operation room for assisted reproduction technology procedures is important for successful in vitro fertilization (IVF) [1, 2]. The purpose of the study was to determine safety of inhalational anaesthetics by dynamic measurements of volatile organic compounds (VOC) in different areas of operating room.

Materials and Methods: Measurements of air pollution were performed using portable photoionization gas analyzer in 5 areas of operating room where oocyte retrieval was conducted during 7 working days in areas of the staff (embryologist, gynecologist, anaesthetist and anaesthesiologist) and near the patient's head. Inspiratory concentration of sevoflurane was 7 - 8%, gas flow changed from 6 l/min to 2 l/min. VOC were assessed at least 3 times during induction, support of anaesthesia and awakening periods. Statistical analysis was performed using nonparametric sign test and Wilkoxon T-criterion for 95% confidence interval.

Results and Discussion: No air pollution was determined during induction of anaesthesia in all measuring points. There was no air pollution in the areas of embryologist and gynecologist during all the periods of anaesthesia. Data from the other areas demonstrated VOC increase twice more significant in the awakening period comparing with induction of anaesthesia (VOC increased from 0.21 ± 0.05 to 0.72 ± 0.12 mg/m³ in the anaesthetist area, from 0.68 ± 0.12 to 1.50 ± 0.18 mg/m³ in the anaesthesiologist area and from 1.02 ± 0.16 to 2.61 ± 0.28 mg/m³ near the patient, $p < 0.05$). All the values were below maximal allowable VOC concentration ($16.6 \text{ mg/m}^3 = 2 \text{ ppm}$).

Conclusion(s): Air pollution during oocytes retrieval with sevoflurane anaesthesia was not significant in all areas of operating room. VOC monitoring appeared to be an effective method of prevention air pollution.

References:

1. Esteves, SC, Bento, FC., Implementation of air quality control in reproductive laboratories in full compliance with the Brazilian Cells and Germinative Tissue Directive. Reproductive BioMedicine Online (2012), <http://dx.doi.org/10.1016/j.rbmo.2012.10.0106>.
2. Zuegge KL. Ecological and economical practice for anesthesiologists. *Advances in Anesthesia* 31 (2013) 21-29.

04AP06-10**Congenital lamellar ichthyosis, severe pre-eclampsia, emergency C-section: a challenging triad for an anaesthetist!**

Shihurkar R.

Postgraduate Institute of Medical Education & Research, Dept of Anaesthesiology & Intensive Care, Chandigarh, India

Background: Lamellar Ichthyosis, a rare autosomal recessive disorder, presents with hyperkeratosis and eventually involves multiple systems due to systemic effects of medications, malnutrition and increased loss of water and calories. Most reported cases are children and experience with anesthetizing adults is insufficient. Anesthetic management in this case is complicated by interplay of considerations for an emergency caesarean section, severe pre-eclampsia and congenital lamellar ichthyosis.

Case report: A 33 yr old primigravida with severe preeclampsia and fetal distress was posted for emergency caesarean section. Diagnosed with congenital lamellar ichthyosis, osteomalacia, polymyositis, steroid induced proximal myopathy, cushingoid features and depression over the years, she had been treated with emollients, keratolytics, steroids, nutritional supplements, antimicrobials and physiotherapy.

C-section was done under spinal anesthesia with 10 mg of 0.5% Bupivacaine. Perioperative course and recovery was uneventful.



[Challenges for anaesthetist in Ichthyosis]

Discussion: Emergency section for fetal distress meant less time for detailed evaluation and workup, expedite induction and maintenance of hemodynamics and homeostasis for optimal maternal and fetal outcome.

General anesthesia in this case meant risks of aspiration, difficult airway, poly-pharmacy, fetal transfer of drugs, increased blood loss & delayed recovery. Spinal anesthesia was also challenging, with procedural difficulty due to sub-optimal positioning, osteoporosis, scoliosis, difficulty in preparing the back and palpating the interspinous space.

References: Hegde HV, Annigeri VM, Pai VV. *Paediatr Anaesth.* 2012 May;22(5):492-4.

Learning points:

1. Lamellar ichthyosis though rare may compound anesthetic management of emergency surgeries.
2. Special considerations are
 - a. Fixation of cannulae, ECG electrodes, ETT etc. is difficult
 - b. Careful transport and positioning because of joint involvement
 - c. Prevent periop hyper/hypothermia
 - d. Replacement tear drops, protective goggles for exposure keratitis
 - e. Malnutrition may cause altered pharmacokinetics/dynamics.
 - f. Procedural difficulty in regional anesthesia due to hyperkeratosis and skeletal deformity.

04AP06-11**Epidural blood patching under fluoroscopic guidance for the treatment of post dural puncture headache versus conventional method**Katary A.¹, Elsaudi E.², Ahmed O.², Elkhateeb S.²¹Queens Hospital, Dept of Anaesthesiology, Burton-upon-Trent, United Kingdom, ²Al Azhar University, Dept of Anaesthesiology & Intensive Care, Assuit, Egypt

Background and Goal of Study: Epidural analgesia is considered the gold standard for labour analgesia. However, accidental dural puncture is not uncommon and more cases of accidental dural puncture are being seen. Postdural puncture headache is a serious and bothersome complication of accidental dural puncture; being more common in females and in middle age group. Together with the large gauge of epidural needle, we are faced with a higher risk of dural puncture in labouring women and also a higher chance for the postdural puncture headache to develop. Epidural blood patch is the main stay for the treatment of postdural puncture headache when conservative treatment fails.

Materials and Methods: This study was carried as a PhD thesis in AlAzhar university on 60 women who suffered postdural puncture headache after accidental dural puncture during epidural labor analgesia, between January 2012 and December 2013. Epidural blood patch was performed after failure of conservative treatment for 24 or 48 hours depending on the severity of headache. Patients were randomly allocated into two groups; 30 patients each.

Group I: Epidural blood patch was done under fluoroscopic guidance, until covering the suspected site(s) of dural puncture plus a space above and a space below.

Group II: Epidural blood patch was done under no image guidance, administering 20 ml of blood or less if limited by back pain.

Results and Discussion: All of the following were significantly lower in the fluoroscopy group; the mean volume of the blood patch (10.6 ml vs 16 ml), headache scores at 2, 6, 12 and 24 hours, the number of rescue analgesics needed during the first 24 hours following the blood patch, the VAS of back pain after 2 hours of the blood patch and the number of attempts to reach the epidural space. Regarding the number of patients who required a second epidural blood patch, though the difference was not statistically significant, but still fewer patients in the fluoroscopy group required a second blood patch compared to the control group (5 and 9 respectively).

Conclusion(s): Performing epidural blood patch under fluoroscopic guidance increases its success rates and decreases the headache scores significantly and decreases the incidence of back pain and complications and helps determine the exact volume of blood to be injected on individual basis.

04AP07-1

Retrospective study to investigate the effect of fixed ratio management of packed red blood cell: fresh frozen plasma on blood management in postpartum hemorrhage

Weiniger C.¹, Yakirevich N.², Gural A.³, Sela H.Y.⁴, Einav S.⁵

¹Hadassah Medical Center, Hebrew University of Jerusalem, Dept of Anaesthesiology & Intensive Care, Jerusalem, Israel, ²Hadassah Medical Center, Hebrew University of Jerusalem, Medical School, Jerusalem, Israel, ³Hadassah Medical Center, Hebrew University of Jerusalem, Hematology, Jerusalem, Israel, ⁴Shaare Zedek Medical Center, Obstetrics and Gynecology, Jerusalem, Israel, ⁵Shaare Zedek Medical Center, Intensive Care, Jerusalem, Israel

Background and Goal of Study: Massive Transfusion Protocol (MTP) 1:1 ratio of packed red blood cells (PRBC) to fresh frozen plasma (FFP) improves outcome among trauma victims. Many postpartum hemorrhage (PPH) protocols recommend 1:1 ratio to improve outcome in PPH, despite lack of evidence. (1) We investigated the blood management for PPH, managed with a 1:1 ratio of PRBC:FFP versus a non-fixed ratio.

Materials and Methods: Retrospective study in two major Jerusalem medical centers with IRB approval. We identified women with PPH receiving ≥ 3 PRBC units within 24hour period from blood bank records. Our MTP, introduced in 2010, recommended 1:1 ratio of PRBC:FFP for PPH management. Demographic, obstetric, blood management data were retrieved from the electronic medical record. We compared estimated blood loss (EBL), PRBC, FFP administration and hematological variables for 1:1 ratio of PRBC:FFP versus non-fixed ratio, using descriptive statistics.

Results: We identified 273 women (2004-2014). EBL among women managed by 1:1 ratio was 2.26 ± 0.74 L versus 2.91 ± 1.93 L for non-fixed ratio, $p=0.04$. PPH managed by 1:1 ratio required median (IQR) 5 (4-6) PRBC versus 6 (4-10) PRBC units for non-fixed ratio, $p=0.013$. PPH managed with non-fixed ratio was associated with a higher likelihood receiving massive transfusion (≥ 8 PRBC units), Odds Ratio 2.88 95%CI 1.37-6.06.

Conclusion(s): PPH management using a 1:1 ratio PC:FFP strategy was associated with significantly lower EBL and PRBC requirements. The study findings support the recommendation of a 1:1 ratio of PRBC:FFP for PPH management.

References: 1. Shaylor R et al. National and International Guidelines for Patient Blood Management in Obstetrics: A Qualitative Review. *Anesth Analg*. 2016

	1:1 ratio PRBC:FFP (n=64)	Non-fixed ratio PRBC:FFP (n=209)	p-value
Estimated blood loss (ml) ¹	2260.5 \pm 742.4	2913.1 \pm 1929.8	0.04
PRBC units (number) ²	5 (4-6)	6 (4-10)	0.013
FFP units (number) ²	5 (4-6)	6 (3-9)	0.44
PLT units (number) ²	0 (0-1)	1 (0-2)	0.016
CRYO units (number) ²	10 (0-10)	10 (0-20)	0.40
Hemoglobin (g/dl) ¹			
Baseline	11.5 \pm 1.4	11.6 \pm 1.4	0.59
Nadir	7.8 \pm 1.5	7.4 \pm 1.5	0.07
Hematocrit (%) ¹			
Baseline	34.1 \pm 3.9	34.7 \pm 3.8	0.32
Nadir	23.1 \pm 4.6	21.9 \pm 4.3	0.06
Fibrinogen (mg/dl) ¹			
Baseline	498.5 \pm 134.6	481.5 \pm 154.7	0.75
Nadir	324.0 \pm 131.3	264.6 \pm 113.5	0.003

Key: ¹Mean \pm SD, ²median (IQR), PRBC = packed red blood cells; FFP = fresh frozen plasma; PLT = platelets; CRYO = cryoprecipitate

[Table. Blood loss and hematologic indices according to 1:1 ratio of packed cells: fresh frozen plasma during postpartum hemorrhage management]

04AP07-3

Successful management of major haemorrhage in 6 cases of abnormal invading placentation during 2016 in a tertiary hospital in Crete, Greece

Spartinou A., Christofaki M., Stefanakis G., Nyktari V., Tsagaraki G., Papaioannou A.

General University Hospital of Heraklion, Dept of Anaesthesiology, Heraklion, Greece

Background: Invading placentation can cause severe haemorrhage, affecting maternal morbidity and mortality¹.

Case report: We report 6 cases of invading placenta diagnosed prenatally with U/S & MRI. A multidisciplinary team was involved (obstetricians, anaesthetists, urologists, neonatalists, intensivists, blood bank). Ureteral stents were placed preoperatively in increta-percreta placentae. General anesthesia with invasive monitoring was used. Tranexamic was given post-induction. Blood bank was informed for potential massive transfusion and 4 units RBCs were brought to theatre. Hysterectomy with placenta *in situ* was pre-planned in percreta cases, whereas in increta ones hysterectomy was performed in case of severe bleeding. The uterus was preserved in accreta cases. In 2 cases urologists dealt with bladder invasion/ureter suturing. Massive transfusion protocol was activated in 5 cases (Table 1). Serial lactate measurements guided fluid and vasopressor administration. At the end coagulation tests and PLT count were normal. 4 patients were admitted to ICU for 24-48h with a further uncomplicated hospital stay.

Placenta Type	Blood loss (L)	Crystalloids (L)	Colloids (L)	RBC	FFP	PLT	Fibrinogen (g)	PCC (IU)
Percreta	4.5	4	-	6	3	1	3	-
Percreta	5	3	-	7	3	1	3	1000
Increta	7	5.5	0.75	10	6	1	4	1000
Increta	5.5	3	1.5	7	5	1	4	-
Accreta	1.2	1.5	0.5	3	-	-	3	-
Accreta	3	3.5	-	6	5	-	2	-

[Table 1]

Discussion: The increasing incidence of invading placentae is due to rising maternal age, multiple gestations, caesarean sections and uterine scars¹. Multidisciplinary plan and interventional radiology have reduced haemorrhage¹. Our hospital receives all cases of invading placentae from South Greece despite lack of interventional radiology support. We targeted fibrinogen level >200 mg/dl, as lower level is regarded as predictor of peripartum haemorrhage². Prompt use of PCCs had key role in major bleeding. We demonstrated that good maternal outcome is possible despite limited resources.

References:

1. Center of excellence for placenta accreta, Silver RM et al. *Am J Obstet Gynecol*. 2015 May;212(5):561-8

2. Transfusion and coagulation management in major obstetric haemorrhage. Butwick AJ et al. *Curr Opin Anaesthesiol*. 2015 Jun;28(3):275-84

Learning points: Invading placentae can lead to catastrophic haemorrhage. Prenatal diagnosis, multidisciplinary approach and prompt use of massive transfusion protocol can be life-saving.

04AP07-4

Prophylaxis in pregnant women with factor VII deficiency

Fernandes M.¹, Mota S.¹, Martires E.²

¹Centro Hospital e Universitario de Coimbra, Dept of Anaesthesiology, Coimbra, Portugal, ²Centro Hospitalar e Universitário Braga, Dept of Anaesthesiology, Coimbra, Portugal

Background: Factor VII deficiency (FVII) is a rare congenital hemorrhagic disease in which the value of FVII activity and the tendency for bleeding is not completely correlated. (1) Thus, it is difficult to predict which pregnant women may need prophylactic replacement of FVII.

Treatment with recombinant factor VIIa (rFVIIa) increases thrombotic risk and in the literature it is unclear whether prophylaxis is required.

Case report: We report the case of a 37 year old woman with factor VII deficiency (heterozygous - level 34%), with no history of bleeding or thrombosis.

Regarding the obstetric history is a first gestation, which went smoothly. She has no other relevant personal history or usual medication, however, she has a family history (mother) of fVII deficit. She was submitted to an appendectomy under general anesthesia, without complications, and to the exeresis of a sublingual cyst under general anesthesia complicated by intraoperative hemorrhage, however without administration of fVII or fresh frozen plasma (PFC). A multidisciplinary approach was taken and delivery was scheduled for the 39 weeks.

Periodic dosages of factor VII were performed during pregnancy, with no significant variation in factor levels.

He started induction of labor with misoprostol at 39s, with favorable evolution, had a eutychogenic delivery 10h after, without any interurrence. Because of the fVII deficit, analgesia with remifentanyl was performed as an alternative to epidural analgesia. By decision of Immunohemotherapy, the prophylaxis was done with recombinant fVII and with enoxaparin to reduce hemorrhagic and thrombotic risk, respectively. The puerpera was discharged 5 days later without complications.

Discussion: Prophylaxis with fVII was used, however, according to the literature, hemorrhage rates were equivalent among pregnant women with and without prophylaxis. In addition, fVII values were equivalent in pregnant women with and without postpartum haemorrhage. The lack of correlation between the value of fVII and the tendency for hemorrhage provides a greater challenge in determining the risk of bleeding in the pregnant woman.

References: Haemophilia. 2013 November; 19(6): doi:10.1111/hae.1267.

Learning Points: In the case of a clinical condition with an increased thrombotic risk, it is considered that prophylaxis should not be considered mandatory in all pregnant women with factor VII deficiency, but should be assessed on a case-by-case basis.

04AP07-5

Combined spinal-epidural and general anaesthesia for cesarean section in pregnant patients with placental anomalies - two case reports

Ferraz S., Carvalho B., Barbosa T., Ferreira A., Faria A.
Centro Hospitalar de São João, EPE, Dept of Anaesthesiology & Pain Medicine, Porto, Portugal

Background: Placenta previa (PP) is used to describe the insertion of the placenta in the lower segment of the uterus. Placenta accreta (PA) is defined as an abnormal attachment of the placenta to the myometrium. These conditions can be associated with massive blood loss at delivery and with high maternal mortality. Prenatal diagnosis of these anomalies allow a reduction of maternal morbidity and mortality, as it makes possible to perform the pregnancy guidance and supervision in a hospital with special care and a multidisciplinary team approach.

Case report: We describe two cases of pregnant women, 35 and 40 years old, ASA II, that were admitted for elective c-sections due to placental abnormalities.

A multidisciplinary group of obstetrics, urologists, interventional radiologist, anaesthesiologists and immunohemotherapists planned the anaesthetic and surgical management.

Combined anaesthesia was used: a subarachnoid blockade, with levobupivacaine 10mg and sufentanil 0,002mg, was performed by a sequential technique, level L3-L4, in order to set, bilaterally, a double J urethral catheter and a balloon catheter in the common iliac arteries, via femoral approach. After that, a general anaesthesia was performed to proceed with the cesarean: induction with propofol 2mg/kg, fentanyl 2ug/kg and a muscular relaxant, and maintenance with a mixture of O₂/N₂O and sevoflurane, MAC 1.0. Standard monitoring was used and an arterial line and central venous catheter were placed.

The balloon catheter was only inflated in one patient, in order to minimize an active blood loss during the surgery.

Discussion: In these cases, we perform combined neuroaxial anaesthesia to enable the setting of double J catheter and the iliac artery balloon catheter, followed by general anaesthesia. The subarachnoid blockage allowed protecting the fetus from the deleterious effects of prolonged general anaesthesia. Induction of general anaesthesia was motivated by the predictable complexity of the surgical intervention and the possibility of severe blood loss with hemodynamic instability. The epidural catheter was used to administer post-operative analgesia.

References: Moreira,A; Sampaio,C; Faria,A. Anestesia combinada para cesariana em grávida com placenta percreta. Rev Soc Port Anestesiol,Vol. 23-nº1,2014.

Learning points: The outcomes of our cases have led us to consider sharing our experience and highlight the success behind a conservative approach planned by a multidisciplinary team.

04AP07-6

Influence of propofol and dexmedetomidine on oxytocin-induced contractions of isolated pregnant rat myometrium

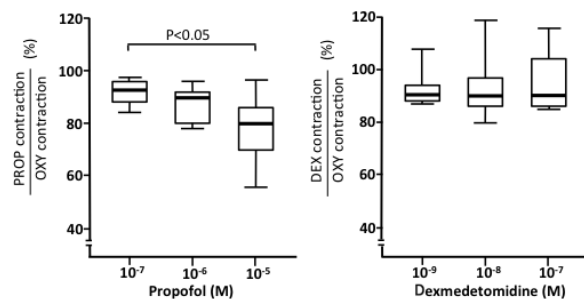
Kimizuka M., Tokinaga Y., Hayashi S., Azumaguchi R., Yamakage M.

Sapporo Medical University, Dept of Anaesthesiology, Hokkaido, Japan

Background: Propofol is used after extraction of the fetus in pregnant women who have received combined spinal-epidural anesthesia for caesarean section. In previous studies, it was shown that propofol has an inhibitory effect on uterine contraction like volatile anesthesia^{1,2}. On the other hand, it has been shown that dexmedetomidine is an α 2-adrenergic agonist that induced uterine contraction via a pathway involving G protein³. However, there are no data on a comparison of the effects of propofol and dexmedetomidine on oxytocin-induced contractions of the isolated pregnant rat myometrium. The aim of this study was to determine the effects of propofol and dexmedetomidine on oxytocin-induced contractions of the isolated pregnant rat myometrium.

Methods: With institutional approval, 6-mm-long uterine rings were sliced from the uterine horns of late-term pregnant Wistar rats and mounted in a temperature-controlled organ bath containing 10 ml Krebs solution. After administration of oxytocin (20 nM), contraction and frequency changes in response to propofol (10⁻⁷-10⁻⁵M) or dexmedetomidine (10⁻⁹-10⁻⁷M) were evaluated. Statistical analysis was performed using the Kruskal-Wallis' H-test followed by the Newman-Keuls-type test for multiple comparisons. P values <0.05 were considered statistically significant.

Results: Propofol inhibited oxytocin-induced contraction of the pregnant rat myometrium in a dose-dependent manner, but dexmedetomidine did not inhibit oxytocin-induced contraction of the pregnant rat myometrium (figure).



[Figure. Effects of anesthetics on oxytocin-induced contraction of pregnant rat myometrium. (n=8)]

PROP contraction: propofol-induced contraction, DEX contraction: dexmedetomidine-induced contraction, OXY contraction: 20nM oxytocin-induced contraction

The effects of both propofol and dexmedetomidine on frequency did not change significantly.

Conclusions: Dexmedetomidine did not inhibit oxytocin-induced contraction of the pregnant rat myometrium. Dexmedetomidine may be preferable for maintaining uterine contraction in caesarean section.

References:

- Anesthesiology 2001;95:1245-55
- Acta Anaesthesiol Scand 2005;49:1355-1359
- European Journal of pharmacology 2000;390:185-195

04AP07-7**Emergency obstetric drug administration survey on uterotonics**

Aaytee H.¹, Lal N.², Windsor J.³

¹Sheffield Teaching Hospital, Dept of Anaesthesiology & Intensive Care, Sheffield, United Kingdom, ²University of Warwick, Medical School, Coventry, United Kingdom, ³Chesterfield Royal Hospital, Dept of Anaesthesiology & Intensive Care, Chesterfield, United Kingdom

Background and Goal of Study: Postpartum Haemorrhage (PPH) is the leading cause of 25% of all maternal deaths globally¹. Administration of uterotonic drugs at delivery reduces the risk of PPH by 60%². Obstetric anaesthetists are a crucial part of the team to manage anaesthetic and medical complications, supporting the obstetrician. Although, uterotonics are the key feature of conservative treatment³, a significant variation in practice exist. This survey establishes such variations in practice across the Yorkshire region.

Materials and Methods: An electronic survey that included all grades of anaesthetists exploring the choice of dose and route of administration of uterotonics during caesarean section was conducted. Results obtained were compared to the standard Green TOP² guidelines from the Royal college of Obstetrician and Gynaecology (RCOG) UK and WHO.

Results and Discussion: A total of 80 responses for the survey on the administration of uterotonics were received. Fifty-four percent of responses were compliant with recommended guidelines. However, a significant proportion (46 %) were non-complaint. Compared, with the other uterotonics in this study, route of administration for oxytocin alone received 100 % compliance. This survey demonstrated a distinct and marked contrast in the responses received for the drugs used in treating uterine atony. These variations signpost that discrepancies underline the lack of knowledge and inadequate communication within the specialty in the region surveyed.

Given the unpredictable and increasing risks in the incidence of PPH, it is vital to ensure that the protocols and anaesthetic practice reflect national and WHO recommendations for treatment and prevention of PPH¹.

Conclusion(s):

- Education and update of information in a consistent manner across the trust
- Written and pictorial guidelines facilitating easy access uterotonics information
- Training session on PPH drills
- Frequent review and re-evaluation of compliance to national guidelines

These simple steps will aid in decreasing the inconsistent responses that may well reflect the discrepancies in the clinical practice and contribute towards a positive outcome for mother and the baby.

References:

1. WHO recommendations for the prevention and treatment of PPH 2012
2. RCOG Green-top Prevention and Management of PPH 2011
3. Prendiville WJP, Active vs expectant management in the third stage of labour

Cochrane Database 2000

Acknowledgements: All participants

04AP07-8**Laparotomic myomectomy in the 18th week of pregnancy: a case report**

Buriticá Aguirre A.M.¹, Mata Francisco N.C.¹, Borja Andrés H.², Nieto Martín L.¹, Vargas Fajardo M.D.C.¹, Rubio Babiano M.D.P.¹

¹Complejo Asistencial Universitario de Salamanca, Dept of Anaesthesiology & Pain Medicine, Salamanca, Spain, ²Atención Primaria Valladolid, Department of Primary Care, Valladolid, Spain

Background: The estimate prevalence of uterine myomas during pregnancy varies from 0.2 to 15 %. Most remain asymptomatic but may result in obstetrical complications in 10 % of cases [1].

Case report: A 36 year-old primigravid in the 18th weeks of pregnancy reported abdominal pain, vaginal bleeding and bilateral lower limb edema. Abdominal ultrasound confirms a viable fetus and diagnosis a giant haemorrhagic myoma (24 x 20 x 13 cm) and extrinsic compression of inferior venous cave. Considering the increase in symptoms a laparotomic myomectomy was planned.

The patient received standard monitoring with invasive blood pressure, venous cannulation and was premedicated (Metoclopramide 10 mg, Ranitidine 10 mg and Fentanyl 50 mcg). An epidural catheter is placed at level L3-L4 (Ropivacaine 0.2 % 10 ml and fentanyl 50 mcg). Rapid sequence induction intubation was conducted (Fentanyl 100 mcg, Propofol 100 mg, Rocuronium 60 mg) and anesthetic maintenance was carry out with Sevoflurane MAC 1 and SEDline® (Physiometric SEDline Monitor). Total bleeding was 2000 ml and the infusion volume were 1500 ml Ringer's Lactate®, 500 ml Voluvyte® 6% and transfusion of 3 packed red blood cells and 1 unit of fresh frozen plasma. The hemodynamic stability was maintained (hemoglobin level 10, 5g/dl, biochemistry and coagulation test were normal). At the end of operation the patient was extubated. The postoperative period was uneventful. The patient was schedule for elective cesarean section in the 36th weeks gestation.

Discussion: Beyond the cases of acute abdomen, other indications for myomectomy in pregnancy are recurrent pain, rapid growth, large myoma located in the lower segment, deforming of the placentation site or compression phenomena with intestinal obstruction [2].

References:

1. Domenici L, et al;. Laparotomic Myomectomy in the 16th Week of Pregnancy: A Case Report. Case Rep Obstet Gynecol. 2014;2014:154347.
2. Campbell JE, et al; Successful pregnancy following myomectomy for uterine smoothmuscle tumor of uncertain malignant potential: A case report and review of the literatura. Gynecologic Oncology Reports 15 (2016) 1-3

Learning points: Myomectomy during pregnancy is extremely rare, management is conservative and surgical removal should be avoided. Anesthetic approach should be individualized to optimize uteroplacental perfusion and fetal oxygenation.

04AP07-10**Comparison of two diagnostic scores of disseminated intravascular coagulation in pregnant women admitted to the ICU**

Marie J.¹, Bouthors-Ducloy A.-S.², Fourrier F.²

¹CH Lens, Dept of Anaesthesiology & Intensive Care, Lens, France,

²Academic Hospital, Dept of Anaesthesiology & Intensive Care, Lille, France

Background and Goal of Study: To compare the validity of two previously published diagnostic scores (1,2) of disseminated intravascular coagulation (DIC) in pregnant women admitted to ICU for an acute complication.

Materials and Methods: Five years population based retrospective study; 154 patients admitted to ICU for severe delivery and postpartum complications. A recently published adapted score (platelet count, prothrombin time and fibrinogen) was compared to the International Society for Thrombosis and Hemostasis (ISTH) unadapted score (platelet count, fibrinogen, prothrombin time, and fibrin related marker). Both scores were calculated at delivery, ICU admission, day 1 and 2 postpartum. The validity of both scores was compared to the consensual and blinded analysis of two experts. The sensitivity (Se), specificity (Sp), and area under the curve (AUC) of each score were evaluated for DIC diagnosis at each time-points in a generalized mixed model. The agreement between the two scores was evaluated by the Kappa coefficient.

Results and Discussion: DIC was diagnosed by the new score (Se:0.78; Sp:0.97; AUC:96%) and ISTH score (Se:0.31; Sp:0.99; AUC:94 %). The Kappa correlation between both scores was 0.35. The lower ISTH score Se was mainly explained by unadapted pregnancy-related fibrinogen and fibrin-markers thresholds.

Conclusion(s): The new DIC score seem highly discriminant in the subset of patients admitted to the ICU after delivery for an acute specific complication. The ISTH score is not recommended in pregnant women because of its poor sensitivity.

References:

1. Toh CH, Hoots W (2007) SSC on Disseminated Intravascular Coagulation of the ISTH. The scoring system of the Scientific and Standardisation Committee on Disseminated Intravascular Coagulation of the International Society on Thrombosis and Haemostasis: a 5-year overview. J Thromb Haemost 5:604-6.
2. Erez O, Novack L, Beer-Weisel R, Dukler D, Press F, Zlotnik A, et al (2014) DIC Score in Pregnant Women - A Population Based Modification of the International Society on Thrombosis and Hemostasis Score. PLoS ONE. 9:e93240.

04AP08-1**The effect of right versus left lateral-tilt position on compression of the inferior vena cava in parturients**

Fujita N.¹, Higuchi H.², Sakuma S.², Zhang K.³, Takagi S.², Ozaki M.²
¹St.Luke's International Hospital, Dept of Anaesthesiology & Intensive Care, Tokyo, Japan, ²Tokyo Women's Medical University, Dept of Anaesthesiology, Tokyo, Japan, ³Cleveland Clinic, Dept of Anaesthesiology, Ohio, United States

Background and Goal of Study: The left lateral-tilt position has become an established practice of obstetric anesthesia since the 1970s, especially after the study by Crawford et al.,¹ who reported the significant improvement in the fetal acid-base status when a cushion was placed under the hip of mother to tilt the pelvis to the right or to the left under general anesthesia. We currently reported that of a 30° left-lateral tilt, but now a 15° tilt, partially relieves compression of the inferior vena cava (IVC) in parturients at term without anesthesia.² The effect of right lateral-tilt position on the IVC compression, however, is unknown. Here, we used magnetic resonance (MR) imaging to examine the effect of the right lateral-tilt position on the IVC compression.

Materials and Methods: MR images of 9 singleton parturients (37 weeks gestation) were obtained for observation of the IVC and aorta in both the supine, left lateral-tilt positions (15°, 30°) and right lateral-tilt positions (15°, 30°) with head to toe placement of a 1.8-m long hard V-block constructed of closed-cell polyethylene foam under the right side of the parturient's body.

Results: Aortic volume did not change in any of positions. MR images revealed total compression of the IVC when parturients were in the supine positions. The IVC volume in the lateral-tilt position was not increased at 15°, whereas the corresponding values at 30° were significantly increased compared with the supine position ($p < 0.05$). In contrast, the IVC volume in the right lateral-tilt position did not increase at both 15° and 30°.

Discussion: The present study indicates that the left and right lateral-tilt position at 15° did not reduce compression of the IVC, consistent with our previous report.² These findings also indicate that the left lateral-tilt position at 30°, but not right lateral-tilt position at 30°, was effectively reducing compression of the IVC.

Conclusion(s): In parturients, the abdominal aorta is not compressed by pregnant uterus in any positions. Only left lateral-tilt position at 30° effectively reduces compression of the IVC.

References: 1:Crawford et al. BJA 1972;44:474-84 2:Higuchi et al. Anesthesiology 2015;122:286-93

04AP08-2**Persistent low back pain in a pregnant woman after epidural anesthesia for cesarean section: an unsuspected MRI findings and diagnosis**

Farina L.M.¹, Filetici N.², Dionisi P.¹, Piscicelli C.³, Diamanti P.¹
¹Cristo Re Hospital, Dept of Anaesthesiology & Intensive Care, Rome, Italy, ²Policlinico Gemelli, Dept of Anaesthesiology & Intensive Care, Rome, Italy, ³Cristo Re Hospital, Obstetrician and Gynecology, Rome, Italy

Background: The current case report presents a 32-year-old patient who presented with low back pain (LBP) that began in the last trimester of the pregnancy and worsened the day after c-section and unsuspectedly diagnosed with lumbosacral metastasis from occult follicular thyroid cancer.

Case report: A 32 year old gravida 2, para 1, was admitted to Cristo Re hospital to undergo C-section. The day scheduled for the C-section she arrived in the operating room on a wheelchair because of LBP: an epidural anesthesia at L2-L3 intervertebral space was performed by the anesthesiologist with the patient in the sitting position. After the dose LBP disappeared and she had an uneventful c-section. The day after, the LBP came back stronger (VAS 9) than before the c-section and the patient presented detectable weakness of hip flexion. Lumbosacral MRI showed a 7 x 7 x 5 cm mass invading the posterior regions of L3 and L4 with paravertebral soft tissue invasion and dural sac compression (Fig.1) the mass presented also "dural tail" and L3 roots compression. Immediately after the CT scan the patient underwent a neurosurgical operation to decompress the dural sac: during the surgery the patient lost a lot of blood and radiological embolization of III and IV lumbar arteries was done to stop the bleeding. Definitive histological examination

revealed a follicular thyroid cancer lumbosacral metastasis and therefore a total body CT scan was done: a 2,1 cm node in the left thyroid lobe was found. A total thyroidectomy was done and finally she was moved to oncology ward where she began the therapy.



[Fig.1]

Discussion: Only few cases described in the literature report LBP as first sign of an occult thyroid cancer but none of the cases concern a pregnant woman who has to undergo to elective c-section with epidural anesthesia. The obstetric anesthetist was lucky because the epidural catheter was inserted in the intervertebral space above the highly vascularized mass and no epidural bleeding, that could be catastrophic, was done.

References: Leyla K., Recep S., Ihsan Y., Hayri O., Mecit K. Unusual metastasis of papillary thyroid carcinoma: lumbar vertebrae. The Spine Journal 15 (2015) 1697-1698.

04AP08-3**Cerebrospinal fluid fistula after combined spinal-epidural labor analgesia (CSE) - a very rare case report**

Perry da Câmara L.¹, Spencer L.¹, Perry da Câmara C.², Marques R.², Pissarra F.¹, Fragata I.¹

¹Centro Hospitalar de Lisboa Central, Dept of Anaesthesiology, Lisbon, Portugal, ²Centro Hospitalar de Lisboa Central, Dept of Neuroradiology, Lisbon, Portugal

Background: Cerebrospinal fluid (CSF) leak may occur after CSE labour analgesia, and can be a cause of Post Dural Puncture Headache (PDPH). If headache persists after treatment measures, continual leakage of CSF should be considered. Although rare, this leakage may lead to a fistulous tract - a cerebrospinal fistula¹.

Case report: 22 year-old woman, with no underlying diseases and an uneventful pregnancy underwent CSE labor analgesia. Three punctures were necessary for a successful technique, but no accidental dural puncture was reported. 24 hours after labour, the patient complained of nausea and headache that worsened after standing position. Conservative treatment was initiated: paracetamol, caffeine, hydration and bed rest. After 72 hours with no improvement, a successful blood patch was performed and she was discharged. The patient returned to the hospital 2 days later, with the same symptoms. She was again given conservative therapy and 2 more blood patches with no success. Her spine CT-scan and MRI were normal. A myelography computerized tomography was performed, showing a CSF fistula in the CSE puncture site. Neurosurgery was contacted and it was decided to attempt a fluoroscopic guided blood patch, before any surgical approach. The blood patch was successful and the patient was asymptomatic at the time of discharge.

Discussion: Although most cases of CSF leakage are iatrogenic², it is very rare to encounter CSF fistulas as a complication of CSE puncture. During CSE, no accidental dural puncture was reported, but 3 punctures were necessary, indicating a higher risk of lesion. Orthostatic headaches are the main symptom of CSF fistulas². Initially fistulas can be hard to detect on spinal CT or MRI. Myelography-CT was essential to the diagnosis³. Treatment is at first conservative. If symptoms persist, targeted blood patch is a safe technique and was more effective than blindly placed blood patch in this case.²

References:

1. Couture D, Branch CL., Jr Spinal pseudomeningoceles and cerebrospinal fluid fistulas. *Neurosurg Focus*. 2003;15(6):E6.
2. Gottschalk A. Cerebrospinal fluid leakage. Indications, technique and results of treatment with a blood patch. *Radiologie*. 2015;55(6):471-478
3. Schievink Wl. Spontaneous spinal cerebrospinal fluid leaks: a review. *Neurosurg Focus*, 2000Jul15;9(1):e8.

Learning Points: Although CSE labour analgesia is often performed with no associated complications, the anaesthesiology must be able to recognize and manage iatrogenic lesions.

04AP08-4

Ultrasound epidural catheter in obese pregnant patients.

Evaluation of the ultrasound-assisted epidural catheter placement technique by “rookie users”

Sacchetti C., Migliavacca G., Esposito I., Trombi G., Fanelli G., Compagnone C.

Università degli Studi di Parma, Dept of Anaesthesiology & Intensive Care, Parma, Italy

Background: Epidural technique in obstetric setting is widely studied and safe(1). However it has potential complications, like dural puncture (1-5%) and failure of epidural itself (1.5-20%). In 2008 the National Institutes for Health and Clinical Excellence suggested the use of ultrasound to facilitate the placement of the epidural catheter(2). The ultrasound-assisted placement can be particularly useful in technically difficult cases, as in obese pregnant. For these reasons we decided to use ultrasound to assist the placement of epidural catheter in obese candidates for cesarean section before entering the operating room with greater comfort for the patient and an optimization of time management. All the operators had only a few hours training in epidural US technique.

Case report: We enrolled 4 patients from October to November 2016. The mean BMI was 48 ± 6.08 . We used ultrasound to identify the intervertebral space and the optimal insert point and needle inclination. In all these cases the procedure has been successful on the first attempt without the need for needle redirection and it was found an exact match between the depth of the dura madre detected by ultrasound and the real one. Sensory and motor block were adequate too.

Discussion: US assisted epidural placement was easy and reduces procedure difficulty. As shown in literature, the advantages are multiple and include precise identification of the intervertebral space and of the most appropriate needle inclination, depth of dura madre measurement, improvement of the success rate (1,3). These advantages are even more evident in obese pregnant patients.

References:

1. Loubert C, et al. *Anaesthesia* 2011, 66:191-212
2. National Institute of Health and Clinical Excellence. Ultrasound-guided catheterisation of the epidural space: understanding NICE guidance. IP Guidance Number IPG249. London, UK: National Health Service, national Institute for Health and Clinical Excellence; 2008
3. Valjejo MC, et al. *Int J Obstet Anesth* 2010; 19:373-378

Learning Points: In our experience, even in rookie users, the ultrasound-assisted epidural catheter placement in obese pregnant patients is a quite simple and useful technique, which allows a better anaesthesia management reducing both number of attempts and complications. Furthermore it improves patients comfort and satisfaction and it permits a better time management.

04AP08-5

Spontaneous spinal epidural hematoma after labour with epidural anaesthesia: a case report

Miguel Ruano G., Kollmann Camaiera A., Alsina E., Gilsanz F
La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Spinal epidural hematomas are extremely rare, 0,1%/100,000 counting spontaneous and those associated with anaesthetic procedures¹. During pregnancy the pressure in the abdomen and venous plexus, making them more susceptible to rupture and bleeding².

Case report: We report a 39 y.o. full term secundipara woman with medical history of hypothyroidism and chronic neck pain. She received a L3-L4 lumbar epidural without incidents for labour according to our department protocol and 11h later went to c-section for cephalopelvic disproportion, with mild bleeding requiring oxytocin 10UI and methylergometrine 100mcg, being discharged from PACU 6h after surgery. 27 hours after the initial sitting of the epidural the patient developed acute intense posterior neck pain followed respiratory distress and progressive tetraparesis.

The patient was transferred to the ICU and intubated due to respiratory arrest. Brain CT-scan was normal and the patient was awakened, her consciousness was intact but she had left sided hemiparesis.

Brain and cervical MRI showed an anterior epidural hematoma in C5-C6 and decompression surgery was performed immediately. After the surgery the patient was transferred to the neurology unit for recovery and discharged home with a mild 4/5 left sided hemiparesis which still remains to date and chronic neck pain requiring amitriptyline, escitalopram and NSAIDs.

Discussion: Spontaneous spinal epidural hematomas are extremely rare and there are only a handful of cases associated with pregnancy³. After reviewing the literature, we couldn't find any relationship to the initially sited epidural catheter, and the most probable cause was an arteriovenous malformation presenting with typical symptoms corresponding to the level of the hematoma in the spinal column. A fast diagnosis and management allowed the patient to recover fast and have minimal neurological damage.

References:

1. Hirota I et al, A Case Report with a Literature Review of 50 Cases. *Intern Med* 2014;53: 57-62.
2. Bose S et al, Spontaneous spinal epidural hematoma. *BJA* 2007; 99:855-7
3. Puah KL et al. Spontaneous cervical spine epidural hematoma in the postpartum period. *Spine* 2012;37:408-10

Learning points: Not all haematomas are related to anaesthetic techniques, even if the two events occur within a short time frame. Pregnancy is a characteristic physiological state predisposing so a wide range of pathologies and anaesthesiologist must be trained to promptly identify and manage them.

04AP08-6

My pregnant patient proposed for a C-section has a history of intracranial arteriovenous malformation... what now?

Alves D.R., Ribeiro P

Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal

Background: Cranial arteriovenous malformations (AVM) are vascular anomalies that result in shunting between small arteries and veins in cerebral or cerebellar circulation and can present clinically either as intracranial haemorrhage, focal neurologic deficits or seizures. The risk of re-rupture throughout pregnancy is estimated at 3,5%, but it should be emphasized that intrapartum intracranial haemorrhage is responsible for 5-12% of obstetric mortality overall.

Case report: 30-year-old, ASA 3 female patient admitted at 39 weeks + 4 days into her pregnancy for an elective caesarean section. She had a history of occipital AVM, discovered 7 years before during the medical workup of headache and partially treated (3 embolization attempts, last one 5 years ago, leading to a decrease in AVM dimensions). She maintained regular follow-up as an outpatient.

A spinal block was performed at the L3-L4 interspace (27G pencil-point needle), allowing for continued neurologic monitoring in the intraoperative period. The patient remained hemodynamically stable, with no neurologic changes and had an uneventful postoperative period allowing discharge home on the 4th postoperative day.

Discussion: In these patients one should correctly characterise the lesions, institute close neurologic monitoring and avoid marked changes in blood pressure or Valsalva manoeuvres. The emergence of general anaesthesia can be associated with hypertension, reacting to the presence of the endotracheal tube and nausea/vomiting. On the other hand, approaches to the neuroaxis may also lead to important haemodynamic changes and risks related to dural puncture, though allowing continued neurologic monitoring of the awake patient. Some authors uphold the use of epidural blocks to allow for a more progressive block installation, but the risk of dural puncture with an 18G epidural needle and subsequent loss of CSF with potential changes in ICP has been described in the literature, leading us to elect a spinal block. ICU vacancy was secured, but not used.

Learning points: Neurosurgical team consultation and timely preparation of both obstetricians and anaesthesiologists are of paramount importance in the management of these patients. Although the anaesthesiologist should choose a technique with which he/she is comfortable, special attention should be paid to avoiding haemodynamic instability and Valsalva manoeuvres, as well as ensuring adequate neurologic monitoring throughout the perioperative period.

04AP08-7

Intrapartum fever for primiparous parturients: causing factors and effect on neonate

Linđžiūtė U.¹, Saulėnas T.¹, Baliulienė V.², Rimaitis K.², Macas A.²
¹Lithuanian University of Health Sciences, Lithuanian University of Health Sciences, Kaunas, Lithuania, ²Lithuanian University of Health Sciences, Dept of Anaesthesiology, Kaunas, Lithuania

Background and Goal of Study: Fever during labour and delivery occurs in 1.6-14.6% of deliveries. Maternal fever is associated with higher risk of adverse neonatal and maternal outcomes. The controversy exists about the factors that could affect the rise of temperature during labour. The aim of this study was to determine factors causing intrapartum fever for primiparas and to find out the effect on neonate.

Materials and Methods: The study was carried out at the Department of Obstetrics of a teaching hospital in 2015. Medical records of 543 women were retrospectively reviewed. Primiparas at gestational age ≥ 37 weeks, giving vaginal birth with singleton cephalic presentation and normal weight fetus were included. Local Ethics Committee approval was obtained.

Data were analysed with the SPSS 23.0. Spearman Rank Correlation, Mann-Whitney U test, χ^2 and Logistic Regression were used. $P < 0.05$ was considered statistically significant.

Results and Discussion: Among 543 primiparas average age was 28.38 ± 5.89 years, weight gain during pregnancy 15.14 ± 6.40 kg, 49.72% gained < 15 kg, 50.28% ≥ 15 kg, BMI 22.71 ± 5.02 , labour period 647 ± 201 min, anhydrous period 465 ± 329 min. Epidural analgesia was selected in 32.78% cases. Intermittent epidural bolus were used in 7.93%, bolus and continuous epidural infusion 82.38%, patient controlled analgesia 9.69% cases. Average duration of epidural was 413 ± 220 min. The rate of intrapartum fever ($\geq 37^\circ\text{C}$) - 32.6%, hyperthermia ($\geq 38^\circ\text{C}$) - 3.3%. Apgar score ≤ 7 at 1min was given to 7.73%, at 5min to 2.95% of neonate.

There was statistically significant relation between rise of temperature and longer labour period ($r = 0.427$, $p < 0.001$), rise of temperature and anhydrous period ($r = 0.273$, $p < 0.001$).

Elevation of body temperature was not significantly associated with weight gain ≥ 15 kg during pregnancy (OR 0.980 (95% CI 0.722-1.330), $p = 0.896$), the choice of epidural analgesia during labour ($p = 0.642$), the duration of epidural ($r = 0.1$, $p = 0.182$), the mode of prescription of epidural ($p = 0.417$). Elevation of body temperature above 38°C was significantly associated with Apgar ≤ 7 at 1min ($p < 0.05$) Apgar ≤ 7 at 5min ($p < 0.05$).

Conclusion(s): The intrapartum fever is affected by longer duration of labour and anhydrous period, but it is not associated with weight gain during pregnancy, epidural analgesia, the mode of epidural analgesia infusion, the duration of epidural analgesia. Intrapartum hyperthermia negatively affects neonatal condition.

04AP08-8

Benefits of balanced crystalloid in peripartum period

Sedinkin V., Klygunenko O., Volkov O.
State Establishment 'Dnipropetrovsk Medical Academy of Health Ministry of Ukraine', Dept of Anaesthesiology & Intensive Care, Dnipropetrovsk, Ukraine

Background and Goal of Study: The Aim to determine the effect of normal pregnancy on the water sectors of body and their changes after crystalloids infusion during uncomplicated peripartum period.

Materials and Methods: Having agreed with the local Ethics Committee and obtained the informed consents, 115 women were examined. The women were randomized into 3 groups: N ($n = 50$) - nonpregnant healthy women (control), A and B groups depend on the infusion agent administered during delivery (for uterotonics due to obstetric indications): A ($n = 30$) 0.9% saline 500 mL, B ($n = 35$) Sterofundin ISO 500 mL. Both groups were similar in relation to age, height, gestation term, blood loss volume (350.19 ± 85 mL); absence of severe extragenital pathology, absence of preeclampsia, singleton pregnancy, vaginal delivery. Changes of water spaces and sectors of the body were performed by noninvasive integral impedance method ("Diamant-M"). We determined the Total Fluid Volume in the body (TFV), Intracellular fluid volume (INFV), Interstitial fluid Volume (ISV) and intraVascular Fluid Volume (VfV): Plasma Volume (PV), Volume of Erythrocytes (VE). Time points: before delivery, on day 1 and 3 postpartum.

Results and Discussion: All fluid volumes in the body are increased by the time of labor in normal pregnancy.

Indicators	Nonpregnant	Pregnant	L	% to nonpregnant
TFV	36.8 ± 0.4	42.9 ± 0.7	8.8 ± 0.3	16.6
INFV	24.4 ± 0.2	27.5 ± 0.4	3.1 ± 0.4	12.7
ISV	8.8 ± 0.1	10.4 ± 0.1	1.6 ± 0.1	18.2
VfV	3.6 ± 0.1	4.7 ± 0.2	1.1 ± 0.2	30.1

[Table]

INFV in both groups did not change reliable on day 1 postpartum regardless type of infusion agent. ISV did not change vs prenatal level in A group. In B group ISV decreased by 12.6% ($p < 0.01$) vs antenatal. There were downward trend of VE in both groups due to intrapartum hemorrhage. At the same time PV did not differ significantly from the prenatal level. On the day 3 after delivery, VfV and INFV in A group was similar to antenatal, that is retained cell and interstitial edema. INFV in B group decreased by 1.2 L (1/3 of antenatal level), and ISV decreased by 1.39 L (18.5%) approaching volume of non-pregnant women. VfV on day 3 after delivery returned to the level of non-pregnant women, regardless type of infusion agent.

Conclusion(s): Infusion of balanced crystalloids eliminates hyperhydration was formed in normal pregnancy, due to normalization of interstitial and intracellular fluid volume by day 3 postpartum.

04AP08-9

Epidural catheter breakage

Fernandes M., Pereira E., Ferreira Silva L.I., Silva E.
Centro Hospitalar e Universitário de Coimbra, Dept of Anaesthesiology, Coimbra, Portugal

Background: The epidural catheter is a widely used medical device. Although being considered a rather safe procedure, adverse events like dural punctures, spinal hematomas or epidural abscesses have been continuously reported since the introduction of this technique. Among the different issues that the anesthesiologist may face while dealing with an epidural, breakage of the catheter is a rare but troublesome event.

Case report: We report the case of a 35-year-old caucasian woman who went to the emergency department for severe low back pain and paresthesia of the left lower limb, with progressive aggravation. The symptoms started three years after labor analgesia with an epidural catheter. No mention of breakage had been made to her at that time, nor a retained foreign body was ever reported afterwards. She has no relevant personal history or usual medication. She underwent tomography scan of the lumbar spine which revealed the presence of a foreign body adjacent to the left inferior articular apophysis of L1. The patient was referred for neurosurgery and after multidisciplinary

meeting made the decision of their surgery extraction. The patient underwent a balanced general anesthesia for two hours to fluoroscopy-guided extract the fragment of the epidural catheter, which was uneventful. At the time of discharge, the patient presented improvement in symptoms.

Discussion: Shearing of an epidural is a rare but serious adverse event, whose management may be problematic for the anesthesiologist. The greatest attention must be paid while handling the catheter, especially at its removal. Generally speaking, careful training of the healthcare personnel is probably the most effective preventive strategy.

In addition, several technical options have been reported about what to do in case resistance is found during withdrawal of the catheter. When facing breakage of a catheter during removal the different authors agree that the treatment of small fragments in an asymptomatic patient should be conservative, informing the patient of the complication.

References: Lee YH, Hwang HY, Sim WS. Breakage of a thoracic epidural catheter during its removal-A case report. *Korean J Anesthesiol.* 2010;58:569-7

Learning Points: In case breakage of the catheter occurs, full disclosure and timely communication to the patient are essential, as well as detailed reporting in the hospital record.

04AP08-10

Anesthetic management of laparoscopic surgery during the second trimester of pregnancy. Case report

Heredia C.¹, Gine M.¹, Parrilla L.¹, Estadella J.², Moral M.V.¹

¹Hospital de la Santa Creu i Sant Pau, Dept of Anaesthesiology, Barcelona, Spain, ²Hospital de la Santa Creu i Sant Pau, Dept of Surgery, Barcelona, Spain

Background: Up to 2% of pregnant women may present a pathology that would require a non-obstetric surgery [1]. Although the advantages that laparoscopy approach offers during the pregnancy are well documented, it becomes an anesthetic challenge.

Case report: 34 year-old woman on her 19th week of gestation, without relevant medical history, was admitted at the ER of our hospital due to abdominal pain. Ultrasound scan revealed the presence of fluid in the abdominal cavity compatible with hemoperitoneum. Initial blood tests showed hemoglobin levels of 9,4g/dL and 19,72x10E9/L leucocytes, with normal platelet count and coagulation parameters. In successive blood counts a progressive drop of the hemoglobin was evidenced, deciding to perform an explorative laparoscopy. Total intravenous anesthesia was performed and hemodynamic stability was constant during the pneumoperitoneum. Inspection of the abdominal cavity found fresh venous blood from a crumbly vascular network located on the anterior uterus wall, where hemostasis was correctly performed. The patient was extubated without incidences and was admitted to the reanimation care unit.

Discussion: Current literature provides recommendations for safe laparoscopy during pregnancy. CO₂ insufflation pressure should be kept between 10 to 15 mm Hg and intraoperative CO₂ monitoring by capnography should be used during laparoscopy [2]. Fetal heart rate must be monitored both pre- and post-operatively. According to SAGES guidelines, the use of prophylactic tocolytics are not advised, although they should be considered in coordination with obstetric consultation [3].

References:

1. Crowhurst JA. Anaesthesia for non-obstetric surgery during pregnancy. *Acta Anaesthesiol Belg.* 2002;53:295-7.

2. E. Reitman. Anaesthetic considerations for non-obstetric surgery during pregnancy. *British Journal of Anaesthesia* 107 (S1): i72-i78 (2011)

3. SAGES. Guidelines for diagnosis, treatment, and use of laparoscopy for surgical problems during pregnancy. *Surg Endosc.* 2008;22:849-861.

Learning points:

1. This case exemplifies that the laparoscopic approach is the technique of choice in both complicated and uncomplicated non-obstetric surgery during pregnancy

2. The main target of pregnancy anesthesia is the mother-fetal safety.

3. Anesthetic techniques should adapt to the anatomical and physiological changes of pregnancy to improve the mother safety.

04AP08-11

External cephalic version: what are the ideal technique and dosage?

Alvar E.¹, Otero I.¹, Gredilla E.¹, Guasch E.¹, Gilsanz F.¹, Caro J.²

¹Hospital Universitario La Paz, Dept of Anaesthesiology, Madrid, Spain, ²Hospital Universitario La Paz, Cardiology, Madrid, Spain

Background and Goal of Study: In case of breech presentations, cesarean section (CS) is indicated to reduce fetal risks, although a successful external cephalic version (ECV), can reduce the c-section rate[1]. ECV is infrequently offered; its success is higher when neuroaxial techniques are used, although the exact dose of local anesthetics is still unknown.

Our goal is to study the success of ECV performed in our hospital with doses of 0.5% heavy bupivacaine (HB) 5 or 6 mg + 20 mcg fentanyl in a combined epidural-spinal (CSE) technique.

Materials and Methods: We performed a retrospective study where we studied all the ECV performed at our institution since it was offered (17 months). Our protocol includes: CSE technique, using doses of 5 or 6 mg HB + 20 mcg fentanyl intrathecally, leaving an epidural catheter for 6 hours, to top up in case of breakthrough pain (BP) or just in case of CS. We analyzed the anesthetic technique, success rate, top-up needs and obstetric results.

Results and Discussion: 48 patients were included (an ECV was performed). Obstetric results: success in 21 women (44.7%); failure main cause was fetal bradycardia (FB) (66.7%). In 9 of the successful cases (21.4%) a vaginal birth was achieved on the following days or weeks. In 33 of the successful cases (78.6%) a CS was performed: 18.8% urgent CS following ECV, (66% of them were category I CS[2] and the catheter was used to top up), and 81.2% scheduled CS. The mean duration of the procedure (DP) was 18.50 minutes (min). 5 mg of HB+fentanyl was administered intrathecally to 34 women (74%) and 8 women (36%) needed top up because of BP during the procedure.

The most frequent obstetric complication was FB (11 cases). Maternal hypotension was also frequent despite of prophylactic perfusion of phenylephrine. The longer the procedure, the higher rate of obstetric complications, as more attempts of ECV are achieved, although statistical significance was not reached. (p=0.059).

There is a statistically significant relationship between the need of top up and the failure of the ECV (p=0.03).

Conclusions: Our success rate for ECV is similar to other series, although with these doses, a CSE technique is useful as it allows epidural top ups for BP and for emergency CS. ED95 for this procedure should be determined.

References: Weiniger C. *Curr Opin Anesthesiol* 2013, 26:278-87[2] Lucas, DN. *J R Soc Med* 2000; 93: 346-50

Paediatric Anaesthesiology

05AP01-1

Incidence of and Risk factors for perioperative respiratory adverse events in children: a prospective cohort study

Sonia B.K., Abbes A.

Children's Hospital ,Bechir Hamza' of Tunis, Dept of Anaesthesiology & Intensive Care, Tunis, Tunisia

Background and Goal of Study: Respiratory adverse events represent a major cause of perioperative morbidity, in children. The aim of this study was to determine the incidence of and risk factors for PRAE in children undergoing elective surgical procedures under general anaesthesia.

Materials and Methods: It's a prospective observational study, including children undergoing general anaesthesia for elective surgical procedures in paediatric anaesthesiology department from November 2014 to November 2016. We collected demographic data, medical history of asthma, allergy, second hand smoking, night-snoring and sleep apnea and recent upper respiratory tract infection. Induction techniques and agents, airway management and the occurrence of PRAE (moment, management strategy and evolution) were recorded. Pearson's Chi-square and Fisher's exact tests were used. $P < 0.05$ was considered significant. Multivariate Cox regression was employed to identify independent predictors for PRAE.

Results and Discussion: 1022 children were included in the study. PRAE occurred in 96 (9.4%) patients. Laryngospasm, bronchospasm, desaturation, upper airway obstruction and coughing occurred in 7 (7.4%), 36 (37.5%), 18 (18.7%), 18 (18.7%) and 17 (17.7%), respectively. The incidence of PRAE was higher at the emergence period (61; 63.5%) compared to the induction (19; 19.8%) and the maintenance (16; 16.7%) of anaesthesia. Children under 12 month-old, ASA (American Society of Anesthesiologist) class superior to 1, upper respiratory tract infection, night snore, use of laryngeal mask airways and endotracheal intubation were independently associated with a higher risk of PRAE; with an Odds-Ratio equal to 2.41 (95% CI [1.29-4.50] ; $p=0.005$), 2.89 (95% CI [1.01-8.27] ; $p=0.047$), 2.22 (95% CI [1.36-3.61] ; $p=0.001$), 1.78 (95% CI [1.00-3.17] ; $p=0.047$), 2.44 (95% CI [1.18-5.05] ; $p=0.016$) and 2.67 (95% CI [1.25-5.71] ; $p=0.011$) Respectively. Factors that were independently associated with lower incidence of PRAE were management of peripheral regional nerve block (OR=0,51 95% CI [0,30-0,88] ; $p=0,015$) and inhalatory induction (OR=0,47 95% CI [0,25-0,87] ; $p=0,018$). Asthma and second hand smoking were not associated with a higher risk of PRAE in our cohort.

Conclusion(s): PRAE occur more often in the emergence period. Age under 3 and a recent history of upper airway tract infection are the main predictive factors of PRAE in our study.

05AP01-2

Development of a paediatric emergency manual

Koers L., Stevens M., Eveleens F., Schlack W., Preckel B.

Academic Medical Center, University of Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: Managing a paediatric emergency can be extremely stressful and even experienced anaesthesiologists might miss critical steps in the adequate treatment. A cognitive aid is a tool that will help care providers to perform and speed up all the necessary management and treatment steps of a critical event. In order to improve the perioperative management of paediatric emergencies, a cognitive aid bundle to manage a number of life threatening paediatric emergencies was created in the Academic Medical Centre of Amsterdam.

Materials and Methods: The bundle was based on the adult version of the AMC cognitive aid bundle¹ and the PediCrisis cards from the Society for Pediatric Anesthesia² and created within an expert team of paediatric anaesthesiologists and intensivists.

Paediatric Emer...

Results and Discussion: A bundle containing 18 cognitive aids for paediatric emergencies was created (see Figure). During the creation, several deficits within our organisation of paediatric emergencies, both technical and non-technical, were uncovered and fixed, increasing patient safety. For example, our equipment for nebulising during mechanical ventilation was improved. Also, prior to the cognitive aid there was no consensus regarding the steps in

the paediatric difficult airway algorithm. Paper versions of the bundle were installed on all the paediatric anaesthesia carts and handed out to all members of staff. An electronic version was also made available.

Conclusion(s): In order to increase patient safety, we created a paediatric cognitive aid bundle for the management of paediatric emergencies. Patient safety is already enhanced by the development of a department specific cognitive aid bundle. The effectiveness of cognitive aids has been demonstrated in simulated emergencies.³ Further research should therefore focus on the implementation and optimisation of these tools.

References:

1. Koers L, Eveleens FM, Schlack WS et al. Cognitive aids for emergencies in the OR-AMC bundle helps ensure that no steps are left out. *Ned Tijdschr Geneesk* 2015; 159(13): A8325.
2. http://www.pedsanesthesia.org/wp-content/uploads/2015/12/CriticalEventsChecklists_12142015.pdf
3. Arriaga AF, Beder AM, Wong JM et al. Simulation based trial of surgical-crisis checklists *New Engl J Med* 2013 368(3): 246-53.

05AP01-3

Sedative effects and risk factors for desaturation during transport after general anaesthesia with sevoflurane in pediatric ambulatory inguinal herniorrhaphy cases: an observational study

Fujita H., Miyazawa N., Yamamoto Y., Kubo N., Fukushima T., Ando T.

Tokyo Metropolitan Children's Medical Center, Dept of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: Most current reports demonstrated no difference in the incidence of pediatric respiratory complications resulting from laryngeal mask airway (LMA) removal whether this was done under deep anaesthesia or when the patient was awake. However, we were unable to find reports on the quality of sedation during transport to the recovery unit after LMA removal under deep anaesthesia with sevoflurane. The goal of this study was to assess the safety of transport and sedative effects immediately after deep sevoflurane anaesthesia.

Materials and Methods: We retrospectively reviewed all cases of elective ambulatory inguinal herniorrhaphy from 6 months to 15 years of age in a one-year period from July 2015. After anaesthesia induction with sevoflurane, a LMA was inserted, and an ilioinguinal-iliohypogastric nerve block was performed. Anaesthesia was maintained with 3% sevoflurane in oxygen and air until LMA removal. After LMA removal the patients were promptly fitted with an oxygen mask and transferred to the postsurgical unit. SpO₂ was monitored until full recovery. The primary outcomes were the incidence of agitation and hypoxemia (defined as SpO₂ <90%) during transport. The secondary outcome was the statistical analysis of risk factors predicting hypoxemia using logistic regression analysis. We compared incidence with age, preoperative snoring, upper airway symptoms, anaesthesia duration, and end-tidal sevoflurane concentration at removal of LMA.

Results and Discussion: The subjects were 323 children with an average age of 4 years and 4 months and an average transport time of 5 minutes 57 seconds. Adequate sedation was maintained in 95.7 % (309/323) of cases, and 2.5% (8/323) showed hypoxemia. Serious events due to agitation did not occur. Six patients required airway maneuvers and two needed mask ventilation. One patient was hospitalized for upper respiratory symptoms, fever, and dehydration. The remaining patients were discharged on the same day. Preoperative snoring was significantly associated with the incidence of hypoxemia by an odds ratio of 6.6 ($p < 0.05$).

Conclusion: Preventing agitation during transport after anaesthesia with sevoflurane in children is challenging. Residual sevoflurane provided adequate sedation but 2.5% of patients showed hypoxemia. Preoperative snoring was related to the incidence of hypoxemia. The presence of a doctor during transport is strongly advised.

05AP01-4**Laryngotracheal stenosis in children following cardiac surgery: a retrospective review**

Caruso G., Van Deenen D., Willems A., Van Der Linden P.
Hopital Universitaire des Enfants Reine Fabiola, Dept of
Anaesthesiology & Intensive Care, Brussels, Belgium

Background and Goal of Study: Laryngotracheal stenosis is a rare but potentially dangerous complication after surgical repair for congenital heart disease (1). The aim of the present study was to determine incidence and contributing factors of such complication in our population.

Materials and Methods: After IEC approval, the medical chart of children undergoing cardiac surgery under cardiopulmonary bypass between January 2002 and July 2015 were reviewed. Patients with a laryngotracheal stenosis were compared with those without one, after matching with a 1:2 ratio considering age and weight. Continuous variables were compared with the Mann-Whitney test and categorical ones with the χ^2 -test.

Results and Discussion: Among the 2121 patients involved in the study, 12 children developed laryngotracheal stenosis, including glottic stenosis (N=2), subglottic stenosis (N=8) and tracheal stenosis (N=2). Two children received medical therapy alone, 8 had endoscopic treatment, and 3 underwent airway surgery. Those 12 children were matched and compared with 24 children without laryngotracheal stenosis. The results are illustrated in Table 1. Prematurity, endotracheal tube size and number of endotracheal intubations were statistically significant between both groups. Children with stenosis tended also to have more genetic abnormalities than those who did not (29.2% vs. 58.3%; $P=0.091$). Due to the retrospective character of our study, we cannot exclude that children with laryngotracheal stenosis had a higher number of intubation attempts because of their pathology. Other factors, such as RACHS-1 score, and CBP time were not significantly different between both groups.

Variables	No laryngotracheal stenosis	Laryngotracheal stenosis	P-value
Prematurity	1 (4.2%)	4 (33.3%)	0,017
Endotracheal tube size (mm)	3.0	3 (13.6%)	0.038
	3.5	13 (59.1%)	
	4.0	4 (18.2%)	
	4.5	2 (9.1%)	
Number of intubation attempts	1	16 (66.7%)	0.005
	2	6 (25.0%)	
	3	1 (4.2%)	
	>3	1 (4.2%)	

[Table 1. Risk factors for laryngotracheal stenosis]

Conclusion: Laryngotracheal stenosis is a rare postoperative complication of congenital heart surgery. Prematurity, greater endotracheal tube size and repeated intubation attempts are significant risk factors.

References: 1. Mossad E et al. J Cardiothorac Vasc Anesth 2009; 23:658-62.

05AP01-5**Postoperative complications after spinal surgery in children with neuromuscular scoliosis**

Garini E.¹, Gkliatis E.¹, Kouna N.¹, Aggelis F.², Dimitropoulou E.¹, Mammi P.¹

¹Agia Sofia Children's Hospital, Dept of Anaesthesiology, Athens, Greece, ²Agia Sofia Children's Hospital, 2nd Department of Orthopaedics, Athens, Greece

Background and Goal of Study: The purpose of this retrospective audit is to identify factors related with postoperative complications in children undergoing neuromuscular scoliosis surgery.

Materials and Methods: Data from 24 neuromuscular scoliosis patients operated between September 2013- September 2016 were retrieved retrospectively. SPSS 21 program, Fisher's exacts and Mann Whitney tests were used for statistics.

Results and Discussion: Data was available for 24 children, 14 females-10 males, 9-16 years old, 18-72 kg (mean 39). Scoliosis was result of Cerebral Palsy in 19 cases (41.6%), Spinal muscular atrophy II in 3 (12.5%), Duchenne in 2 (8.3%) and of Arthrogyrosis, Prader Willi, Centronuclear Myopathy, Ehlers Dahnlos, Neurofibromatosis, Dravet, Friedreich's ataxia, Congenital leydodystrophy PMD, Congenital muscular dystrophy, in 1 child each (4.1%). Growth rod was inserted in 11 cases (45.8%) or 13-14 vertebrae levels were fused in 13 cases (54.2%).

TIVA was used in all cases, as well as low ketamine infusion, tranexamic acid, cell saver and a transfusion trigger of Hb 8g/dl.

At least 1 postoperative complication were recorded in 11 cases (45.8%): pulmonary oedema (1 case), pneumothorax (1), pulmonary embolism (1), respiratory (1), need for NIMV (2), bradycardia and hypotension (1), elevated liver enzymes (1), wound infection (3), wound rupture (1), meralgia paresthetica (1), blood loss requiring transfusion >2 PRBC (5), prolonged ICU stay >48h (2). Prolonged hospital stay (12,74 days mean) was also considered.

Complications were recorded in: 57% of the female and 50% of the male, 46% of the growth rod cases and 63% of the vertebrae fusion cases, 50% of those with pre-existing respiratory and 52% of those with cardiac conditions, 71% of cases with walking disability, 80% of epileptic children and 80% of the transfused >2 PRBC. Complicated versus non-complicated cases had: mean age 12.8 vs 13.7 years, BMI 17.9 vs 18.2, Cobb angle 96.3° vs 93.1°, FVC 59.5 vs 63.8, FEV/FVC 103.8 vs 104.8, preoperative Hb:12.7 vs 11.7mg/dl, duration of surgery 5.8 vs 5.2h, hospital stay 12.8 vs 12.6 days, ICU stay 3 vs 2.2 days. Statistic significance ($p<0.05$) was reached for the walking disability factor and the prolonged ICU stay.

Conclusion(s): Walking disability may increase complications after neuromuscular scoliosis surgery. Complications may prolong ICU stay.

05AP01-7**The clinical and physiologic implications of phenylephrine in Tetralogy of Fallot. A case report**

Romera A., Hernández L., Álvarez L., Barragán M.L., Fuentes J.R., López-Gil M.T.

Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Tetralogy of Fallot (TOF) is the most common form of cyanotic congenital heart disease. Anesthetic management should be focused on optimization of pulmonary/systemic flow ratio. The strategy to increase pulmonary flow is based on two cornerstones: α -1 agonists (such as phenylephrine) and fluid therapy. The goal of this case report is to introduce the clinical and physiologic implications of phenylephrine and the differences between its administration by continuous intravenous infusion or bolus injection in these patients.

Case report: A 36 week newborn, weighing 2650 grams, with prenatal diagnosis of TF, was scheduled for balloon dilatation of the right ventricle outflow tract with stent placement. Patient's global assessment was discussed between the interventional cardiologist and the anesthesiologist, placing an emphasis on whether to administrate phenylephrine as a continuous intravenous infusion at rates of 0,1 to 0,5 microgrames/kilo/minute or give it by 10 micrograms/kilo bolus, when necessary to decrease the right-to-left shunt. Global cardiac output reduction, myocardial wall stress increase and myocardial oxygen requirements increase, caused by phenylephrine, all together with the fact that those effects are dose-dependent and continuous intravenous infusion is associated with higher doses, made us choose the bolus option, preceded by albumin 5% and adjustment of preoperative fasting.

Discussion: Several studies in patients born with TF show they may potentially benefit from a drug that increases left heart afterload more than right heart afterload. Phenylephrine appears to have such an effect. Surgery lasted 180 minutes and bolus requirement was higher than expected (nine bolus). Although lactic acid levels were always lower than 1,2 mmol/l and there was not acidosis disorder, periods of hemodynamic instability - with hypotension and low arterial saturation - were observed. Absence of bladder catheterization and lack of cerebral/somatic oximeter complicated volumetric management, which was not as accurate as we thought.

Learning points: Phenylephrine is a useful drug in the setting of children with TF, but its potential harmful clinical and physiologic effects should not be underestimated. Further studies to compare continuous intravenous infusion versus bolus injection in cases with TF are needed. Hemodynamic monitoring, able to provide oxygen-supply-to-demand ratio information, must be aggressive in this kind of patients.

05AP01-8**Anaesthetic management of a pediatric patient with Autosomal Recessive Progressive External Ophthalmoplegia (AR-PEO) in the emergency operating room: a case report**Galacho J., Caldeira A., Santos J.*Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal*

Background: AR-PEO is a mitochondrial disease (MD) characterised by weakness of the eye muscles, ptosis and ophthalmoplegia. Additional signs can include myopathy, sensorineural hearing loss, neuropathy and ataxia. A careful anaesthetic approach is needed as serious complications and altered sensitivity to anaesthetic agents may occur.

Case report: A 10-year-old girl (weight 23kg) with acute lower respiratory infection was admitted in the emergency operating room for a central venous catheter replacement needed for IV antibiotherapy.

At 7 years of age, she was evaluated for ptosis, limited ocular mobility and gait instability. Physical development was noted to be delayed. Muscle biopsy revealed fibers compatible with mitochondrial disease. POLG gene study identified a variant compatible with PEO. Cardiac evaluation showed a small mitral valve prolapse.

A brief procedural sedation was planned.

Standard American Society of Anesthesiologists anaesthetic monitoring was used. Glycemia monitoring and use of lactate-free solution were also contemplated.

Pre-medication with midazolam 1mg IV was given and anaesthesia was conducted with ketamine 30mg IV.

Vital signs were stable during the intervention, which underwent uneventfully. Dantrolene was immediately available.

The patient was discharged from the Post-Anaesthesia Care Unit 1 hour after procedure, without any complications.

Discussion: Anaesthetic management of patients with MD and AR-PEO is challenging as it can affect several organ systems. Pre-operative evaluation should focus cardiac, respiratory, neurologic, endocrine and metabolic compromise.

Anaesthetic implications of these diseases include an increased susceptibility for malignant hyperthermia. Lactate containing solutions are better to avoid. Shivering, hypoxia, fasting, hypotension and post-operative pain should be avoided as mitochondrial function may be depressed and lactic acidosis may ensue when metabolic demand is increased.

References: Genetics Home Reference - <https://ghr.nlm.nih.gov/condition/progressive-external-ophthalmoplegia> (accessed in 12/12/2016).

Anaesthesia recommendations for patients suffering from Mitochondrial Cytopathy, Mitochondrial Myopathy, Mitochondrial Encephalomyopathy - orphananesthesia (accessed in 12/12/2016).

Learning points: Anaesthetic management of patients with MD is challenging as it can affect several organ systems.

05AP01-9**Periprocedural complications of paediatric cardiac catheterization (CC) for closure of patent ductus arteriosus (PDA): 10 years experience**Czajkowska K.¹, Madrigal A.¹, Germanova L.¹, Jesus J.², Bento M.², Lima H.²*¹Coimbra Hospital and University Centre, Dept of Anaesthesiology, Coimbra, Portugal, ²Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology, Coimbra, Portugal*

Background and Goal of Study: In the last 20 years transcatheter closure has become the leading approach for closure of most PDAs. Frequently anaesthesia needs to be provided, especially in paediatric patients. The goal of this study is to identify and analyse the major perioperative complications of CC for PDA closure.

Materials and Methods: We conducted a retrospective assessment of chart records of patients submitted to CC for diagnosis or closure PDA between 2006-2016. Collected data was analysed with the SPSS software.

Results and Discussion: 218 interventions were analysed, 165 successful (75,7%), 47 diagnostic (21,6%), 6 unsuccessful (2,7%). 96,0% were elective, 4,0% urgent. 128 patients were females (58,7%), 90 males (41,3%); 5 were aged <1 month (2,3%), 43 1month-1y (19,7%), 134 1-8y (61,5%), 29 8-13y

(13,3%) and 7 >13y (3,2%). Most patients were classified as ASA I (n=101, 46,3%) or II (n=94, 43,1%), 22 were ASA III (10,1%) and 1 ASA IV (0,5%). In most cases general anaesthesia (GA) was provided (n=211; 96,8%), 7 patients were sedated (3,2%). Average duration of the procedure was 87,4±33,5min. During 10 years we observed 23 major complications in 16 patients (7,4%). Most frequent were arrhythmia (n=6) and severe hypotension with the need for inotropes/vasopressors (n=7), followed by coil migration (n=4), bronchospasm (n=2) and respiratory depression (n=3) with 1 case when a reintubation was needed.

We did not have any mortality case during the study. We observed higher complication rate in: female patients (56,25%), younger children (<1m: 40,0%; 1m-1y: 16,30%; 1-8y: 3,7%; 8-13y: 6,9%; >13y: 0,0%); patients with lower weight (<5kg: 37,5%; 5-10kg: 31,3%; 11-20kg: 12,5%; 20-30kg: 6,3%; >30kg: 12,5%); higher ASA classification (I: 2,0%; II: 10,6%; III: 13,6%; IV: 100,0%) and unsuccessful PDA closure (33,3% vs. successful 6,7%). Statistically significant (p<0,05) risk factors of perioperative complications were: age and weight, ASA and duration of the procedure.

Conclusion(s): CC for PDA closure is associated with some major complications. Lower age and weight, higher ASA classification and longer procedure duration showed to be risk factors for periprocedural complications.

References: KE Lee, YJ Seo, GB Kim, HS An, YH Song, BS Kwon, EJ Bae, CI Noh. Complications of Cardiac Catheterization in Structural Heart Disease. Korean Circ J 2016;46(2): 246-255

05AP02-1**Epidemiology, effectiveness and safety of continuous caudal analgesia administered through a catheter advanced to the lumbar and thoracic regions in 19 newborns**Barragán L., Álvarez L., Romera A., Cebrián J., Fernández R., López-Gil M.T.*Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*

Background: Paediatric caudal epidural anesthesia is a well-accepted technique, commonly used in combination with general anesthesia. The aim of this study is to analyze , according to epidemiological, effectiveness and safety parameters, all newborns with continuous caudal infusions administered through a catheter advanced to the lumbar and thoracic regions, subjected to major thoraco-abdominal procedures in a twelve-month period, in a tertiary care hospital.

Materials and Methods: Retrospective analysis of all children undergoing major surgery with continuous caudal epidural technique in year 2015 in Gregorio Marañón General Hospital. 19 catheters were placed, using ultrasonography, at lumbar or thoracic cord levels. 0,2% or 0,25% bupivacaine was administered in intermittent bolus during surgery. Continuous 0,1% ropivacaine perfusion of 0,1-0,3 ml/kg/h, combined with intravenous paracetamol at a dose of 10 mg/kg/ every 8 hours, was used for post-operative pain management up to 72 hours. Epidemiological collected data included weight, age, associated conditions, respiratory support and type of surgery and incision. Analgesic effectiveness was measured using three different parameters: morphine consumption in the Intensive Care Unit, time to extubation and beginning of oral feeding. In terms of safety, local anesthetic toxicity or technique complications were also evaluated.

Results and Discussion: Postconceptional age ranged from 34 to 42 weeks (eleven preterms). Weight ranged from 1510 to 3760 grams. Most patients had associated comorbidities. The most common type of procedure performed was bowel atresia. Two patients needed continuous positive airway pressure. Successful pain control was achieved in eight patients. Nine of them required one or two morphine bolus and two needed continuous infusion of morphine. Overall, more than 50% (eleven) of patients were extubated in the operating room, and 74% of them in the first 24 hours. When indicated, oral feeding was started within 72 hours following surgery in all patients. No complications were described.

Conclusions: Caudal anesthesia provides safe, reliable and efficient analgesia for both general neonates and preterms undergoing major thoraco-abdominal surgery. Caudal catheters advanced to the lumbar and thoracic regions can be used to decrease intravenous opioids and thereby allow early tracheal extubation and early oral feeding.

05AP02-2

Effect of intravenous steroid added to caudal local anesthetics in improving postoperative pain: a systematic review and meta-analysis

Kawakami H., Mihara T., Nakamura N., Ka K. Kanagawa Children's Medical Center, Dept of Anaesthesiology, Yokohama, Japan

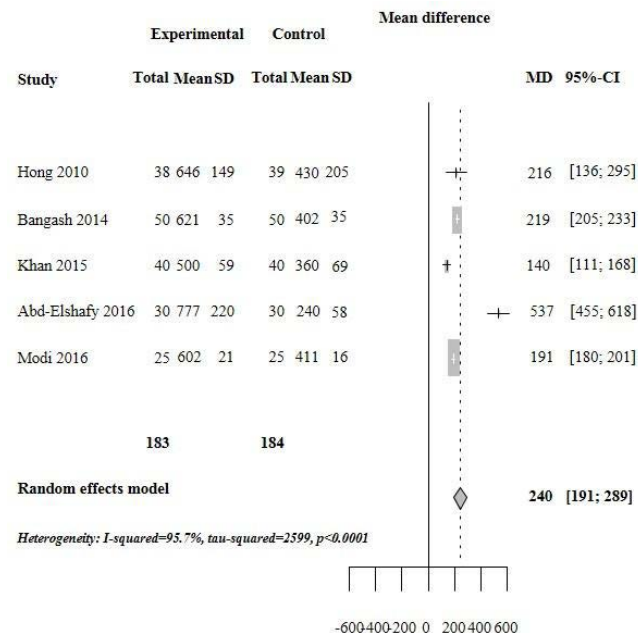
Background and Goal of Study: Caudal anesthesia has been used for post-operative pain control in pediatric surgical patients, but the duration of the analgesic effect is sometimes not satisfactory. The additional caudal medications are investigated but there is some concern regarding safety. Intravenous steroid has been shown effective for pain management after some surgeries (1). We conducted a meta-analysis to evaluate the analgesic effect of steroid when administered to patients given caudal anesthesia.

Materials and Methods: This study was a systematic review and meta-analysis. A search was conducted of published literature in MEDLINE, EMBASE, Web of Science, and Cochrane Central Register of Control Trials databases. Randomized control trials that compared intravenous steroid with placebo for pediatric patients who received caudal anesthesia for surgery were included. Continuous data were summarized using mean difference with a 95% confidence interval (CI). If the 95% CI included a value of 0, we considered the difference not to be statistically significant. We used the random effect model (Dersimonian and Laird method) to combine the results. Heterogeneity was quantified with the I² statistic. The primary outcome from the present meta-analysis was analgesic duration.

Results and Discussion: Five trials (367 patients) were included with 183 patients receiving intravenous steroid. All the studies compared dexamethasone with placebo. The definition of the analgesic duration varied among studies and the examples of these definition were time from caudal injection to pain score >4 and from extubation to first oral paracetamol. Dexamethasone prolonged the analgesic duration with caudal analgesia (mean difference of 240 minutes, 95% CI 191 to 289). However, this result should be interpreted with caution because of the extreme heterogeneity with I² of 95.7%.

Conclusion(s): Intravenous dexamethasone prolongs analgesic duration of caudal anesthesia.

References: 1. Waldron NH, et al., Br J Anaesth. 2013;110(2):191-200.



[Forest plot]

05AP02-3

Neurostimulation in the pudendal nerve block in pediatric surgery: a randomized controlled trial

Sonia B.K., Abbes A., Refka K., Hajer B. Children's Hospital 'Bechir Hamza' of Tunis, Dept of Anaesthesiology & Intensive Care, Tunis, Tunisia

Background and Goal of Study: Neurostimulation is possible in the pudendal block considering that it is a mixed nerve.

The aim of our study is to compare the efficacy of neurostimulation compared to the loss of resistance in the pudendal blocks techniques during circumcision surgery and anterior hypospadias in children.

Materials and Methods: Following Ethical Committee approval and parental informed consent, we conducted a prospective randomized study, including children aged from 1 to 9 years, scheduled for hypospadias surgery, urethral fistula repair or circumcision. Patients with known allergy to anesthetic products, coagulopathy or infection at the site of puncture were not included. Patients with intraoperative analgesic or surgical complication were excluded. The patients were randomly assigned into two groups:

Group 1: Block without neurostimulation, it is the technique of loss of resistance that signals the crossing of the obturator aponeurosis;
Group 2: Block with neurostimulation.

The expected response stimulation was an up and down movement of the penis. A hospitalization of 6 hours postoperatively was required. Patients received paracetamol 15 mg per kg if CHEOPS > 7 and nalbuphine if persistent pain (CHEOPS >7). Patients were contacted at home by telephone to assess the analgesic requirement. The efficiency of the pudendal block, the quality of postoperative analgesia evaluated by the CHEOPS score (awakening, H1, H2, H4, H6), the need for analgesics in the hospital and at home and the parents satisfaction were recorded. The statistical analysis was carried out by SPSS software 19 (p is significant if <0.05).

Results and Discussion: Seventy-one patients were included in the study: group 1 (n = 35) and group 2 (n = 36). The mean age of the patients was 42 months [8-108] and the patients were all classified as ASA I. The two groups were comparable for the demographic characteristics (age, ASA and type of surgery). The Block rate failure was comparable in the two groups. At the hospital, there was no significant difference in the use of analgesics between the two groups. At home, 23 patients (14 in group 1 and 9 in group 2) have received paracetamol, with no significant difference between the two groups. No child needed the use of nalbuphine. Parental satisfaction was insignificant in two groups (82.8% versus 97.2, p = 0.052).

Conclusion(s): Neurostimulation doesn't increase the effectiveness of the pudendal block.

05AP02-5

Vascular access for bleeding surgery in a pediatric university hospital

Latorre J., Pérez Ferrer A., Dennis Filippini S., De Vicente Sánchez J. La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Introduction and Objectives: The cannulation and vascular access in the child is essential for the infusion of fluids, drugs and blood components, to monitor cardiovascular function and for the extraction of blood samples. It presents greater difficulty in the infant and young children, requiring multiple attempts with the consequent increased risk of complications and loss of time before surgery. In the case of interventions at risk of developing massive hemorrhage, larger gages are required which further complicates the process.

Materials and Methods: A description of the clinical practice of the peripheral and central vascular accesses is more adequate for surgeries with risk of massive hemorrhage, analyzing the most suitable gauges, types of catheters and technique, as it is done in our institution, including limit situations such as liver transplantation where veins that drain into the inferior vena cava should not be channeled.

Discussion: Literature concerning catheterization of vascular access in children refers to situations in which only maintenance fluid is required. However, some situations (massive bleeding, transplants) require a different approach. Both access and caliber should be adapted to the patient's age, type of surgery and clinical situation.

	LITERATURE	LA PAZ UNIVERSITY HOSPITAL	
AGE	CENTRAL LINE Caliber	MASSIVE HEMORRHAGE: CENTRAL LINE Caliber	MASSIVE HEMORRHAGE: Introducer Sheath Caliber/Length
PRETERM	3 Fr	4 Fr	3 Fr / 4 cm
NEONATO AND INFANT SCHOOL	4-4,5 Fr	4,5-5 Fr	4-5 Fr / 5,5 cm
PRESCHOOL	4,5-5,5 Fr	5,5-7-8 Fr	6 Fr / 5,5-8,5 cm
SCHOOL	5,5-6 Fr	7-8 Fr	7 Fr / 7-12 cm
TEEN	7 Fr	≥ 8 Fr	≥ 8 Fr / 11-12 cm

[Table 1]

The saphenous vein and the external jugular vein are useful as peripheral access in infants of difficult canalization. For the central compartment, ultrasound-guided technique is of choice. The right internal jugular vein is the most frequently channelled for situations with significant bleeding in our center. In situations of extreme urgency do not forget the intra-osseous access.

Conclusions: The vascular canalization in pediatrics requires a greater learning curve than in the adult, requiring knowledge of the technique and the appropriate material. The case of potential or actual situations of massive hemorrhage requires considering specific implications.

05AP02-6

Anaesthesia for paediatric cardiac catheterization (CC) for closure of patent ductus arteriosus (PDA): 10 years experience

Czajkowska K.¹, Madrigal A.¹, Germanova L.¹, Bento M.², Jesus J.², Lima H.²

¹Coimbra Hospital and University Centre, Dept of Anaesthesiology, Coimbra, Portugal, ²Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology, Coimbra, Portugal

Background and Goal of Study: In the past 20 years transcatheter closure has become a leading approach for closure of most PDAs. Frequently anaesthesia needs to be provided, especially in paediatric patients¹. The aim of this review is to present a data from 10 years of experience of a single centre where paediatric CC is a standard procedure.

Materials and Methods: A retrospective analysis was performed using the data collected from patients submitted to PDA closure between 2006 and 2016.

Results and Discussion: 218 interventions were analysed (20,47% of all CC performed), 165 successful (75,7%), 47 only diagnostic (21,6%) and 6 unsuccessful (2,7%). 96,0% were elective, 4,0% urgent. 128 patients were females (58,7%), 90 males (41,3%); 5 were aged <1 month (2,3%), 43 were 1 month-1y (19,7%), 134 1-8y (61,5%), 29 8-13y (13,3%) and 7 >13y (3,2%). Most patients were classified as ASA I (n=101, 46,3%) or II (n=94, 43,1%), 22 were ASA III (10,1%) and 1 ASA IV (0,5%). Most frequent comorbidities were: other congenital heart disease, development delay, Down syndrome, cardiac insufficiency and pulmonary hypertension. In most cases general anaesthesia (GA) was provided (n=211; 96,8%), 7 patients were sedated (3,2%). Tiopental was mostly chosen for the induction of anaesthesia (n=193; 88,5%), followed by Sevoflurane (n=16; 7,3%). Average duration of the procedure was 87,37min. Most patients were admitted to Post-Anaesthesia Care Unit and transferred to a general ward, 11 went to ICU (5,0%). We observed 23 major complications in 16 patients (7,34%), most frequently: arrhythmia (n=6), severe hypotension with the need for inotropes/vasopressors (n=7), coil migration (n=4), bronchospasm (n=2) and respiratory depression (n=3). We did not have any mortality case during the study.

Conclusion(s): In our centre CC for PDA closure is mostly performed in children aged 1-8y, with no comorbidities or with mild disease without substantive functional limitations, and GA is preferred. The intervention shows to be associated with some major complications with the overall incidence similar to the data present in the literature².

References: 1. AE B, S H, J B, Y B, V L, CY A, E B, J P, R P: Transcatheter closure of patent ductus arteriosus: Past, present and future. Archives of Cardiovascular Disease 2014 107, 2. KE L, YJ S, GB K, HS A, YH S, BS K, EJ B, CI N. Complications of Cardiac Catheterization in Structural Heart Disease. Korean Circ J 2016

05AP02-7

Comparison of the quality of introduction of anesthesia between inhalation and intravenous techniques

Stojanović Stipić S.¹, Bajic Z.²

¹University Hospital Split, Dept of Anaesthesiology & Intensive Care, Split, Croatia, ²Biometrika, Research and Development Department, Zagreb, Croatia

Background and Goal of Study: There are three key events during hospitalization of a child which are extremely stressful: the introduction of i.v. cannula, separation from their parents when they are going to the operating room and the induction of anesthesia. The impact of the anesthesiologist on all three situations is great, so we decided to compare the quality of the induction of anesthesia, conditions for intubation, length of intubation and extubation time between intravenous and inhalation techniques.

Materials and Methods: A randomized, parallel groups trial was conducted at the University Hospital Split with 64 children (aged 6-13, ASA I-II) undergoing elective adenotonsillectomy. Children were randomized into inhalation sevoflurane (S) and total intravenous anaesthesia propofol (TIVA), in equally large groups. After applying EMLA cream, all patients had iv line before the induction and were given midazolam. In TIVA group anesthesia was induced with propofol, fentanyl and vecuronium, and maintained with continuous infusion of propofol. In S group, after fentanyl, anesthesia was induced and maintained with sevoflurane in O₂/N₂O (50:50) mixture. Patients were anaesthetized by one anaesthetist. The assessment of conditions for intubation were done by using the Krieg tracheal intubation score and Copenhagen Consensus Conference score. We graded the quality of tracheal intubation according to the ease of laryngoscopy, the position of the vocal cords, coughing and movement of the limbs. We also measured the intubation time, duration of operation, extubation time as well as time from the end of surgery until when patients spontaneously opened their eyes.

Results and Discussion: We have not found significant differences neither in KTI or CCC results between intravenous and inhalation anesthesia ($P=0.544$, $P=0.554$ respectively) nor in duration of intubation, operation and extubation ($P=0.321$, $P=0.953$, $P=0.270$ respectively). Time needed for children to open the eyes was significantly longer in the inhalation group: median (IQR) 38 (30-45) minutes, then in intravenous group: 30 (26-40) minutes ($P=0.021$; AUC=0.33).

Conclusion(s): In both groups, children had equally good quality of anesthesia induction. However, significantly longer time was needed for children to open the eyes in the inhalation group compared to the intravenous group. This is an important finding, because our goal is to awaken the child as soon as possible.

05AP03-1

A two-way randomized cross-over pharmacokinetic and pharmacodynamic evaluation of ADV6209, an innovative oral solution of midazolam

Brackhahn M.¹, Marçon F.², Guittet C.³, Manso M.A.³, Burton I.⁴, Granier L.A.³

¹Kinder- und Jugendklinik, Dept of Anaesthesiology & Intensive Care, Hannover, Germany, ²CHU d'Amiens-Picardie, Pharmacy, Amiens, France, ³Advicenne, Clinical Affairs, Nîmes, France, ⁴ClinBay SPRL, Statistics, Baisy-Thy, Belgium

Background and Goal of Study: One of the best-adapted options for moderate sedation in pediatric patients is oral midazolam. In many European countries there is currently no oral midazolam licensed product available and off-label use of other forms is common. These forms present very poor acceptability as major drawback.

A new 0.2% (w/v) midazolam solution has been developed, based on the advantages of cyclodextrin inclusion complexes: bitterness masking, solubility and stability improvement.

The present work aimed at evaluating the impact of cyclodextrins on oral midazolam pharmacokinetics (PK) and pharmacodynamics (PD) in adults, in view of the future use of ADV6209 in children.

Materials and methods: A Phase I (n=12) randomized study with a standard two-way (15 mg ADV6209 PO - 5 mg Hypnovel® IV) crossover design was performed in order to determine the main PK parameters including absolute oral bioavailability, after single administration of ADV6209.

The sedative effect was measured using a visual analog scale (VAS) for alertness and the observer's assessment of alertness/sedation (OAA/S) scale at different time points up to 12 hours after administration. Safety and tolerability were assessed.

Results and discussion: PK parameters for midazolam (MDZ) and its main active metabolite, α -hydroxymidazolam (a-OHM) were determined (see Table). Oral bioavailability with ADV6209 was 39.4%, in close agreement with literature values for other oral formulations.

	C _{max} (ng/mL)	T _{max} (h)	AUC _{0-t} (h*ng/mL)	AUC _{0-∞} (h*ng/mL)	t _{1/2} (h)	Cl/F (L/min)	Vz/F (L)
MDZ	113 (51.1)	0.583 (0.333-2.00)	244 (82.4)	230 (73.8)	2.66 (0.300)	1.21 (0.509)	280 (121)
α -OHM	57.0 (35.3)	0.583 (0.333-2.00)	91.5 (30.9)	91.1 (32.0)	2.33 (0.245)	3.05 (1.02)	622 (241)

[PK parameters in adults. Mean (SD), Median (range)]

Overall, ADV6209 provided sedation (OAA/S score ≤ 17) within 30 minutes and over at least 2 hours and PD scores reflected well the extent of sedation/alertness in relation with midazolam plasma concentrations.

The minimum plasma concentration required to reach a sedative effect (C_{min}) was 53.05 ng/mL (95 % CI, 46.65, 60.44).

Midazolam complexation with cyclodextrins in order to obtain a solution with improved pharmaceutical characteristics and palatability did not seem to alter PK and PD parameters. Safety and tolerability were also very good.

Conclusion: Results in adults indicated that no significant modifications of PK and PD parameters should be expected in children administered ADV6209 and supported further evaluation of this innovative product for moderate sedation in the paediatric population.

05AP03-3

Prospective randomized double blinded placebo controlled study to assess the efficacy of single dose intranasal dexmedetomidine in attenuating the hemodynamic response to endotracheal intubation

Rajendran M., Sheena Cherry B., Madhumitha M.
RG Stones, Dept of Anaesthesiology, Chennai, India

Background and Goal of Study: The aim of this study is to prove the efficacy of single dose intranasal dexmedetomidine in attenuating the intubation response.

Materials and Methods: The study was conducted at Sri Ramachandra Medical College and Research Institute between DEC 2011-SEP 2012 after getting the ethics committee approval.

This is a prospective, placebo controlled, randomized, double blinded study. The sample size was determined as 30 per group by Power analysis with alpha error of 0.01 and beta error 0.8. 60 subjects were enrolled in our study.

Results and Discussion: The pre induction mean of mean blood pressure in group A was 84.13 \pm 5.13mm of Hg and 86.17 \pm 6.29mm of Hg in Group B which was not significant with a p value of .176.

The pre intubation mean of mean blood pressure in group A was 79.83 \pm 4.57mm of Hg and 85.67 \pm 7.75mm of Hg in group B which was significant with a p value of 0.001

The post intubation mean mean blood pressure at 0 minute was 80.73 \pm 3.48mm of Hg in group A and 105.70 \pm 8.76mm of Hg in group B with a p value of 0.000 which is highly significant.

The mean of mean blood pressure at 3, 5 were also highly significant with p value 0.000 between the two groups.the mean of mean blood pressure at 10 minutes also had a significant p value of 0.001.

The pre induction mean heart rate in group A was 70.57 \pm 4.88 and 75.27 \pm 8.60 in group B which was significant with a p value of .025.

The pre intubation mean heart rate in group A was 69.10 \pm 6.59 and 75.33 \pm 9.64 in group B which was significant with a p value of 0.002.

The post intubation mean heart rate at 0 minute was 69.47 \pm 6.59 in group A and 93.20 \pm 7.65 in group B with a p value of 0.000 which is highly significant. The mean heart rates at 3, 5, 10 minutes were 70.23, 69.10, 68.23 in Group A and 85.23,80.03,75.40 in Group B with p value 0.000 between the two groups. 60 patients were enrolled in the study and the observations made were analyzed using the SPSS software. The results were expressed as mean, standard deviation and percentage. A p value <0.05 was considered significant.

Conclusion(s): In our study usage of dexmedetomidine given intranasally at a dosage of 1mcg/kg, 30 minutes prior to the procedure with succinyl choline attenuates the hemodynamic response to intubation.

05AP03-4

The effect of intraoperative dexmedetomidine on acute kidney injury after paediatric congenital heart surgery

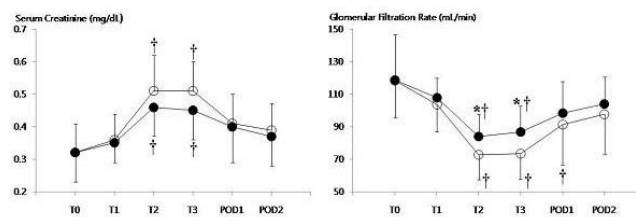
Choi J., Kwak H.J., Jo Y.Y., Lee K.C., Kim H.S.

Gachon University Gil Medical Center, Dept of Anaesthesiology & Pain Medicine, Incheon, Korea, Republic of

Background and Goal of Study: Dexmedetomidine has been reported to have a renal protective effect after adult open heart surgery. The authors prospectively investigated the effect of intraoperative dexmedetomidine on acute kidney injury (AKI) after paediatric congenital heart surgery with cardiopulmonary bypass.

Materials and Methods: 29 paediatric patients (1-6 yrs) scheduled for atrial or ventricular septal defect repair were randomly assigned to receive either continuous infusion of normal saline (control group, n=14) or dexmedetomidine (a bolus dose of 0.5 μ g/kg and then an infusion of 0.5 μ g/kg/h) (dexmedetomidine group, n=15) after anaesthetic induction until cardiopulmonary bypass weaning. Serum creatinine (Scr) was measured before surgery (T0), 10 min after anaesthesia induction (T1), 5 min after cardiopulmonary bypass weaning (T2), 2 hours after T2 (T3), and after postoperative day 1 (POD1) and postoperative day 2 (POD2) and estimated glomerular filtration rates (eGFRs) were calculated. Renal biomarkers were measured at T1, T2 and T3. AKI was defined as an absolute increase in Scr of ≥ 0.3 mg/dl or a percent increase in Scr of $\geq 50\%$.

Results and Discussion: The incidence of AKI during the perioperative period was significantly higher in the control group than in the dexmedetomidine group (64% (9/14) vs. 27% (4/15), P = 0.042). eGFR was significantly lower in the control group than in the dexmedetomidine group at T2(P = 0.044) and T3(P = 0.03). eGFR decreased significantly at T2, T3, and T4 (P < 0.001, < 0.001 and 0.009, respectively) as compared with T0, in the control group and at T2 and T3 (P values < 0.001) in the dexmedetomidine group.



Patients that received normal saline (the control group, ○) or dexmedetomidine (the dexmedetomidine group, ●). Error bars represent standard deviations. * P < 0.05, vs. the control group † P < 0.05 vs T0

[Perioperative changes in Scr and eGFRs]

Renal failure indices, fractional excretions of sodium (FE_{Na}), urine N-acetyl-beta-D-glucosaminidase to creatinine ratios (U_{NAG}/U_{Cr}), and urine microalbumin to creatinine ratios (U_{Alb}/U_{Cr}) at T1, T2 and T3 and changes in these variables over time were not significantly different in the groups.

Conclusions: Intraoperative infusion of dexmedetomidine might reduce the incidence of AKI and suppress post-bypass eGFR decline, but was not found to improve other renal biomarkers after paediatric open heart surgery.

05AP03-5

Incidence of neuromuscular relaxation after magnesium sulphate 60 mg kg⁻¹ in paediatric patients

Carlos R.V.¹, Cardoso P.F.N.¹, Torres M.L.A.¹, de Boer H.D.²

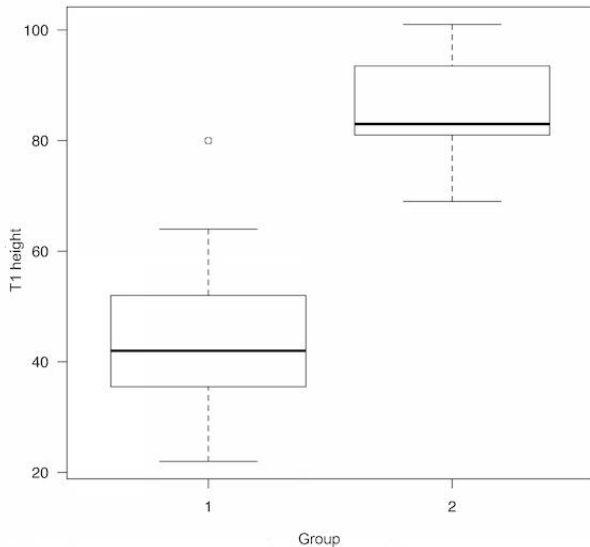
¹Child Institute, Hospital das Clínicas, São Paulo University Medical School, Dept of Anaesthesiology, São Paulo, Brazil, ²Martini General Hospital, Dept of Anaesthesiology & Pain Medicine, Groningen, Netherlands

Background and Goal of Study: The use of magnesium sulphate during anaesthesia has increased in recent years because it benefits patients with various clinical conditions, such as pre-eclampsia, cardiac arrhythmias, acute bronchospasm and postoperative pain. The main endpoint of the present study was to evaluate the incidence of neuromuscular relaxation after administration of magnesium sulphate 60 mg kg⁻¹ with two different anaesthesia techniques: inhaled anaesthesia (sevoflurane) and total intravenous anaesthesia (TIVA). We conducted a prospective study to investigate this hypothesis.

Materials and Methods: 23 patients age 2-13 scheduled for abdominal and/or perineal surgery were included in the study. Anaesthesia maintenance was performed with inhaled anaesthesia (sevoflurane - group 1) or intravenous anaesthesia (continuous infusion of propofol - group 2). No neuromuscular blocking drug was used in this study. After stable response of neuromuscular monitoring, magnesium sulphate 60 mg.kg⁻¹ was administered within 10 minutes. Serum magnesium levels were collected before and after.

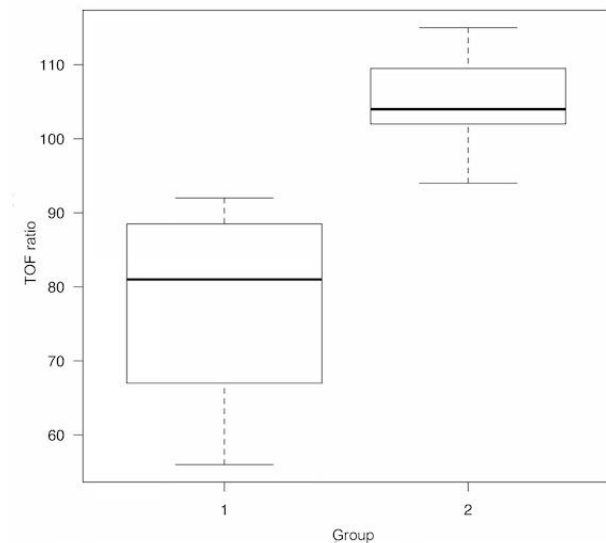
Results and Discussion:

1. T1 height comparison between groups is shown in figure 1;
 2. TOF ratio comparison between groups is demonstrated in figure 2;
- Serum magnesium concentration after bolus in both groups is presented in figure 3.



[Figure 1. Lowest T1 height after bolus]

Mean T1 height (%) after magnesium sulphate 60 mg kg⁻¹. Group 1 - inhaled anaesthesia (sevoflurane), group 2 - intravenous anaesthesia; $p < 0.001$.



[Figure 2. Lowest TOFR after bolus]

Mean TOF ratio (%) after magnesium sulphate 60 mg kg⁻¹. Group 1 - inhaled anaesthesia (sevoflurane), group 2 - intravenous anaesthesia; $p < 0.001$.

Conclusion(s): A single dose of magnesium sulphate 60 mg kg⁻¹ associated with inhaled anaesthesia (sevoflurane) presents the risk of curarisation (TOF < 0.9) in paediatric patients. The use of NMM is recommended to increase the safety margin.

05AP03-6

Does the depth of neuromuscular blockade influence surgical conditions during paediatric laparoscopic surgery? Preliminary results of a randomized controlled study

Szturzová K., Knoppová L., Burgetová A., Ťoukálková M., Klučka J., Štourač P., The PedLapBlock Study Group
Faculty of Medicine, Masaryk University and University Hospital
Brno, Department of Paediatric Anaesthesiology and Intensive Care
Medicine, Brno, Czech Republic

Background: Muscle relaxants, including cisatracurium and rocuronium, are a necessary part of laparoscopic surgery even in paediatric patients. The aim of the PedLapBlock trial (NCT02546843) is to investigate whether the depth of the muscle relaxation can improve the quality of the surgical field and thus increase the comfort of the surgeon.

Methods: Since February 2016, we have randomly assigned eligible patients between 2 years 0 days and 17 years 364 days of age, who were planned for laparoscopic surgery, in two groups according to the depth of neuromuscular block. Group A received rocuronium (starting dose 0.6 mg/kg, boluses 0.3 mg/kg) to induce and maintain deep neuromuscular block (train-of-four count [TOF] 0 and post-tetanic count [PTC] 1) followed by sugammadex reverse (2-4 mg/kg, depending on TOF). In Group B, intermediate neuromuscular blockade (TOF 1-2) produced by cisatracurium (starting dose 0.15 mg/kg, boluses 0.03 mg/kg) was reversed using neostigmine (0.03 mg/kg) and atropine (0.02 mg/kg). To assess surgical conditions during laparoscopy, a 5-point scoring system (from 1=optimal to 5=extremely poor conditions) was adopted. Means were compared using t-test.

Results: As of December 7, 2016, 20 patients were evaluated (mean age 13.5 years [range 5-17]; mean weight 53.3 kg [range 20-90]; median ASA score 1 [range 1-2]; median Mallampati score 1 [range 1-2]). Types of surgical procedures comprised appendectomy (n=16), splenectomy (n=1), pyeloplasty (n=2), and cholecystectomy (n=1). Satisfaction of surgeons, as measured by the 5-point scoring system, was comparable between the two study arms (mean: 1.4 ± 0.7 vs 1.2 ± 0.4 in Groups A vs B, $p=0.43$). Mean capnoperitoneum pressure and duration were 9.7 mmHg [range 7-12] and 39.5 min [range 14-188], respectively, with a tendency towards lower pressures in Group A (mean: 9.1 ± 1.1 vs 10.1 ± 1.3 , $p=0.08$). The mean time to first EtCO₂ wave was significantly shorter in Group A (118.3 ± 36.2 s) compared with Group B (177.5 ± 45.5 s, $p < 0.01$). When looking at the time from the last skin stitch to extubation, roughly corresponding to recovery time from neuromuscular block, the difference also reached statistical significance (mean: 683.4 ± 214.5 vs 1045.8 ± 322.4 s in Groups A vs B, $p=0.02$).

Conclusion: The presented preliminary results show that both levels of neuromuscular blockade (deep versus intermediate) are feasible in paediatric patients undergoing laparoscopic surgery.

Supported by MZ ČR - RVO (FNBr, 65269705).

05AP03-7

Sugammadex versus neostigmine in reversing neuromuscular block induced by rocuronium during adenotonsillectomy in pediatric patients

Moustafa A., El Sharkawy O., Miligy A., Abo Ali A.
Menoufia University, Dept of Anaesthesiology & Intensive Care,
Menoufia, Egypt

Background and Goal of Study: Residual neuromuscular blockade is associated with increased risk of post operative critical events. Sugammadex is a new specific agent provides a rapid and complete reversal of neuromuscular blockade induced by rocuronium.

The goal of this study is to compare sugammadex and neostigmine as regard efficacy, safety and side effects of both drugs in pediatric patients undergoing a denotonsillectomy.

Materials and Methods: Forty pediatric patients undergoing elective adenotonsillectomy with standard propofol-fentanyl-rocuronium-isoflurane anaesthesia were divided randomly into two equal groups (n=20) either received sugammadex 2mg/kg or neostigmine 0.03mg/kg and atropine 0.01mg/kg body weight at the end of operation when T2 appeared by train of four TOF watch acceleromyography (SX model) monitoring. When TOF ratio 0.9 was reached, patients were extubated. Time to reach TOF ratio 0.9 after reverse given, hemodynamic alteration and adverse effects were recorded and compared.

Results and Discussion: Children in sugammadex group attained 0.9 TOFR in statistically shorter time (88 +/- 45.4 seconds) than those in neostigmine group (415.8 +/- 227.5 seconds), heart rate was significantly increased in neostigmine group at 2, 5 and 10 minutes. Comparison of adverse effects yielded no difference.

Conclusion(s): Sugammadex reversed rocuronium induced neuromuscular blockade in pediatric patients more rapid, effective and safe when compared with neostigmine.

05AP03-8

Electrophysiologic cardiac safety of intravenous lidocaine infusion in children

Fesenko U.¹, Perova-Sharonova V.², Albokrinov A.²

¹Danylo Halytsky Lviv National Medical University, Dept of Anaesthesiology & Intensive Care, Lviv, Ukraine, ²Lviv Regional Children's Clinic Hospital, Dept of Anaesthesiology & Intensive Care, Lviv, Ukraine

Background and Goal of Study: Intravenous (IV) lidocaine infusion is widely used for intraoperative (IO) and postoperative (PO) analgesia and PO ileus treatment after abdominal surgery. There is speculation in scientific literature about similar efficacy and less invasiveness of IV lidocaine infusion compared to epidural anesthesia (EA). Effect of IV lidocaine infusion on cardiac electrophysiology in children is not studied well.

Objective: To study the effect of PO IV lidocaine infusion on basic cardiac conduction intervals in children.

Materials and Methods: Twenty-one 6 to 14 years old children with acute appendicular peritonitis or acute bowel obstruction due to intestinal/colo-intestinal intussusception who undergone surgical treatment were randomized into 2 groups ("EA", n=12 and "IV Lidocaine", n=9) before surgery. Children with cardiac pathology were excluded from this study. Groups did not differ in diagnosis, age, body weight, sex and ASA physical status. Propofol/fentanyl-based total IV anesthesia with mechanical ventilation was used for induction and maintenance of general anesthesia. In "EA" group EA was performed in lateral position at Th12-L1 level and EA catheter was advanced 3-5 cm cranially. Bupivacaine 0.25% 0.5 ml/kg bolus was administered prior to surgery and bupivacaine 0.25% infusion 4-6 ml/kg*h was started. In "IV Lidocaine" group 1.5 mg/kg IV lidocaine bolus was administered 30 min prior to surgery and IV lidocaine infusion 1.5 mg/kg*h was started. Epidural bupivacaine and IV lidocaine infusions lasted 3 PO days. Besides standard IO and PO monitoring, Holter monitoring during 3 PO days was used to analyze ECG intervals (PQ, QRS, QTc).

Results and Discussion: HR and basic ECG intervals did not differ significantly between groups. Main study results are shown in Table 1.

	IV lidocaine	EA	P
PQ (ms)	161.4±23.4	157.1±23.6	0.74
QRS (ms)	75.7±18.1	74.3±16.2	0.88
QTc (ms)	421.3±42.1	408.0±48.0	0.59
HR (bpm)	92.6±13.3	84.6±19.1	0.38

[HR and basic ECG intervals in "EA" and "IV Lidocai"]

Conclusion(s): IV lidocaine administration in recommended doses (1.5 mg/kg bolus followed by 1.5 mg/kg*h infusion) is safe in terms of cardiac electrophysiology in children.

05AP04-1

The relevance of fluid and blood management using microcirculatory parameters in children undergoing craniofacial (CF) surgery

Kilicaslan B.¹, Canbay O.¹, Saylan A.¹, Akinci S.B.², Tuncbilek G.³, Ince C.⁴

¹Hacettepe University, Dept of Anaesthesiology & Intensive Care, Ankara, Turkey, ²Hacettepe University, Dept of Intensive Care, Ankara, Turkey, ³Hacettepe University, Dept of Surgery, Ankara, Turkey, ⁴University of Amsterdam and Erasmus University, Dept of Translational Physiology and Intensive Care Unit, Amsterdam and Rotterdam, Netherlands

Background and Goal of Study: Managing the bleeding pediatric patient perioperatively can be extremely challenging. Non-invasive techniques such as orthogonal polarization spectral (OPS) imaging has allowed clinicians and researchers to perform bed-side monitoring of the microvascular network. Therefore, this present study was performed to investigate the effects of blood management using simultaneous macro- and microhemodynamic parameters measurement in children undergoing craniofacial surgery.

Materials and Methods: 14 children who underwent surgery were included in this study. The indications for RBC transfusion were changes of hb/hct levels, the presence of signs of altered tissue perfusion (i.e elevated lactate) and impaired microcirculation images. A 8% change from baseline capillary perfusion density was accepted as a clinically significant change to guide management. Haemodynamic variables (HR, MAP, CVP), laboratory parameters (Hb, Htc, lactate, SvO2 and K⁺) and microcirculatory variables (Total vascular density-TVD (mm/mm²), microvascular flow index-MFI (AU), perfused vessel density-PVD (mm/mm²), proportion of perfused vessels-PPV (%) of vessels were obtained baseline(T1), before(T2) and after RBC transfusion(end of the operation)(T3). These images have been analysed by using AVA (Automated Vascular Analysis) software. Data was analysed by Friedman, Wilcoxon and Spearman correlation test.

Results: 4 patients did not need RBC transfusion because of sufficient Hb values in whom a decrease in microcirculation parameters was observed which did not return to baseline values. In the other 10 patients who received RBCs, capillary perfusion was higher at T3 when compared with the values of at T2 (from 11.47(9.16-12.93) to 13.83(10.04-16.87); 12%, >8%)(p<0.05). Six patients reached baseline microcirculatory values(T1). RBC transfusions increased hct% values from 16.4(12.3-20.9)(T2) to 18.2(14.8-23.5)(T3)(p<0.05). There was no significant correlation between microvascular changes and other hemodynamic and tissue perfusion parameters (p>0.05).

Conclusion(s): The sublingual microcirculation could change by RBC transfusion but there was not any correlation between microcirculation changes, hemodynamic and tissue perfusion parameters even with hct values. The indication, guidance and timing of fluid and blood therapy may be assessed by bedside microvascular analysis in combination with standard haemodynamic monitoring.

05AP04-2

Activation of the protocol of massive hemorrhage in a pediatric university hospital. Retrospective analysis of two years

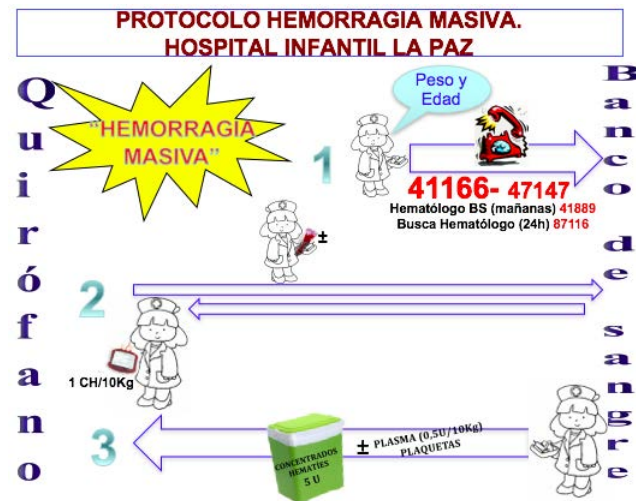
Pérez Ferrer A., Viejo Llorente A., Navarro Suay R., Latorre J, La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Introduction and Objectives: The pediatric patient has a limitation of adaptation to hypovolemia, which is the origin of 12% of cardiorespiratory arrest in children. For this reason, it is essential to develop protocols that facilitate the unification of criteria and communication between services and professionals and give a rapid response to a critical situation such as massive hemorrhage (MH).

We present the protocol of MH of La Paz Children's University Hospital and the analysis of its activation in a two years period.

Materials and Methods: A retrospective descriptive analysis of the activation of MH protocol of La Paz Children's University Hospital between 2013 and 2014. Data were collected on the number of patients per year and the number of concentrated red blood cells.

We also present the hospital protocol based on improved communication with the blood bank, the use of a hemostatic resuscitation protocol through the administration of component packages and the use of point of care monitoring using ROTEM™.



[Image 1]

Results and Discussion: The analysis of the first two years of operation of the massive hemorrhage protocol of the La Paz children's hospital shows a total of 9 activations (5 in 2013 and 4 in 2014). The mean and standard deviation of RBC transfused was 7.6 (\pm 6.4) and 6 (\pm 1.6) units per patient respectively, with a maximum of 19 units and a minimum of 4.

As reported in several studies, the proportion of RBC is higher than that of other blood components (FFP and PC), whose transfusion can sometimes be reduced or even avoided using factor concentrates (fibrinogen or prothrombin complex).

Conclusions: Every hospital must have a protocol of massive hemorrhage adapted to its characteristics that allows a coordinated and rapid response that corrects and avoids, as much as possible, hypovolemia and coagulopathy.

05AP04-3

Craniosynostosis surgery in infants-transfusion requirements

Nastasovic T.¹, Milakovic B.¹, Stosic M.¹, Kaludjerovic M.¹, Lazarevic I.¹, Grujicic D.²

¹Clinical Center of Serbia, Dept of Anaesthesiology & Intensive Care, Belgrade, Serbia, ²Clinical Center of Serbia, Clinic for Neurosurgery, Belgrade, Serbia

Background and Goal of Study: The most important risk to the infant during primary craniosynostosis repair is blood loss. The assessment and accurate replacement of this loss is a major concern for the anesthetist.

Materials and Methods: Retrospective review of the records of 74 consecutive young children who underwent craniosynostosis surgery between 2005 and 2015 in one center was conducted to determine transfusion requirements, to document morbidity, and to identify causative variables associated with transfusion.

Operative age and weight, affected suture(s), neurosurgeon, anesthesiologist, preoperative and postoperative hematocrit, and transfusion volumes of blood and crystalline products were recorded. Transfusion volumes were converted to percent estimated red cell mass for analysis.

Results and Discussion: Affected sutures were: sagittal 24, metopic 21, bicoronal 14, unicoronal 9, and lambdoid 7. Mean operative age was 7.5 months, and weight 8.3kg. Mean preoperative hematocrit was 32 percent. Seventy five percent of patients had postoperatively hematocrit of 27 percent or greater. This hematocrit was unrelated to age during surgery. Mean intraoperative transfusion was 65 \pm 42 percent estimated red cell mass. Transfusions differ statistically among suture(s), neurosurgeons and anesthetists.

Conclusion(s): Blood loss during craniectomy for primary craniosynostosis surgery is significant. The anesthetist and neurosurgeon may be equally or more important than the affected sutures as causal variables in transfusion.

References:

- Eaton AC, Marsh JL, Pilgram TK. Transfusion requirements for craniosynostosis surgery in infants. *Plast Reconstr Surg* 1995; 95:277.
- Kearney RA, Rosales JK, Howes WJ. Craniosynostosis: an assessment of blood loss and transfusion practices. *Can J Anaesth* 1989; 36(4):473-477.

Acknowledgements: We thank our colleagues from Clinic for Neurosurgery, Clinical Center of Serbia, both the anesthetists and the neurosurgeons, who performed the neurosurgical interventions, although they may not agree with all of the interpretations of this abstract.

05AP04-4

Prospective single blinded randomized controlled study comparing the efficacy of epsilon-aminocaproic acid and tranexamic acid in pediatric patients undergoing elective idiopathic scoliosis surgery

Moguilevitch M.¹, Vivek K.²

¹Montefiore Medical Center, Dept of Anaesthesiology, Bronx, United States, ²Einstein College of Medicine, Dept of Anaesthesiology, Bronx, United States

Background and Goal of Study: Epsilon-aminocaproic acid (EACA) and tranexamic acid (TXA) are routinely used to prevent significant blood loss during multilevel pediatric scoliosis surgeries. Efficacy of these anti-fibrinolytic drugs was demonstrated in cardiac, total joint arthroplasty and in adult spine surgeries. To date very few studies have compared the efficacy of these drugs in multilevel pediatric scoliosis surgeries. Purpose of this study was to compare the efficacy of EACA and TXA in reducing intraoperative blood loss, post-operative drain output and blood transfusion requirements.

Materials and Methods: This is a single center, prospective, single blinded, randomized controlled pilot study comparing the efficacy of TXA and EACA used intra-operatively in pediatric patients undergoing multilevel idiopathic scoliosis corrective surgery. After obtaining IRB approval, idiopathic scoliosis patients undergoing corrective surgery were randomly assigned to one of the two groups - TXA or EACA. The following parameters were analyzed: intraoperative estimated blood loss (EBL), perioperative blood transfusion requirements, surgical drain output on post operative day (POD)-1, POD-2, POD-3 and total 72 hr drain output.

Results and Discussion: Forty six patients were randomly assigned to receive TXA (n=23) and EACA (n=23). Groups were similar at baseline with regards to weight, starting hematocrit level and gender distribution. Age and number of spinal fusion levels were different in the two groups. The median (25th and 75th percentile) EBL in TXA and EACA group were 600 (400-800) and 600 (450-800) respectively, p value 0.580. The median 72 hours drain output in the TXA and EACA group were 303.5 (186.5-553) and 330 (165-513) respectively, p value 0.991. Additionally there were no differences in the blood transfusion requirements between the two groups.

Conclusion: TXA and EACA showed no difference in EBL, 72 hour drain output and blood transfusion requirements in patients undergoing idiopathic scoliosis repair. The endpoints analyzed did not demonstrate superiority of one drug over the other. Limitations of the study are single center, small sample size; anesthesiologist was not blinded to the treatment and occurrence of baseline differences in the two groups.

05AP04-6

Anesthetic management of pediatric patients with Congenital Rubella syndrome: our experience and a review of the literature

Khanna P.¹, Sinha R.¹, Arora M.¹, Agarwal A.², Subramanian R.¹, Dass C.¹

¹AIIMS, New Delhi, Dept of Anaesthesiology & Intensive Care, New Delhi, India, ²Fortis Hospital, Noida, U.P., Dept of Anaesthesiology & Intensive Care, Noida, India

Background and Goal of Study: Rubella is a disease with mild maculo-papular rashes, but it is a teratogen and can cause varied congenital malformations in the newborn. These anomalies are collectively called as CRS (Congenital Rubella Syndrome CRS may present with (one or more) cataracts, congenital

glaucoma, congenital heart disease, hearing impairment, pigmentary retinopathy, purpura, hepatosplenomegaly, jaundice, microcephaly, developmental delay, meningoencephalitis, or radiolucent bone disease.

As an Anesthesiologist we encounter such children most commonly during ophthalmic surgeries, cardiac surgeries, and cochlear implant surgeries and during imaging studies these cases are still an anesthetic challenge due to scarce literature on perioperative management of such children. We performed a retrospective review of the perioperative course of 46 cases of CRS, who underwent ophthalmic surgery in our institute.

Materials and Methods: Institutional ethical committee approval was obtained. Medical records of patients with CRS who have had ophthalmic surgeries in our institute were collected and reviewed.

Case records that were incomplete were excluded. Demographic data, present cardiac anomaly, extra cardiac manifestations, symptomatic heart disease, cardiac drug therapy, coexistent mental retardation were the preoperative variables collected. Intraoperative variables were type of anesthesia, analgesia, airway, other cardio-respiratory events or anesthetic complications. Postoperative cardiac failure, respiratory distress & intensive care (ICU) stay were noted.

Results and Discussion: Total of 46 cases were eligible for analysis, demographics along with other preoperative variables were analyzed. Study group consisted of equal numbers of children in age group between (0-6months) & (>1 year). Most of the children were male. Of the 46 children 33 had congenital cataract (71.74%) and congenital glaucoma were noted. Patent Ductus Arteriosus was the most common isolated cardiac anomaly we encountered with 16 of 46 having uncorrected PDA. Pulmonary stenosis (PS) with PDA was the next common.

Conclusion(s): CRS is a multiorgan dysfunction with varied cardiac anomalies, knowledge about varied manifestations and apt clinical suspicion is vital. Extreme care should be exerted in children with CRS and symptomatic heart disease to improve perioperative outcomes.

05AP04-7

Anesthesia for Mowat-Wilson syndrome

Calhau R.¹, Calvão Santos C.², Borges Marques J.³, Trindade H.³

¹Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal, ²Centro Hospitalar de Trás-dos-Montes e Alto Douro, Dept of Anaesthesiology & Pain Medicine, Vila Real, Portugal, ³Hospital Dona Estefânia - Centro Hospitalar de Lisboa Central, Dept of Anaesthesiology, Lisboa, Portugal

Background: Mowat-Wilson Syndrome (MWS) is a genetic condition with facial, gastrointestinal and neurologic characteristics.

Case report: We present the case of a 15 year-old (25 kg) ASA III patient with history of MWS, which includes Hirschsprung disease, epilepsy and mental retardation.

Admitted to the hospital for severe upper gastrointestinal bleeding associated with pyloric stenosis and marked gastric distension, she was proposed for a laparoscopic gastric sleeve and gastrojejunostomy.

Physical examination revealed deep-set eyes, broad nasal bridge, prominent and pointed chin, heavy eyebrows and macroglossia. Apart from these there were no further criteria for difficult airway (DA) - Mallapanti I, mouth opening >3 cm. Laboratory results and chest x-ray were normal.

We proceeded with a rapid sequence induction (RSI) using Alfentanil 20 mcg/kg, Propofol 3 mg/kg and Rocuronium 1.2 mg/kg. The laryngoscopy was classified as Cormack I and the patient was easily intubated. Anesthesia was maintained with Sevoflurane (MAC and BIS guided), Oxygen/Air and Remifentanyl. Before the incision a bilateral ultrasound-guided quadratus lumborum block (Ropivacaine 0.375% 10 mL each side) was done using a 120 mm needle. Intraoperative monitorization included ASA-standard, invasive blood pressure, pulse pressure variation, central venous catheter and neuromuscular blockade (NB).

The surgery went on without mishappenings, NB was reversed with Sugammadex 2 mg/kg and the patient safely extubated.

Discussion: Management of the airway represents the biggest challenge to the anesthesiologist. In this case we were confronted with a high risk of aspiration. As it would be difficult for the patient to cooperate with an awake intubation we decided for a RSI. However, the DA car, including a fibroscope, was readily available.

References: Deshmukh AS, Kelkar KV, Khedkar SM, Gavali Y. Anaesthetic management of Mowat-Wilson syndrome. Indian Journal of Anaesthesia. 2016;60(4):292-294.

Learning Points: Adequate planning of tracheal intubation is essential while managing patients with rare and barely known syndromes. Regional anesthesia provides good analgesia with an opioid sparing effect.

05AP04-8

Anesthetic management of a child with neuroblastoma: always a challenge

Davila B.¹, Guerra M.², Vaz S.³

¹Centro Hospitalar Baixo Vouga, Dept of Anaesthesiology, Aveiro, Portugal, ²Centro Hospitalar São João, Dept of Anaesthesiology, Porto, Portugal, ³Unidade Local de Saúde de Matosinhos, Dept of Anaesthesiology, Matosinhos, Portugal

Background: We present a case of anesthesia for retroperitoneal neuroblastoma surgery, emphasizing the perioperative anesthetic management.

Case report: A 3-year-old, 14 kg male was scheduled to undergo excision of a retroperitoneal high risk neuroblastoma. The patient has been followed in oncology since 2014 by this tumor. On physical examination, he had a good nutritional status. He presented a distended abdomen and a mild hepatomegaly. Laboratory test did not show relevant changes and catecholamines dosages was normal.

Discussion: Intra-abdominal tumors cause an increase in abdominal pressure that increase the risk of aspiration. The compression of inferior vena cava decrease preload and reduce cardiac output. The displacement of the diaphragm decreased pulmonary compliance and causes atelectasis. The secretion of catecholamines by the tumor is often responsible for the cardiovascular changes and hypertensive crises may occur during laryngoscopy or tumor manipulation. The anesthetic approach should minimize the adrenergic stimulation that may arise. Adequate monitoring should be available to detect hemodynamic changes and to monitor treatment. Neuroaxial Blocked inhibits the physiological response to surgical stimulation but has no effect on the release of catecholamines from tumor cells. It seems prudent avoid histamine releasing drugs. In this patient already submitted to chemotherapy we must pay attention to its adverse effects, especially cardiac toxicity by anthracyclines.

References: Anesthetic management of children with neuroblastoma. Kain, ZN; Shamberger, RS. Holzman, RS. J Clin Anesth.1993 Nov-Dec;5(6):486-91 Catecholamine-secreting neuroblastoma in a 4-month-old infant: perioperative management. Hernandez MR, Shamberger RC, Seefelder C. J Clin Anesth.2009;21:54-6.

Learning points: Neuroblastoma is related to the presence of hemodynamic changes due to its potential to secrete catecholamines. Anaesthesiologist should ensure proper monitoring, anticipate hemodynamic changes and provide early treatment if necessary.

05AP04-9

Kabuki syndrome - an anesthetic challenge

Oliveira C., Saura C., Pereira V., Sampaio J.

HGO, Dept of Anaesthesiology, Almada, Portugal

Background: Kabuki syndrome (KS) is a rare congenital syndrome characterized by multiple malformations, characteristic facial features and cognitive deficit. Five cardinal manifestations have been described: "peculiar face", skeletal anomalies, dermatoglyphic anomalies, mental retardation and growth retardation(1); other abnormalities include hypotonia, cardiovascular malformations, urinary tract malformations and epilepsy.

The aim of this case is to report a case of an anesthetic approach to a patient with KS.

Case report: We present a case of 12-year-old female with KS including facial dysmorphies, post natal growth deficiency, epilepsy and generalized hypotonia, proposed to a piloricoma excision as an outpatient. Anti-convulsant therapy was maintained. The anesthetic induction and maintenance included a TIVA with propofol and remifentanyl. The airway was first and successfully approached with an i-gel supraglottic airway device to avoid neuromuscular blockade; preparations for a possible difficult airway were made. Due to higher incidence of latex allergies in these patients, the latex allergy protocol was applied. The laryngeal mask was removed after surgery and the patient admitted to a post-anaesthesia care unit.

Discussion: KS is known for a variable phenotypic expression, for that reason the anesthesiologist must perform a careful physical evaluation to be prepared for some specific concerns. Airway evaluation is an important aspect of physical examination once this children often presents with multiple facial malformations that can determine a difficult airway. Heart congenital defects are present in almost 50% of these patients(2), with a wide spectrum of malformations; a pre-operative assessment of cardiac malformations and function should be made. Hypotonia is other common characteristics that may present a challenge to the anesthesiologist, with concerns about malignant hyperthermia and neuromuscular blockade. Epilepsy presents in 19% of children with KS; concerns with the anti-convulsant therapy at the day of surgery and interaction with non depolarizing muscle relaxant must be taken.

References: 1. Johnson G, Mayhew JF *Anaesthesia for a child with Kabuki Syndrome*. Paediatr. Anaesth. 2007; 17 (9):900-901

Learning points: KS is a disease that presents multiple concerns for the anesthesiologist, who should be aware of possible difficult airway, congenital heart disease, epilepsy, muscular disorders and latex allergies.

05AP04-10

A safe surgical and anesthesia approach in a full term baby girl with a rare presentation of combination: myelomeningocele and unknown anatomy of tracheoesophageal fistula

Russo-Menna L., Kenneth Potter, MD

Virginia Commonwealth University - Health System, VCU-HS, Dept of Anaesthesiology, Richmond, United States

Background: A full term female baby born to a healthy G3P3 female via SVD complicated by 2 vessel cord and meconium. Prenatal ultrasound had revealed a lumbosacral defect, which was confirmed as myelomeningocele at birth. Neurosurgery consulted.

Case report: A full term female baby born to a healthy G3P3 female via SVD complicated by 2 vessel cord and meconium. Prenatal ultrasound had revealed a lumbosacral defect, which was confirmed as myelomeningocele at birth. Neurosurgery consulted, and patient posted for repair four hours later. NICU attempted NG tube, however chest X-ray demonstrated coiling in the proximal esophagus, suggestive of blind pouch versus tracheoesophageal fistula.

Discussion: This case was a rare example of multiple combined central lesions, which resulted in complicated anesthesia care, and a good example of difficulty that can result from abnormal physiology and anatomy of the airway, and spinal cord and how to manage it.

References:

1. Chand MB, Agrawal J., Dr. P Bista Anaesthetic Challenges and Management of Myelomeningocele Repair. PMJN, Vol 11, Number 1, Jan-Jun 2011 Costa P, Bruno A,
2. Bonzanino M, et al. Somatosensory and motor-evoked potential monitoring during spine and spinal cord surgery. Spinal Cord 2007;45:86-91N.
3. Munevver Uluba, M.D.Sabriye Dayi, M.D.*Tracheoesophageal Fistula in a NewbornN Engl J Med 2014; 371:e23October 16, 2014DOI: 10.1056/NEJMicm1314269
4. Soundararajan and M. Cunliffe ; Anaesthesia for spinal surgery in children, Br J Anaesth (2007) 99 (6): 917-918

Learning Points: Anesthesia implications and challenges in double complex difect in new born with Myelomeningocele and TEF

05AP05-1

The effect of LMA Supreme and LMA ProSeal on intraocular pressure in children undergoing strabismus surgery

Türkyılmaz N.¹, Arslan Z.I.¹, Altıntaş Ö.², Solak M.¹

¹Kocaeli University Medical Faculty, Dept of Anaesthesiology & Intensive Care, Kocaeli, Turkey, ²Kocaeli University Medical Faculty, Dept of Surgery, Kocaeli, Turkey

Background and Goal of Study: It was shown that endotracheal intubation increases intraocular pressure higher than supraglottic airway devices.¹ We aimed to compare the effects of insertion and removal of the LMA ProSeal and the LMA Supreme on intraocular pressure in pediatric patients undergoing elective strabismus surgery.

Materials and Methods: Fifty-four patients, ASA (American Society of Anaesthesiologists physical status) I-II, between the ages of 1-12 years were included in this study. After premedication with intravenous midazolam (0,03 mg/kg), anesthesia was induced with propofol and fentanyl. A neuromuscular blocker agent was not administered. Intraocular pressures, heart rate, systolic and diastolic blood pressures of the patients were recorded before and after the induction, after the insertion and three minutes after the insertion of the airway device, at the end of the surgical procedure and after the removal of the airway device. Development of oculocardiac reflex during the perioperative period and postoperative nausea and vomiting were recorded.

Results and Discussion: Age, weight, gender and ASA scores were similar between the two groups. Both airway devices were inserted successfully at the first attempt in all patients. LMA Supreme raised intraocular pressure more than the LMA ProSeal after insertion, at the end of the surgical procedure and after removal (p=0,005, p=0,04 and p=0,008). Intraocular pressure returned back to control levels after three minutes. Heart rates, systolic and diastolic blood pressure values were similar. No difference was found between the two groups related to the development of oculocardiac reflex and postoperative nausea and vomiting.

Conclusion(s): LMA Supreme raised the intraocular pressure more than that of LMA ProSeal after insertion, at the end of the surgical procedure and after the removal.

References: 1. İsmail SA, Bisher NA, Kandil HW, Mowafi HA, Atawia HA. Intraocular pressure and haemodynamic responses to insertion of the i-gel, laryngeal mask airway or endotracheal tube. Eur J Anaesthesiol 2011; 28: 443-48.

05AP05-3

Airway management in a paediatric patient with a large tongue lymphangioma

Benigni A., Maffioletti M., Locatelli B., Sonzogno V.

Papa Giovanni Hospital, Dept of Anaesthesiology & Intensive Care, Bergamo, Italy

Background: Lymphangiomas are malformations of the lymphatic system, often involving the oral cavity, head and neck, and making airway management difficult

Case report: We present the case of a 16 months old male affected by a large tongue base mass, confirmed to be a lymphangioma by a previous MRI performed under i.v. sedation three months before. The lesion has grown very quickly from the tongue base, becoming protrusive and leading to dehydration, malnutrition, infection and aspiration. The breath had become snoring, although respiratory distress never occurred.

The patient was scheduled for excision surgery under general anaesthesia. The oral airway approach was not feasible due to the large tongue mass occupying the whole intraoral space. The fiberoptic intubation under sedation was mandatory.

The most challenging aspect of this case was to plan a pharmacological strategy to achieve adequate level of sedation while maintaining spontaneous breathing during the procedure. Subsequent to the mask induction by sevoflurane 3% and N2O/air 2:1, venous access was obtained. A successful nasal fiberoptic intubation by a 3,0 mm videobronchoscope under sedation and spontaneous ventilation was performed using ketamine 2mg/kg iv, atropine 0,02 mg/kg iv, midazolam 0,1 mg/kg iv and topical lidocaine 1%. Passive 3l/min flow oxygen via a 4.0 nasotracheal tube was utilized. Desaturation, bleeding and coughing did'nt occur during the procedure. Sialorrhoea was not observed.

Discussion: Conventional endotracheal intubation methods, including the use of video laryngoscope, can be impossible with a mass in oral cavity. In such cases the fiberoptic intubation is the option of choice. A balanced and careful pharmacological approach is critical in order to achieve a good plane of sedation without depressing spontaneous breathing. Ketamine associated with midazolam and topic lidocaine is a safe option for this purpose.

References: Bhalla AP, Mehta S, Garg R - Anaesthetic management of a child posted for excision of lymphangioma of the tongue - Singapore Med J 2012;53(3)

Learning points: There is limited information on the optimal anaesthetic management for fiberoptic intubation in children with a tongue lymphangioma. The association ketamine/midazolam is a valuable option.

05AP05-5**Pediatric difficult airway management: a case report**

Alvar E., Denis S., Reinoso F., Gilsanz F
Hospital Universitario La Paz, Dept of Anaesthesiology, Madrid, Spain

Background: Anaesthesiologists' training in difficult airway is usually centred in the adult patient, and we normally apply the adult guidelines to the paediatric patient.

Case report: We present the case of a two-year-old infant with a facial malformation which included mainly subcutaneous fat on the right cheek, displacing the facial midline. It was diagnosed prenatally but this was the first surgery to correct it. We performed an inhalatory induction with sevoflurane (increasing gradually from 2% to 8%), with a good adaptation and ventilation with a facial mask, maintaining spontaneous ventilation throughout the process.

Afterwards, an intravenous access was established. We prepared a pediatric fibreoptic device in case we needed to use it, but finally we did not use it. We performed a direct laryngoscopy where we could see a light tracheal displacement, but we classified it as Cormack-Lehane I and introduced a tracheal flexometallic 4.5 mm tube.

Then, intravenous propofol and fentanyl were administered. Surgery went on without any complications, but the patient developed an important mucosal edema. We administered hydrocortisone before any attempt of extubation. We used a Cook airway exchange catheter when the patient had already recovered spontaneous ventilation but was still under deep anaesthesia. The tracheal tube was removed, we checked a correct ventilation with the Cook catheter, and then it was also removed to avoid any stimulus on the airway. The patient woke up without incidents and was transferred to the post-anaesthetic care unit.

Discussion: Pediatric difficult airway deserves a special section between the difficult airway algorithms[1], although the most recent guidelines already have a separate section on this issue. Paediatric[2] patients are looked after in many hospitals and specialist paediatric services are neither necessary nor appropriate in all settings. Not only intubation, but also extubation is a dangerous moment, as a laryngospasm on a paediatric patient with a difficult airway might be a true nightmare.

References:

1. <https://www.das.uk.com/guidelines/paediatric-difficult-airway-guidelines>
2. Paediatric difficult airway management: what every anaesthetist should know!

Br. J. Anaesth. first published online April 19, 2016

Learning points: It is important for the anaesthesiologist to know the differences between the pediatric and adult airway and the management of a difficult airway in both cases.

05AP05-6**A novel nasal PAP mask assembly provided continuous active oxygenation in a paediatric patient with OSA during induction of GA for appendectomy**

Tse J., Landgraf B.R., Patel B., Shah U., Barsoum S.
Rutgers Robert Wood Johnson Medical School, Dept of Anaesthesiology, New Brunswick, United States

Background: Patients with OSA can provide difficulties with oxygenation and ventilation after general anaesthesia (GA) induction. A nasal PAP mask assembly has been shown to maintain oxygenation by delivering nasal CPAP, BiPAP or PPV in adult patients with OSA during sedation, GA or awake/asleep endotracheal intubation (ETI).¹⁻⁴ However, it has rarely been used in paediatric patients.^{5,6} We used it in a paediatric patient with OSA for GA induction for laparoscopic appendectomy.

Case Report: A 8-year-old, 133 cm, 42 kg, male with OSA s/p tonsillectomy and adenoidectomy (T&A), presented with acute appendicitis for laparoscopic appendectomy on a Saturday. His father described some difficulty breathing at night in the patient consistent with OSA despite past T&A. His father gave his consent to use a nasal mask and for taking photographs for case-report. The patient received 2 mg midazolam and was transported to the OR in a calm manner. An infant mask (#2) with fully inflated air cushion was secured over his nose with head-straps. It was connected to a breathing circuit/machine with 4 L O₂/min and 1L /min air. APL valve was adjusted to deliver 5 cm H₂O CPAP. He then received 40 mg lignocaine, 50 mg propofol and 20 mg

rocuronium. His mouth was closed and a tight nasal mask was obtained with one hand. Nasal ventilation was easily accomplished. With the nasal mask delivering apnoeic oxygenation, a #2 blade video-laryngoscope was inserted which revealed a class I airway. A 6.0 ETT was inserted to 16 cm and secured. His SpO₂ remained 100% throughout. He tolerated the procedure well. Immediately post-extubation, he received the same nasal mask with 5 cm H₂O CPAP. A bag-valve device was used to deliver nasal CPAP during a long transport from the 1st floor OR to the 7th floor paediatric PACU without incident.

Discussion: This simple nasal PAP mask assembly was used to provide continuous active oxygenation in a paediatric patient with OSA during GA induction. Besides CPAP pre-oxygenation, it provided means to deliver assisted nasal ventilation, apnoeic oxygenation during VL ETI and CPAP during long but safe transport to paediatric PACU. It may improve patient safety at a low cost.

References:

1. www.TSEMask.com;
2. SAMBA 28th AM, 2013;
3. SASM 3rd AM, 2013;
4. ASA AM, 2013;
5. SAM AM, 2014;
6. ASA AM, 2015;
7. SPA-AAP, 2016

Learning Points: How to prepare a nasal mask assembly and to provide nasal CPAP in paediatric patients and assisted nasal ventilation in patients with OSA.

05AP06-1**Near-infrared spectroscopy (NIRS) in a piglet model: readings are influenced by the colour of the cover**

Clausen N.G.¹, Spielmann N.², Weiss M.³, Ringer S.K.⁴
¹University Hospital Odense, Dept of Anaesthesiology & Intensive Care, Odense, Denmark, ²University Childrens Hospital Zurich, Children's Research Center, Zürich, Switzerland, ³University Childrens Hospital Zurich, Dept of Anaesthesiology, Zürich, Switzerland, ⁴University of Zuerich, Vetsuisse Faculty, Zuerich, Switzerland

Background and Goal of Study: Near-infrared spectroscopy (NIRS) is used to monitor regional tissue oxygenation (rSO₂) during general anaesthesia(1, 2). The measurement might have sources of error still insufficiently examined in the clinical setting. The goal of this cross-over study was to investigate the effect of differently coloured coverings on rSO₂ in piglets.

Materials and Methods: Twenty-five healthy piglets aged 4-6 weeks were anaesthetized, intubated, mechanically ventilated and fully monitored using spirometry, ecg, pulse oximetry, invasive blood pressure and rectal temperature. Neuromonitoring comprised of oxygen partial pressure (PtiO₂) measurement and laser doppler blood flow (CBF) in brain tissue. The rSO₂ was measured by placing NIRS sensors in the supra glabellar region.

In 12 animals (part 1) sensors were covered with a uni-coloured pink (P) napkin and a turquoise (T) napkin in a random order. In further 13 animals (part 2) sensors were covered with blue-coloured surgical drape (OR) and a napkin with a reddish Santa Claus (SC) motive. Uncovered (UC) baseline values were captured and measurements obtained for a period of three minutes. During measurements, the animals were kept in normoterm, normotensive, normoglycaemic and normoxic condition. Inspired oxygen fraction and ventilatory settings were kept constant. One-way ANOVA was used to compare the 3 coverage's during each part of the study (p < 0.05).

Results:

Part 1: rSO₂-T differed significantly from rSO₂-UC and rSO₂-P (Mean ± SD rSO₂-UC₁: 49.7 ± 7.5; rSO₂-P: 49.8 ± 8.1; rSO₂-T: 45 ± 8.0 %) (p < 0.05).

Part 2: rSO₂-OR differed significantly from rSO₂-UC and rSO₂-SC (rSO₂-UC₂: 57.4 ± 6.8; rSO₂-SC: 57.5 ± 6.4; rSO₂-OR: 52 ± 5.9 %) (p < 0.05).

CBF and PtiO₂ remained unchanged during measurements in part 1 and 2.

Conclusion: NIRS readings can be influenced by covering of the sensors. The colour of the cover seems to be of importance. This variability is likely to reflect a source of error rather than an actual change in rSO₂. When interpreting rSO₂ in a clinical setting, this should be taken into consideration.

References:

1. Murphy GS, et al. Cerebral oxygen desaturation events assessed by near-infrared spectroscopy during shoulder arthroscopy in the beach chair and lateral decubitus positions. *Anesthesia and analgesia.* 2010;111(2):496-505.
2. Sorensen H. Near infrared spectroscopy evaluated cerebral oxygenation during anesthesia. *Danish medical journal.* 2016;63(12).

05AP06-2**The application of electrical impedance tomography (eit) technology in detecting lung inhomogeneity in neonates and small infants during mechanical ventilation in theatre**

Marchesini V.¹, Corlette S.², Sheppard S.³, Davidson A.³, Tingay D.⁴

¹University of Milan, Dept of Anaesthesiology & Intensive Care, Milan, Italy, ²Royal Children's Research Institute, Dept of Anaesthesiology & Pain Medicine, Melbourne, Australia, ³Murdoch Childrens Research Institute, Dept of Anaesthesiology & Pain Medicine, Melbourne, Australia, ⁴Murdoch Childrens Research Institute, Neonatology, Melbourne, Australia

Background: Mechanical ventilation is often required to support respiratory function however in some cases may lead to lung injury. This specific injury, called Ventilator-Induced Lung Injury (VILI), is well demonstrated in the intensive care unit where mechanical ventilation is needed for long periods of time. Little information is available to describe the risk of VILI during short exposure to mechanical ventilation such as during anaesthesia. Moreover neonates and small infants, because of their specific physiological features, are at greater risk of this potential detrimental effect. VILI is characterized by a loss of a regional ventilation homogeneity. An emerging technology called Electrical Impedance Tomography (EIT) allows us to evaluate the inhomogeneity of the lung with a continuous bedside, non-invasive, radiation-free monitoring technique.

Materials and Methods: We are conducting a prospective observational cohort study in healthy infants with the aim of assessing the impact of ventilation during general anaesthesia in terms of regional lung inhomogeneity measured with an EIT system. Our study includes term infants less than 1 year of age receiving general anaesthesia with an endotracheal tube and surgery in a supine position. Infants born prematurely, with known cardiac or pulmonary disease or history of previous mechanical ventilation are excluded. To measure regional lung homogeneity a novel EIT belt (Swisstom) designed for infants is placed around the chest at nipple level pre-operatively and kept in situ for the study period. Recordings of lung function are made before anaesthesia (baseline), during induction, after intubation, during surgery and post-extubation in recovery.

Results and Discussion: We present anatomically correct 2D images of the distribution of tidal ventilation and aeration collected during our study, including instances of single bronchus intubation, unintended derecruitment and regional inhomogeneity during routine anaesthetic care. These images demonstrate examples of the utility of EIT in assessing lung inhomogeneity throughout the perioperative period. Incidence and implications of inhomogeneity and related factors remain to be determined.

Conclusion: EIT may be a useful tool to improve our knowledge of the effects of mechanical ventilation in this population and may help us to find the best management for neonatal ventilation during anaesthesia.

05AP06-3**Diagnostic accuracy of abdominal compression for predicting fluid responsiveness in children**

Jacquet-Lagrèze M.¹, Tiberghien N.¹, Baudin F.², Lilot M.³,

Javouhey E.², Fellahi J.-L.¹

¹Hospices Civils de Lyon, Hôpital Louis Pradel., Dept of Anaesthesiology & Intensive Care, Lyon, France, ²Hospices Civils de Lyon, Hôpital Femme Mère Enfant, Dept of Intensive Care, Lyon, France, ³Hospices Civils de Lyon, Hôpital Femme Mère Enfant, Dept of Anaesthesiology, Lyon, France

Background and Goal of Study: The administration of fluid to increase cardiac output is a cornerstone of hemodynamic resuscitation. The purpose of this study was to evaluate the clinical usefulness of assessing variation of stroke volume during a calibrated abdominal compression for the prediction of fluid responsiveness in children.

Materials and Methods: This study was approved by the local institutional review board (CPP Lyon Sud-Est II). Patients less than eight years with circulatory failure were selected. Stroke volume index was assessed with an echocardiography at baseline, after an abdominal compression with a calibrated pressure of 25 mm Hg, at return to baseline, and after a volume expansion

of 10 ml/kg over 10 minutes. Respiratory aortic blood flow velocity (V_{peak}) and respiratory vena cava diameter variation (VCI_{var}) were also recorded before volume expansion. Patients were classified as responders if their stroke volume index (SVI) increased by at least 15%. R software with pROC package was used to performed descriptive and analytic statistic. $P < 0.05$ was considered significant.

Results and Discussion: Thirty-one children were included, 17 ± 22 months old. Seven were not on mechanical ventilation and 15 were on a mode allowing spontaneous breathing. Sixteen patients were fluid responders. Operators were blinded from the value of the VTI. Change in SVI during abdominal compression and after a fluid challenge were correlated ($R^2 = 0.796$ $p < 0.001$). The ROC curve analysis showed that SVI change during abdominal compression predicted fluid responsiveness: $ROC_{AUC} = 0.93$; 95% CI: 0.82-0.99. The best threshold was 9.3%. The ROC_{AUC} of VCI_{var} was 0.70 (95% CI: 0.48-0.91) and the ROC_{AUC} of delta V_{peak} was 0.58 (95% CI: 0.34-0.81). Fluid responsiveness assessment is challenging when spontaneous breathing is authorized [1].

Our method seems pretty reliable to predict fluid responsiveness and could be superior to VCI_{var} and delta V_{peak} in that setting.

Conclusion(s): SVI variation during abdominal compression was the sole reliable method to predict fluid responsiveness in a mixed population of children with and without spontaneous breathing suffering from acute circulatory failure.

References:

1. Gan H, Cannesson M, Chandler JR, Ansermino JM. Predicting Fluid Responsiveness in Children: A Systematic Review. *Anesthesia & Analgesia* 2013 ;117:1380-92.

05AP06-4**Effect of entropy guided low flow desflurane anaesthesia on laryngeal mask airway removal time in children undergoing elective ophthalmic surgery - a prospective, randomized, comparative study**

Mishra S., Sinha R., Ray B.R., Pandey R.K., Darlong V., Punj J.

All India Institute of Medical Sciences, Dept of Anaesthesiology & Intensive Care, New Delhi, India

Background and Goal of Study: In children, entropy guided titration of anaesthetic agent like isoflurane and sevoflurane leads to faster recovery after anaesthesia. However, role of entropy in recovery following desflurane anaesthesia is not known. We assessed effect of entropy on awakening in children undergoing ophthalmic surgery using low flow desflurane anaesthesia. We also evaluated effect of entropy on consumption of desflurane in children.

Materials and Methods: After ethics committee approval and parental consent, 80 ASA grade I-II children, aged 2-14 years, undergoing elective ophthalmic surgery were randomized into entropy guided and minimum alveolar concentration (MAC) guided groups. After laryngeal mask airway (LMA) insertion, anaesthesia was maintained using oxygen, air and desflurane using low fresh gas flow. In Entropy group desflurane was titrated to maintain state entropy (SE) value of 40-60. In MAC group, desflurane was titrated to maintain a MAC value between 1-1.3. We compared LMA removal time (defined as time from switching off desflurane at the end of surgery till removal of LMA), haemodynamic parameters, uptake and consumption of desflurane between both the groups.

Results and Discussion: There was significant decrease in LMA removal time in children when low flow desflurane anaesthesia was guided using entropy (4.34 ± 2.03 minutes) compared to MAC values (8.8 ± 2.33 minutes) ($p < 0.0001$). Consumption of desflurane was also significantly less in entropy group (25.3 ± 8.11 ml) compared to MAC group (18.7 ± 5.07) ($p < 0.0001$).

Conclusion(s): Entropy guided anaesthesia is associated with faster awakening and reduced consumption of desflurane in children 2-14 years of age.

05AP06-5

Comparison of CO₂ measurement using a modified CO₂/O₂ Guedel Airway with a CO₂/O₂ nasal cannula without and with oxygen supply in an infant manikin

Moll J.¹, Anagnostopoulou P.², Frei F.J.¹, Erb T.O.¹

¹University of Basel / University Childrens Hospital Basel, Dept of Anaesthesiology, Basel, Switzerland, ²Pediatric Respiratory Medicine, Inselspital, Bern University Hospital, University of Bern, Department of Pediatrics, Bern, Switzerland

Background and Goal of Study: Sedation and general anesthesia especially at remote locations are hazardous because of potential upper airway obstruction. For avoidance a Guedel airway is in use. Additionally, monitoring of breathing by a CO₂/O₂ nasal cannula and pulse oximetry has become common standard¹. In contrast to a nasal cannula, the use of a Guedel airway facilitates airway patency. However it lacks a standardized recording of CO₂ and oxygen supply up to now. Moreover, a CO₂ sampling port in closer proximity to the alveolar space results in a smaller difference between the alveolar and the measured end-tidal CO₂². The aim of this study was to compare the capnography of a modified CO₂/O₂ Guedel airway with a CO₂/O₂ nasal cannula without and with oxygen supply.

Hypothesis: Use of a modified CO₂/O₂ Guedel airway results in a smaller device to tracheal CO₂ difference compared to a CO₂/O₂ nasal cannula.

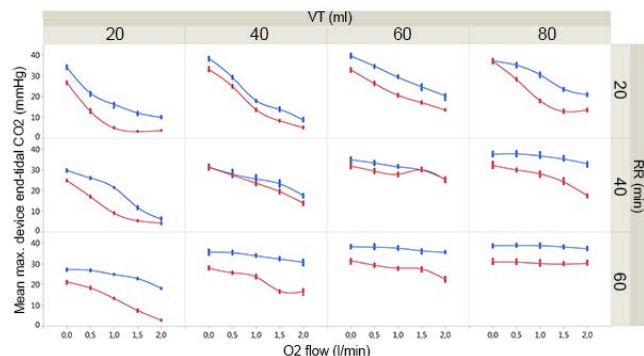
Methods: A manikin of a 6-month-old infant (TruCorp, IRL) was connected to a lung model³ (Soloplex, SWE) and ventilated with respiratory rates (RR) between 20-60 min⁻¹ and tidal volumes between 20-80 ml. Tracheal CO₂ was adjusted to 51.7±1.7 mmHg (Mean±SD) and device capnography (CO₂/O₂ Guedel Airway or CO₂/O₂ nasal cannula (Salter Labs, USA)) with different O₂ flows (0-2 l*min⁻¹) was recorded. The difference of the maximal CO₂ between the trachea and the devices was compared using linear regression analysis (JMP® 12, USA).

Results and Discussion: A significant smaller device to tracheal CO₂ difference with a modified CO₂/O₂ Guedel airway compared to a CO₂/O₂ nasal cannula was observed. Tidal volume, device, O₂ flow and RR had a statistically significant effect (Log Worth: 41.69; 35.19; 6.0 respectively 2.58; P-value < 0.002).

Conclusion: A realistic capnography could be established within the measured range of respiratory settings. Using a modified Guedel Airway in a model resulted in a significantly smaller device to tracheal CO₂ difference compared to a nasal cannula over the examined O₂ supply range (0-2 l*min⁻¹).

References:

1. Pediatrics 2006; 118(6):2587-602.
2. Can J Anesth 1993; 40(11):1038-43.
3. PLoS ONE 2012; 7(4): e36083-8.



[Guedel (blue lines); nasal cannula (red lines)]

05AP06-8

Lung ultrasound for the assessment of lung recruitment in pediatric patients during laparoscopic surgery. A randomized, controlled trial

Acosta C.M.¹, Tusman G.¹, Sara T.¹, Ricci L.², Molinari D.²

¹Hospital Privado de Comunidad, Dept of Anaesthesiology, Mar del Plata, Argentina, ²Facultad de Ciencias Exactas, Department of Mathematics, Mar del Plata, Argentina

Background and Goal of Study: Atelectasis is a negative side effect of general anesthesia (GA) in pediatric patients. Such atelectasis not only reduces lung compliance but also impairs arterial oxygenation and predisposes to a ventilator-induced lung injury. Lung ultrasound (LUS) is a non-invasive reliable tool to detect anesthesia-induced atelectasis in pediatric patients. The aim of this study was to compare lung aeration between two different mechanical ventilation strategies (protective mechanical ventilation vs recruitment maneuvers) in pediatric patients scheduled for abdominal laparoscopic surgery using ultrasound imaging.

Materials and Methods: Forty-two patients ASA I-II, aged 6 months-7yr were included, randomized to either a protective mechanical ventilation group (PV-g), (TV6ml/kg, respiratory rate according with the age of the patients, FiO₂ 0.5 PEEP 5cmH₂O) or recruitment maneuver group (RM-g); RM was done before capnoperitoneum followed by the same ventilatory setting than the PV-g but this time using PEEP8 cmH₂O.

LUS examinations were performed with a linear 6-12MHz probe at three time-points: T1:after anesthesia induction and before capnoperitoneum, T2:after capnoperitoneum and T3:at the end of surgery. An aeration score with a four-point-aeration (0=normal lung, 1=moderate aeration loss, 2=severe aeration loss, 3=complete aeration loss and consolidation) was calculated from LUS images.

Results and Discussion: 42 patients (36 men/6 women) aged 46.2±2 months, weighing 18.5±6.7kg were study. Lung aeration at T1 was decreased in both groups: RM-g: 5.95±4.13 vs PV-g:5.19±3.33 (p=0.51). (Figure 1) However, the RM group resulted in a lower aeration score compared with PV-g at both T2 and T3: 2.71±2.47 vs 6.71±3.54 (p<0.001) and 2.52±2.86 vs 8.48±3.22 (p<0.001), respectively (Figure 2). Lung compliance and oxygenation were significantly improved in RM-g compared to PV-g at T2 20.7±9.2 vs 16.7±4.8 (p=0.083) and 98.9±0.6 vs 98.33.7±0.7 (p=0.009) and T3 28.4±10.3 vs 19.9±5.1 (p<0.001) and 99.2±0.7 vs 98.0±0.6 (p<0.001) respectively.

Conclusion: In children scheduled for laparoscopic surgery, LUS can help anesthetologists to detect those patients with atelectasis and to assess the response of a particular ventilatory setting. A RM followed by an individualized PEEP improved lung aeration score, respiratory compliance and arterial oxygenation compared with patients who received protective ventilation without lung recruitment.

05AP06-9

Benefit of perioperative lung ultrasound in pediatric patients undergoing cardiac surgery: a randomized, controlled trial

Song I.-K., Lee J.-H., Kim E.-H., Kim H.-S., Kim J.-T.

Seoul National University Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background: Children are at risk for developing respiratory insufficiency and ventilatory failure after cardiac surgery. Thus, optimizing perioperative respiratory care is crucial to improve the outcome. We hypothesized that perioperative lung ultrasound (LUS) examination would benefit children undergoing cardiac surgery and assessed the feasibility and utility of it.

Methods: Pediatric patients (≤ 5 yr) scheduled for cardiac surgery under the diagnosis of acyanotic congenital heart disease were enrolled prospectively and randomized into either a control group or a LUS group. Only the LUS group received the LUS examination 1 minute after starting mechanical ventilation. Both groups received the LUS examination identically at the end of the surgery and once between postoperative 6-12 hours in the pediatric intensive care unit (PICU). In the LUS group, ultrasound-guided alveolar recruitment maneuver was performed after each LUS examination. The primary outcome was the incidence of intraoperative desaturation (SpO₂≤95%). The secondary outcomes included the incidence of postoperative desaturation and fever, the LUS scores, intraoperative and postoperative ratio of arterial oxygen partial

pressure to fractional inspired oxygen ($\text{PaO}_2/\text{F}_i\text{O}_2$) from arterial blood gas analysis, the duration of mechanical ventilation, and the length of PICU stay.

Results: Among 122 enrolled pediatric patients, 120 were randomized into the control group ($n=61$) and the LUS group ($n=59$). The incidence of intraoperative desaturation [36% vs 19%; $P=0.041$; OR 0.406; 95% CI: 0.176-0.939] and the incidence of postoperative desaturation [64% vs 27%; $P<0.001$; OR 0.210; 95% CI: 0.097-0.456] were higher in the control group compared to the LUS group. The LUS scores were better in the LUS group compared to the control group on the postoperative and intra-PICU LUS examinations. Intraoperative and postoperative $\text{PaO}_2/\text{F}_i\text{O}_2$ values were higher in the LUS group than those of the control group. Although the length of the PICU stay did not show statistical difference between the groups, the duration of mechanical ventilation was shorter in the LUS group [25.5 (24.6) vs. 38.2 (42.6); 95% CI of mean difference: 0.1 to 25.2; $P=0.048$].

Conclusions: Perioperative LUS examinations followed by recruitment maneuver proved useful in decreasing perioperative desaturation events, improving the LUS findings, and shortening the duration of mechanical ventilation in pediatric patients undergoing cardiac surgery.

05AP06-10

A change of anesthesia circuit reduces the concentration of waste anesthetic gases below cut-off values

Verbeke N., Jamaer L., Ory J.-P., Stessel B., Herbots J., Dubois J. Jessa Hospital, Dept of Anaesthesiology & Intensive Care, Hasselt, Belgium

Background and Goal of Study: The exposure to waste anesthetic gases is linked to harmful short-term and long-term effects such as fatigue and headache at one hand and cancer, infertility, congenital abnormalities, renal and hepatic diseases at the other hand.

It should therefore be eminent to develop an adequate perioperative management of those gases to minimize the exposure for all involved healthcare workers.

All anesthesiologists from our department prefer an open circuit for the inhalational anesthesia in children. Routinely a Mapleson B circuit was used. This could lead to higher exposure levels of waste anesthetic gases in the operation room since there is no active gas scavenging system available.

Therefore we introduced a new open system: the Modified Ayres T-piece circuit with a scavenging adapter connected to the active gas scavenging system.

We compared the levels of waste anesthetic gases using the two different open circuits in inhalational anesthesia in children for otorhinolaryngological procedures.

Materials and Methods: Exposure levels of waste anesthetic gases (N_2O and sevoflurane) were measured using the Mapleson B circuit as well as the Modified Ayres T-piece circuit with a scavenging adapter connected to the active gas scavenging system.

The monitoring device was installed on the anesthesia machine at approximately 50 cm from the operation table. In this setting, all medical and nursing staff was within a half meter range of the device.

Results and Discussion: Measurements with the Mapleson B circuit showed levels of 1020 mg/m^3 (cut-off 91 mg/m^3) for N_2O and 138 mg/m^3 (cut-off 80 mg/m^3) for sevoflurane which clearly exceeds the limits. For the Modified Ayres T-piece circuit levels below 0.07 mg/m^3 for N_2O and 18.7 mg/m^3 for sevoflurane were registered.

Conclusion(s): Changing the type of anesthesia circuit, using an active gas scavenging system, without modifying the anesthesia technique, reduces the concentrations of waste anesthetic gases within safe limits in inhalational anesthesia in children.

By doing so, we created a healthier occupational environment for all perioperative staff.

05AP06-11

Incidence of epileptiform activity in the electroencephalogram in children during anaesthesia induction with Propofol or Sevoflurane and correlation to postoperative emergence delirium

Koch S.¹, Rupp L.¹, Prager C.², Kramer S.¹, Krebs M.¹, Spies C.¹, Evjenia Toubekis

¹Charité - Universitätsmedizin Berlin, Dept of Anaesthesiology & Intensive Care, Berlin, Germany, ²Charité - Universitätsmedizin Berlin, Department of Paediatrics and Neurology, Berlin, Germany

Background and Goal of Study: Epileptiform activity in the electroencephalogram (EEG) is reported in children undergoing mask inductions of anaesthesia with Sevoflurane.[1-3] The aim of this study is

1. to analyze the incidence of epileptiform activity in children receiving anaesthesia induction with Propofol and
2. to correlate incidence of epileptiform activity with Emergence Delirium in the recovery room.

Materials and Methods: Prospective, observational study in children 0.5 - 8 years, undergoing elective surgery (EA2/027/15 / NCT02481999). Children were anaesthetized with either Sevoflurane or Propofol, bodyweight adapted premedication with Midazolam were administered in all children. Bi-frontal EEG were recorded before anaesthesia induction continuously till intubation. Visual EEG analysis (EEG viewer software / 50 μV / 1s/div) were performed with regard to epileptiform EEG pattern: Delta with spikes (DSP), rhythmic polyspikes (PSR), periodic, epileptiform discharges (PED), and suppression with spikes (SSP).[1-3] Emergence Delirium were evaluated during stay in the recovery room by the Pediatric Assessment of Emergence Delirium (PAED) Score. Data are presented as mean \pm SD or median (25/75 percentile).

Results and Discussion: 17 children were anaesthetized with Sevoflurane and 23 children received Propofol, were the age in the Sevoflurane group were significantly lower (age 14 \pm 8 month vs. age 58 \pm 32 month; $p<0.0001$), what is related to the standard operating procedure in our clinic. In the Sevoflurane group 53% ($n=9$) displayed epileptiform EEG pattern, whereas in the Propofol group 43% ($n=10$) displayed epileptiform EEG pattern.

Emergence Delirium is significantly related to PSR and PED during anaesthesia induction ($p=0.025$), but not to DSP and SSP This relationship was independent of the anaesthesia medication applied. Furthermore, Emergence Delirium was not significantly related to age.

PSR (18 (8/60) month vs. 31 (12/77) month), PED (9 (8/9) month vs. 26 (12/76) month) and DSP (12 (8/12) month vs. 26 (12/76) month) showed a tendency to occur primary in younger children, but not in SSP (36 (12/66) month vs. 23 (11/77) month).

Conclusion: First anaesthesia induction with Propofol triggers epileptiform activity as often as Sevoflurane does. Second Emergence Delirium in children is significantly related to epileptiform activity of PSR and PED occurring during induction of anaesthesia, independent of anaesthesia medication.

05AP07-1

Characteristics of infants and very young children undergoing anaesthesia in Danish hospitals 2005-2015

Lohse N.¹, Afshari A.², Lundstrøm L.H.³, Strøm C.¹

¹Copenhagen University Hospital Rigshospitalet, Department of Anaesthesia, Centre of Head and Orthopaedics, Copenhagen, Denmark, ²Copenhagen University Hospital Rigshospitalet, Department of Anaesthesiology, Juliane Marie Centre, Copenhagen, Denmark, ³Copenhagen University Hospital Hillerød, Dept of Anaesthesiology, Hillerød, Denmark

Background and Goal of Study: Thorough knowledge of patient populations undergoing anaesthesia and anaesthesia methods for clinical procedures is needed for quality assurance and continuous improvement. We aimed to describe the population of the youngest children who received anaesthesia in Denmark during 2005-2015, including a description of the anaesthesia practice.

Patients and Methods: Population-based observational cohort study. Children of 0 or 1 years of age who received anaesthesia at a Danish hospital from January 1st 2005 to December 31st 2015 were identified in the Danish Anaesthesia Database (DAD). DAD is a clinical quality assurance database,

covering approximately 75% of all anaesthesia episodes in Denmark. Age, sex, comorbidity measured by ASA score and as days in hospital prior to anaesthesia, height, weight, frequency of anaesthesia per child, indications for anaesthesia, and types of anaesthesia provided were tabulated. The study was approved by the Danish Data Protection agency (2015-41-4498).

Results and Discussion: A total of 17,436 children aged 0 or 1 years (64 % male) received 27,653 episodes of anaesthesia during the 11-year study period (Table 1).

37% of all anaesthesia episodes were conducted on children with previous anaesthesia experience (Table 2);

79% of which in a university hospital; 70 % due to surgery, 16 % due to diagnostic radiologic procedures;

11 % due to non-surgical care; and 3 % due to other reasons. 99% of anaesthesia episodes were general anaesthesia, independent of indication.

Most commonly used for non-surgical care was general anaesthesia with inhalation agents alone (39%), whereas inhalation in combination with intravenous agents was most common for surgery (68%) and radiologic procedures (37%).

The most commonly used peripheral nerve block was an infraclavicular nerve block (11 % of all blocks).

The results reflect some of the clinical considerations that need to be taken into account when providing anaesthesia to children, who may not be able to comply with procedures which in adults are done with local or without anaesthesia, or with the peripheral venous puncture required for total intravenous anaesthesia.

Conclusions: This study provided important information on the composition of infants and very young children undergoing anaesthesia. Almost one third of anaesthesia episodes were for non-surgical reasons, and about two fifths were in children with previous anaesthesia experience.

Basic characteristics of paediatric patients at time of anaesthesia				
Variable	2-5 years old		6-17 years old	
	n, (%)	Missing, n (%)	n, (%)	Missing, n (%)
Study population children, n (%)	32,840		91,418	
Total number of anaesthesia provisions	50,484		141,082	
Sex, n (%)		0 (0)		0 (0)
Male	20,102 (61.2)		49,287 (53.9)	
Age at time of time anaesthesia in years, median (IQR)	4 (3-5)	0 (0)	12 (9-15)	0 (0)
Charlson co-morbidity index, n (%)				
0	38,392 (76.0)	441 (0.9)	112,918 (80.0)	1,127 (0.8)
1	4,775 (9.5)		15,629 (11.1)	
2	5,307 (10.5)		7,672 (5.4)	
3+	1,569 (3.1)		3,736 (2.6)	
Days at hospital prior to anaesthesia ¹ , median [IQR]		0 (0)		0 (0)
0 days	10,612 (21.0)		33,133 (21.0)	
1 day	19,815 (39.3)		66,283 (47.0)	
2 days	5,491 (10.9)		14,763 (10.5)	
3 to 9 days	7,908 (15.7)		16,975 (12.0)	
10 to 24 days	3,047 (6.0)		5,116 (3.6)	
over 25 days	3,611 (7.2)		4,812 (3.4)	
ASA score at time of anaesthesia, n (%)		1,267 (2.5)		2,133 (1.5)
1	34,708 (68.8)		110,077 (78.0)	
2	11,280 (22.3)		22,982 (16.3)	
3	2,989 (5.9)		5,448 (3.9)	
4	217 (0.4)		369 (0.3)	
5	7 (<0.1)		32 (<0.1)	
6	16 (<0.1)		41 (<0.1)	
Height in cm at time of anaesthesia (median, IQR)	105 (98-116)	157 (0.3)	158 (137-170)	302 (0.2)
Weight in kg at time of anaesthesia (median, IQR)	16.5 (14.0-19.5)	141 (0.28)	45 (30.0-60.0)	309 (0.2)

Table 1. Basic characteristics for the paediatric patients undergoing anaesthesia, numbers are for each provision of anaesthesia with exception from study population size and sex distribution. ¹ Days at hospital within the last 6 months prior to time of anaesthesia. Kg=kilogram, cm=centimetre.

[Table 1]

05AP07-2

Characteristics of children age 2 to 17 years undergoing anaesthesia in Danish hospitals 2005-2015

Stroem C.¹, Afshari A.², Lundström L.³, Lohse N.⁴

¹Copenhagen University Hospital, Department of Anaesthesia, Centre of Head and Orthopedics, Copenhagen, Denmark,

²Rigshospitalet - Copenhagen University Hospital, Department of Anaesthesiology, Juliane Marie Centre, Copenhagen, Denmark,

³Hillerød Hospital, Dept of Anaesthesiology, Hillerød, Denmark,

⁴Rigshospitalet - Copenhagen University Hospital, Department of Anaesthesiology, Centre of Head and Orthopedics, Rigshospitalet, Copenhagen, Denmark

Background: There is a lack of data describing children that are anaesthetised. We aimed to describe children from age 2 to 17 years, who received anaesthesia in Denmark, including a description of the anaesthesia practice.

Methods: Population-based observational study. Children aged 2-17 years who received anaesthesia from January 2005 to December 2015 were identified in the Danish Anaesthesia Database (DAD), a clinical quality assurance database. We recorded among others, age, comorbidity, and types and practice of anaesthesia. Data were tabulated for children divided into two age groups: 2-5 or 6-17 years. The study was approved by the Danish Data Protection agency.

Results: In total, 32,840 children aged 2-5 years received 27,653 episodes of anaesthesia and 91,418 children aged 6-17 years received 141,082 episodes of anaesthesia. Basic characteristics of children are summarised in table 1, anaesthetic practice are described in table 2 and 3.

For children age 2-5, it was more common to receive anaesthesia at a university hospital compared to older children (50vs.36%). The younger children did more frequently receive anaesthesia for non-surgical reasons (27%vs.7%). No differences in the anaesthesia method for surgery were observed, but the proportion of smaller children who received purely inhalation agents for general anaesthesia was higher compared to older children (8vs2%).

Conclusion: Younger children (age 2-5) compared to older children (age 6-17) were more frequently anaesthetised 1) for non-surgical reasons, 2) in a university hospital 3) using inhalation agents.

Type of anaesthesia by indication children age 2 to 5 years					
Reason for anaesthesia (n=50,484)		Non-surgical care	Surgery	Radiology	Other
		n, (% of total study population)	4,385 (9)	38,567 (77)	6,797 (13)
Missing, n (% of group reason)		7 (0.2)	6 (<0.1)	3 (<0.1)	209 (28.4)
Combined general and regional anaesthesia, n (% of reason)		31 (0.7)	3,048 (7.9)	0 (0)	18 (2.4)
General anaesthesia, n (% of reason)		4,005 (91.3)	35,261 (91.4)	5,642 (83.0)	446 (60.7)
Regional anaesthesia and sedation, n (% of reason)		0 (0)	19 (<0.1)	0 (0)	0 (0)
Regional anaesthesia, n (% of reason)		1 (<0.1)	18 (<0.1)	0 (0)	0 (0)
Sedation, n (% of reason)		305 (7.0)	162 (0.4)	1,123 (16.2)	51 (6.9)
Monitoring, n (% of reason)		36 (0.8)	53 (0.1)	29 (0.4)	11 (1.5)
Type of general anaesthesia provided (n=50,484)					
Patients n, % of entire population		4,385 (9)	38,567 (77)	6,797 (13)	735 (1)
Missing (includes patients that were deemed only to have regional anaesthesia)		346 (7.9)	231 (0.6)	1,141 (16.8)	270 (36.7)
Inhalation		1,019 (23.2)	2,927 (7.6)	1,706 (25.1)	78 (10.6)
IV w/o N2O		2,165 (49.4)	19,161 (48.7)	1,354 (19.9)	285 (38.8)
IV with N2O		23 (0.5)	429 (1.1)	23 (0.3)	8 (1.1)
IV and inhalation		829 (18.9)	15,909 (41.0)	2,573 (37.9)	93 (12.7)
Rectal or intramuscular		3 (0.1)	10 (<0.1)	0 (0)	1 (0.1)
Type of regional anaesthesia provided for surgery (n=3,085)					
Missing			613 (19.9)		
neuroaxial			604 (19.6)		
iv regional			6 (0.2)		
infiltration block			350 (11.3)		
peripheral nerve block			988 (32.0)		
other			524 (17.0)		
Three most frequently used peripheral nerve block (n=988)					
Infraclavicular nerve block			212 (0.21)		
Popliteal nerve block			87 (0.1)		
Femoral nerve block			67 (0.1)		

Table 2. Type of anaesthesia by indication, including description of subtypes of general anaesthesia and regional anaesthesia, for general anaesthesia only the indication 'surgery' is taken into account.

[Table 2]

Type of anaesthesia by indication children age 6-17 years					
	Non-surgical care	Surgery	Radiology	Other	
Reason for anaesthesia (n=50,484)					
Overall type of anaesthesia	n, (% of total study population)	5,710 (4)	129,626 (92)	4,282 (3)	1,464 (1)
	Missing, n (% of group reason)	8 (<0.1)	15 (<0.1)	25 (0.6)	541 (37.0)
	Combined general and regional anaesthesia, n (% of reason)	59 (1.0)	10,974 (8.5)	1 (<0.1)	99 (6.8)
	General anaesthesia, n (% of reason)	5,360 (93.9)	116,793 (90.1)	3,449 (80.5)	628 (42.9)
	Regional anaesthesia and sedation, n (% of reason)	2 (<0.1)	263 (0.2)	0 (0)	1 (0.1)
	Regional anaesthesia, n (% of reason)	16 (0.3)	426 (0.3)	1 (<0.1)	11 (0.8)
	Sedation, n (% of reason)	233 (4.1)	981 (0.8)	746 (17.4)	161 (11.0)
	Monitoring, n (% of reason)	32 (0.6)	174 (0.1)	60 (1.4)	23 (1.6)
	Type of general anaesthesia provided (n=50,484)				
	Patients n, % of entire population	5,710 (4)	129,626 (92)	4,282 (3)	1,464 (1)
Missing (includes patients that were deemed only to have regional anaesthesia)	286 (5.0)	1,734 (1.3)	830 (19.4)	744 (50.8)	
Inhalation	1,098 (19.2)	1,904 (1.5)	478 (11.2)	568 (38.8)	
IV w/o N2O	3,319 (58.1)	107,936 (83.3)	1,423 (33.2)	2 (0.1)	
IV with N2O	59 (1.0)	1,041 (0.8)	25 (0.6)	97 (6.6)	
IV and inhalation	946 (16.6)	16,989 (13.1)	1,525 (35.6)	0 (0)	
Rectal or intramuscular	2 (<0.1)	22 (<0.1)	1 (<0.1)	0 (0)	
Type of regional anaesthesia provided for surgery (n=11,663)					
Type of regional anaesthesia	Missing		1,843 (15.8)		
	neuroaxial		1,793 (15.4)		
	iv regional		41 (0.4)		
	infiltration block		1,575 (13.5)		
	peripheral nerve block		4,912 (42.1)		
	other		1,499 (12.8)		
	Three most frequently used peripheral nerve block (n=988)				
Femoral nerve block		1,686 (34.3)			
Popliteal nerve block		1,018 (20.7)			
Infraxillary nerve block		752 (15.3)			

Table 3. Type of anaesthesia by indication, including description of subtypes of general anaesthesia and regional anaesthesia, for general anaesthesia only the indication 'surgery' is taken into account.

[Table 3]

05AP07-3

Current practice of preoperative fasting for pediatric day case surgery in a tertiary care university hospital in Egypt

Nassar H., Fawzy M., El-Hadi H., Al-Hakami M.

Cairo University, Dept of Anaesthesiology & Intensive Care, Cairo, Egypt

Background and Goal of Study: Pediatric fasting guidelines are designed to reduce patient discomfort while minimizing the risk of perioperative morbidities. This study was designed to determine current practice of pediatric preoperative fasting for day case surgeries in our Hospital, effect of prolonged preoperative fasting on perioperative morbidities and to assess the possible role of doctor/parent / hospital interactions in changing the current status.

Materials and Methods: This cross-sectional study was conducted in Cairo University paediatric hospital from June to October 2016. Participants were children (2 months -12 years, ASA I or II) undergoing elective day case surgery under general anesthesia; their parents and pediatric surgery residents (SR) participated in questionnaires. We focused on the actual preoperative fasting duration (primary outcome), perioperative morbidities, parents understanding and compliance with fasting instructions as well as on the SR familiarity and acceptance of fasting guideline recommendations.

Results and Discussion: 200 children (mean age 4 years; ophthalmological surgeries 57.5%) and their parents (200 mothers) were enrolled in this study as well as 16 SR. Our children experienced prolonged fasting before procedures compared to ASA recommendation times (p 0.001) with no incidence of regurgitation or pulmonary aspiration (mean fasting times for oral fluids, breast milk, formula and solids were 7.28(1.49), 5.64(1.13), 6.86(0.97), 7.95(2.7) hours respectively). Blood sugar level was less than 70 mg/dl in 8 cases, 75.0% of them were fasting for more than 8 hours. Only 18.5% of the parents believed that fasting was necessary to avoid the development of health problems. All parents (100%) and 80% of SR didn't know that preoperative fasting ASA guidelines allow oral clear fluids up to 2 hours preoperatively. Concerns regarding patient safety and every day work flow in our institution might explain the reasons against implementing fasting guidelines.

Conclusion(s): Prolonged pediatric preoperative fasting period for day case surgery is still a common practice in our institution. Hypoglycemia incidence increases with fasting more than 8 hours. Knowledge deficit about fasting guidelines among our parents and SR as well as concerns regarding patient safety and every day work flow in our institution were the major impediments for improving preoperative fasting care.

05AP07-4

Evolution of Respiratory tests in Children with Idiopathic Scoliosis Corrected by Posterior Approach

Acevedo Bambaren I.¹, Domínguez F.¹, Burgos J.², Martín J.¹

¹Ramón y Cajal Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Ramón y Cajal Hospital, Orthopaedic Surgeon, Madrid, Spain

Background and Goal of Study: Patients with idiopathic scoliosis have well documented decrease tolerance to maximum exercise. After surgical correction of thoracic scoliosis a greater cardiorespiratory adaptation to exercise would be expected, however, there is no clear evidence that the tolerance to maximum exercise improves in the medium term after surgery in patients with mild and moderate curves.

Materials and Methods: Twenty patients diagnosed with adolescent idiopathic scoliosis (AIS), ages 12 to 17 (mean 13) were studied. All curves were classified as Lenke 1A and showed a mean magnitude of 60.3 + 9.9 Cobb angle. The initial heart rate (HR INI), maximum heart rate (HR MAX), final heart rate (HR FIN), initial oxygen saturation (SAT O2 INI), final oxygen saturation (SAT O2 FIN), maximum oxygen consumption (VO2 MAX), production of CO2 (VCO2), ventilation and CO2 quotient (VE/CO2), respiratory exchange rate (RER), ventilator capacity at maximal exercise (VE MAX), and test duration were recorded before surgery and after 2 years of follow-up by a similar test of maximum tolerance to exercise on a treadmill following the standard Bruce protocol

Results and Discussion: The curves averaged were 16.8 + 2.8 Cobb 2 years after surgery. At 2 years after surgery, the patients showed similar values to the values measured in the preoperative period. There were only significant differences in RER (1.12 + 0.09 preop/ 1.20 + 0.12 postop). Oxygen saturation at the end of the test was significantly decreased 2 years after surgery. In the post-operative test we can find a close correlation between duration and VE, which probably means better respiratory efficiency. Also was a close correlation between VO2 MAX, VE, degree of correction and final Cobb degree.

Conclusion: Taken together, patients with moderate to severe AIS showed limited cardiorespiratory tolerance to maximum exercise that was not substantially modified two years after surgery, although the respiratory efficiency was improved by the improvement of many of the parameters. These findings suggest that the reduced cardiopulmonary function during exercise is not strictly associated with the deformity of the spine and can be due to an intrinsic factor such as muscle weakness and external factor such as the absence of physical conditioning in these kind of patients.

05AP07-5

Effect of transportation method on preoperative anxiety in children

Jeong S., Lee H.G., Chung S.S., Choi J.I., Kwak S.H., Bae H.B.

Chonnam National University Hospital, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Children often show preoperative anxiety in the process of moving away from their parents to the operating room. Complementary therapies have been used to decrease children's anxiety, but to decrease the anxiety is still challenging. The aim of study is to evaluate the effect of wagon to stretcher car for reducing children's anxiety in the operating room.

Materials and Methods: We assigned 60 children (aged 2-7 years) undergoing general anesthesia for the elective surgery to two groups. Stretcher group underwent general anesthesia after transferred to the operation room by conventional stretcher car, Wagon group used a wagon to transfer children. Each child's anxiety was evaluated three times using the Modified Yale Preoperative Anxiety Scale (mYPAS): at waiting room (T0), on the hallway to the operating room (T1), and at operating room (T2).

Results and Discussion: In the Stretcher group, there were significant increase in mYPAS during transportation after separation of parents (T1, P = 0.003) and in the operating room (T2, P = 0.004) compare to waiting room (T0). Repeated measured ANOVA showed that wagon prevented the increase of mYPAS during transportation (P = 0.012), but did not in the operating room (P = 0.087) compared with stretcher car. There was significant difference in numbers of children who increased mYPAS scores during transportation after separation of parents (T1, P = 0.014) and in the operating room (T2, P =

0.08) compare to waiting room (T0). Children in the Wagon group showed a reduction ($P = 0.003$) in mYPAS scores at halfway to the operating room and in the operating room compared to those in the control group. Age group significantly affected at mYPAS scores ($P = 0.047$). Younger children group showed higher mYPAS scores than older children group at T1 ($P = 0.033$). Wagon prevented the increase of mYPAS during transportation in older children group ($P = 0.018$), but did not in younger children group ($P = 0.169$).

Conclusion(s): A majority of children scheduled for surgery had an anxiety during transportation to the operating room and before induction of anesthesia in the operating room. Younger children had more anxiety than older children. Wagon as a transporting method decreased this anxiety suggesting that it may be a good alternative choice for reducing children's preoperative anxiety.

05AP07-6

Postoperative recovery characteristics: PAED score, PONV score, recovery scale (Steward and Aldrete scale) with TIVA with propofol versus inhalation anesthesia with sevoflurane for adenotonsillectomy in children

Stojanović Stipić S.¹, Bajic Z.²

¹University Hospital Split, Dept of Anaesthesiology & Intensive Care, Split, Croatia, ²Biometrika, Research and Development Department, Zagreb, Croatia

Background and Goal of Study: Children are more prone to mental disturbances and uncontrolled physical activity during emergence from general anaesthesia. Postoperative recovery is an essential part of the children experience. The aim of this study was to determine the effects of total intravenous anesthesia with propofol compared with those of sevoflurane on recovery characteristics, emergence delirium (PAED), postoperative nausea and vomiting (PONV) and recovery scale (Aldrete score and Steward score).

Materials and Methods: A randomized, parallel groups trial was conducted at the University Hospital Split with 64 children (aged 6-13, ASA I-II) undergoing elective adenotonsillectomy. Children were randomized into inhalation sevoflurane (S) group and total intravenous anaesthesia propofol group (TIVA). In TIVA group anesthesia was induced with propofol, fentanyl and vecuronium, and maintained with continuous infusion of propofol. In S group, after fentanyl, anesthesia was induced and maintained with sevoflurane in mixture of oxygen and nitrous oxide. BIS monitoring was used and depth of anesthesia accordingly adjusted (target BIS 40 to 60). After extubation, children were transferred to the postanaesthesia care unit. We estimated early postoperative recovery (2h after surgery) comparing PONV score, PAED score and Steward and Aldrete recovery scale. In all children, surgery was performed by the same surgeon and anaesthesia was performed by the same anaesthesiologist.

Results and Discussion: The incidence of postoperative nausea and vomiting was low in TIVA (6.3% at discharge) and high in sevoflurane group (50% at discharge) ($P < 0.001$). Mean PAED result as well as mean awareness and restlessness were significantly better in TIVA than in sevoflurane group ($P = 0.045$, $P = 0.030$, $P = 0.022$ respectively). We have not observed differences between intravenous and inhalation anesthesia regarding recovery scale (Steward and Aldrete scale).

Conclusion(s): Total intravenous anesthesia with propofol was associated with a significantly reduced rate of PONV. In addition, PAED results in intravenous group, showed a higher level of response compared with sevoflurane based anaesthesia. There were no differences between the two groups regarding the recovery scale. Children anesthetized with TIVA for adenotonsillectomy had significantly less postoperative nausea and vomiting and emergence delirium estimated by results of our investigation.

05AP07-8

Pediatric emergence delirium and early postoperative negative behavior within two weeks after adenotomy

Ghamari S.¹, Houben A.¹, Fischer A.², Baehner T.¹, Hoefft A.¹, Ellerkmann R.K.¹

¹University Clinic Bonn, Dept of Anaesthesiology & Intensive Care, Bonn, Germany, ²ASG GbR Health Department, Dept of Anaesthesiology, Mönchengladbach, Germany

Background: The aim of this prospective multicenter observatory study was to evaluate the incidence of pediatric emergence delirium (ED) after elective adenotomy and the occurrence of early postoperative negative behavior (ePONB) within two weeks after outpatient surgery.

Methods: The study cohort comprised $n = 222$ patients between 1 and 7 years of age. Premedication was performed with Midazolam (0.3-0.5mg/kg). The first cohort ($n = 108$) received a multimodal anesthesia based on total intravenous anesthesia with Propofol and Remifentanyl in combination with pre-emptive Dipidolor (0.1mg/kg), Ibuprofen (10mg/kg), Dexamethason (0.15mg/kg) and Ketanest S (0.1mg/kg). The second cohort ($n = 114$) additionally received Clonidine i.v. (2µg/kg) intraoperatively.

We analyzed the quality of induction and assessed ED and pain using the pediatric anesthesia emergence delirium (PAED) scale and the KUSS-Score. ED was defined according to Locatelli et al. (1) as a PAED score ≥ 9 for the first 3 criteria (eye contact, purposeful movement, aware of surrounding). In addition, we defined ePONB to be present when at least 5 of 27 criteria of the questionnaire were positive (2;3).

Results: The incidence of postoperative delirium was 22% versus 25% with and without Clonidine, respectively. The incidence of ED was significantly higher in male patients (29% vs. 15%, $p = 0.02$). The occurrence of ePONB within two weeks after surgery was 12%. ePONB was significantly higher among patients with ED (24% vs. 11%, $p = 0.04$).

Conclusion(s): Despite the multimodal pharmacological approach the incidence of ED after adenotomy remains high. Against current literature we saw a higher incidence of ED in male patients. ED not only plays a role immediately after surgery but is also linked to ePONB within two weeks after adenotomy.

References:

1. Locatelli et al. Emergence delirium in children: a comparison of sevoflurane and desflurane anesthesia using the Paediatric Anesthesia Emergence Delirium scale. *Paediatr Anaesth* 2013 Apr;23(4):301-8.
2. Buehrer et al. [Negative behavioral changes in children and adolescents after anesthesia: Development of a German language version of the Post Hospitalization Behavior Questionnaire]. *Anaesthesist* 2015 Feb;64(2):115-21.
3. Kain et al. Preoperative anxiety and emergence delirium and postoperative maladaptive behaviors. *Anesth Analg* 2004 Dec;99(6):1648-54, table.

05AP07-9

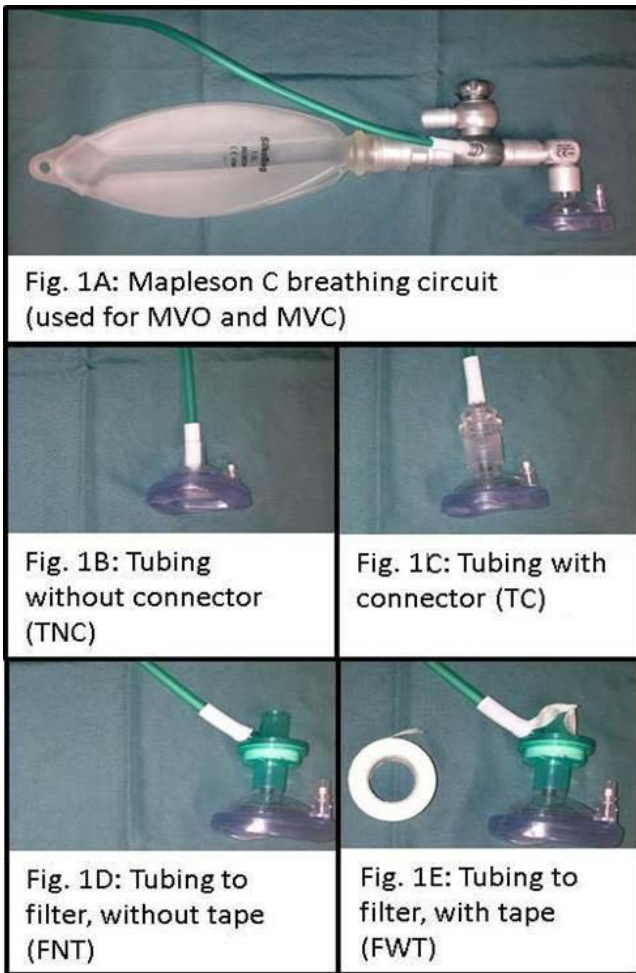
Efficacy of wafting solutions during transport to the paediatric PACU

Barends C.¹, Yavuz P.², Molenbuur B.², Absalom A.²

¹University Medical Center Groningen, University of Groningen, Dept of Anaesthesiology, Groningen, Netherlands, ²University Medical Center Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background: Hypoxia is a serious complication in children after anesthesia. Wafting is used to administer O_2 to them. Distance from the face affects wafting FI_{O_2} [1]. The effect of movement during transport is unknown. 50% O_2 prior to extubation leads to more hypoxic events in the PACU than 100% O_2 [2]. We studied wafting methods during transport and their ability to maintain an FI_{O_2} of $> 50\%$.

Materials and Methods: Transport of a child was simulated by walking 60m at 1.5m/s with a baby manikin in a standard cot after reaching a constant level for a baseline reading. We tested 36 combinations of 6 wafting methods at 0 and 5 cm from the baby's face at O_2 flows of 3, 6 and 10 l/min.

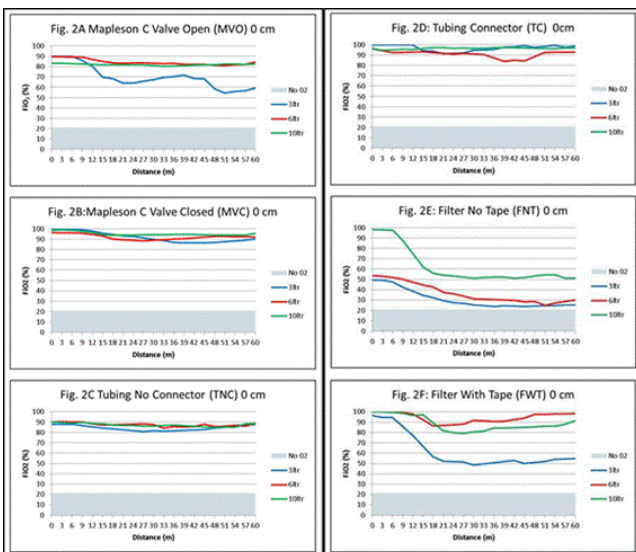


[Fig. 1A-1E]

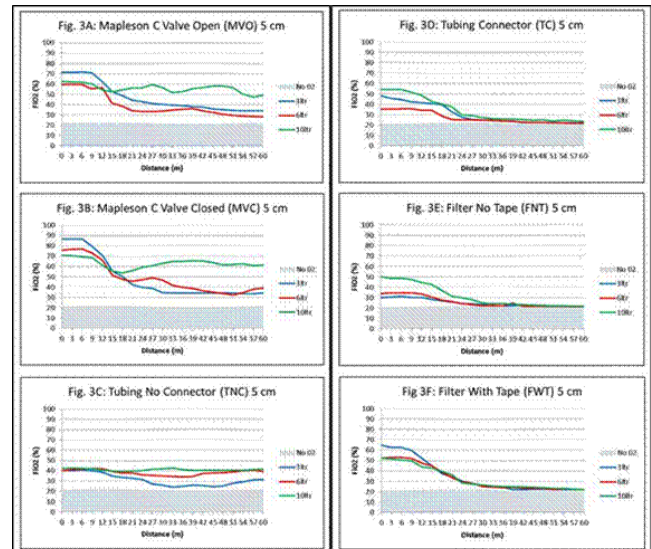
FiO₂ was measured at the mouth. Video was used to capture FiO₂ readings and walking speed (measured by floor markings).

Results and Discussion: Only 2 of 18 combinations at 5 cm held FiO₂ s>50%. For 10 combinations used at 5cm FiO₂ came below 30%. High O₂ flows compensate for this loss.

In 16 of 18 combinations at 0 cm FiO₂ was above 50%. Reproducibility was good. Baseline measurements were in similar to Davies' tests[1]



[Fig 2A-F]



[Fig 3A-F]

Conclusion: Transport has a large impact on FiO₂ of many wafting combinations, even at 5 cm from the face. Careful choice of wafting technique is advised in preparation for transport.

References:

1. Davies P et al. The efficacy of noncontact oxygen delivery methods. Pediatrics 2002;110: 964-7
2. Vijayakumar HR et al. Effects of 100% oxygen and a mixture of oxygen and air on oxygen saturation in the immediate postoperative period in children. Anesth Analg. 1987;66: 181-184.

05AP07-10

Assessment of postoperative management in patient with osa after tonsillectomy

Garcia Fernandez E., Rios LLorente A., Ruiz Chiroso M.C., Pascual Lorenzo M.J., Rodriguez M., Morales C.

Complejo Asistencial Universitario de Salamanca, Dept of Anaesthesiology, Salamanca, Spain

Goal of Study: To assess the selection of patients who are candidates for tonsillectomy and to manage their hospital stay based on the history of obstructive sleep apnea (OSA) and risk factors for postoperative complications.

Materials and Methods: Descriptive cross-sectional study in 56 patients undergoing tonsillectomy during the year 2014. We exclude patients older than 14 years. The variables included were: age, sex, weight, ASA, OSA yes/ no, OSA degree, previous polysomnography, risk factors for complications, place of stay postintervention, postoperative complications during the first 24 hours and where they took place. They were expressed in averages and standard deviations. Qualitative variables in percentages. For the relation of variables we used chi-square and Student-t for independent samples. Statistical significance level p <0.05. For the multivariate analysis, binary logistic regression is performed. The program SPSS 20.0.

Results: 51 patients were diagnosed with OSA, of which 21 (37.5%) had previous polysomnography. We found 35 (71.4%) children diagnosed with mild-moderate OSA, 34.28% had some postoperative complications and 12 (24.5%) had severe OSA, of which 41.66% had one or more complications. 27 patients (48.21%) had one or more risk factors for postoperative complications. Of this group, 14 (51%) had some complications and OSA. Of the 56 patients, 25 were in the PACU, averaging 2.74 hours and 31 days in the ICU, whose average stay was 22.77 hours. There were 23 cases of postoperative complications, 7 occurred in the operating room, 4 in the PACU and 17 in the ICU. Going to the ICU is significantly associated with higher risk of postoperative complications (p <0.05).

Conclusion(s): The percentage of patients operated with risk factors for postoperative complications is low (<2%), except in patients younger than 3 years (19.6%), and with concomitant respiratory disease (14.3%). The statistically significant factor (p <0.05) associated with having a postoperative complication was being younger than three years, which suggests a future better

selection of patients. Polysomnography is the most valued method for the classification of OSA, in this sample of patients only a third had it. The OSA patients and with some risk factors were complicated, so this group should stay during the first 24 hours postintervention in ICU. Most complications occurred in the ICU, where the more complicated patients enter and the hours of stay are greater.

05AP07-11

Outcome after postoperative chylothorax in pediatric cardiac surgery patients, a long term follow-up

Róth G.¹, Czobor N.R.², Holndonner-Kirst E.², Ablonczy L.¹, Sápi E.³, Székely A.⁴

¹Gottsegen György Hungarian Institute of Cardiology, Department of Cardiology and Intensive Therapy, Budapest, Hungary,

²Semmelweis University, School of Doctoral Studies, Budapest, Hungary, ³Gottsegen György Hungarian Institute of Cardiology, Dept of Anaesthesiology & Intensive Care, Budapest, Hungary,

⁴Semmelweis University, Dept of Anaesthesiology & Intensive Care, Budapest, Hungary

Background and Goal of Study: Postoperative chylothorax occurs in 1-2 % of pediatric cardiac surgery patients as a rare but severe complication with high resource utilization at intensive care units. Purpose of this subpart of our study was to determine the long term outcome including factors like mortality and incidence of major complications.

Materials and Methods: We performed the secondary analysis of the prospectively collected data of patients presented with chylothorax after cardiac surgery at the intensive care unit of a tertiary national pediatric cardiac center between 2002 and 2012. Data of 48 consecutive patients was included in the analyses.

The control group, consisting of cardiac surgery patients without postoperative chylothorax, was propensity matched for pre- and intraoperative variables. Primary study endpoints were reoperations, genetic abnormalities, major long term complications including cerebral lesions, setbacks of neurodevelopment, epilepsy, thromboembolic events, as well as mortality.

Results and Discussion: During the 10-year period, 48 patients had chylothorax after pediatric cardiac surgery. The mean survival times were 13.7 years (SD 1.2 years) against 10.5 (SD:0.9) years in the chylothorax and in the control group respectively (log-rank test: 0.97). Cumulative mortality in both groups added up to 29% during the follow-up period. 33 patients with chylothorax needed at least one reoperation, compared to 23 control patients.

During the follow-up, 5 patients had thromboembolic complications (2 had confirmed thrombophilia) in the chylothorax group, while 3 in the control group. Genetic abnormalities were present slightly less often amongst patients without chylothorax, although not significantly ($p=0.362$ for both Down- and Di-George syndromes) Neurologic complications (hypoxic cerebral lesions diagnosed by MRI), epilepsy were frequent in both groups.

In the chylothorax group, phrenic palsy was observed more frequently. During the 49 reoperations, chylothorax did not occur.

Conclusion: Long term follow-up of chylothorax patients did not show an increased mortality or a significant increase in the number and severity of complications compared to other pediatric cardiac surgery patients. Also the fact that during none of the reoperations manifested any chylothorax predicts a multifactorial background of the entity.

Although still considered as a serious complication, our data suggests that it does not influence long term outcome.

Neuroanaesthesiology

06AP01-1

Anaesthesia for acute subarachnoid hemorrhage in a patient with Eisenmenger syndrome: a case report

Makovsek A., Kovac N., Hanzek I., Majic M.

UHC Zagreb, Dept of Anaesthesiology & Intensive Care, Zagreb, Croatia

Background: Eisenmenger syndrome is classified as a cyanotic congenital heart disease that develops in patients with left to right intracardiac shunts. When PVR exceeds systemic vascular resistance, the shunt flow reverses into right to left. This paper discusses the anaesthesia of an Eisenmenger syndrome patient with severe pulmonary hypertension and transposition of the great arteries, who presented with acute subarachnoid haemorrhage (SAH) due to cerebral arteriovenous fistula.

Case report: A 27-year-old female who presented with headaches and a grand mal seizure, GCS 15, ASA IV. She was diagnosed with SAH, with slight left-side hemiparesis. An emergency embolization of the AVf was performed. The patient was born with dextro-transposition of the great arteries and underwent a Rashkind septostomy after birth. Later, the patient developed pulmonary hypertension and Eisenmenger syndrome. Table 1.

Neurological data	Respiratory data	Hemodynamic data	Blood value data
GCS 15	SpO2 68%	RR 120/50 mmHg	E 8.56 x 1012/L
Somnolent	pO2 4.5 kPa	Puls 90/min	Hb 196 g/L
Slight left-side hemiparesis	pCO2 4.9 kPa	NYHA III	Htc 0.639 L/L
Grand mal seizures	FVC 56.7%	ECG: sinus rhythm, RBBB	Platelets 105 x 109 /L
Headache	FEV1 48.1%	ASD: d=1.3 cm; bidirectional flow	PV- INR: 1.43
	VCmax 56.1%	Dilated pulmonary artery trunk: 5.5 cm	
	6-MWT: 300 m	PA diastolic pressure: 60 mmHg	
	Clubbing nails grade V	EF LV: 70%	
		Right ventricular hypertrophy	

[Table 1. Patient data at admission]

Discussion: Patients with Eisenmenger syndrome have a high perioperative mortality rate due to their complex pathology. The principal challenge is to keep SVR from decreasing and PVR from increasing. Decreased SVR results in greater shunt flow, which results in exaggerated hypoxia, which is resistant to increasing FIO2 and we had to consider both the patient's primary pathology and her acute brain trauma. Anaesthesia was induced using fentanyl, etomidate, and rocuronium. Anaesthesia was maintained with sevoflurane. A benefit of sevoflurane is that it blunts the hypoxic pulmonary vasoconstrictive response to hypoxemia, which may be of benefit in patients with Eisenmenger syndrome as well as cardioprotective property.

References: 1. Eisenmenger's syndrome in Handbook of Clinical anaesthesia, 2nd edition, B. Keogh, p112-114.

Learning points: The main objective is to avoid disrupting the patient's unusual physiological balance between PVR and SVR, because any changes could result in increased intracardiac shunt volume, thus leading to hypoxia and associated pathology.

06AP01-2

Anesthesiologists role in management of major arterial injuries during endonasal endoscopic skull base surgeries

Eroglu T.N.¹, Meco B.C.¹, Kahilogullari G.², Bozkurt M.², Beton S.³, Yorukoglu D.¹

¹Ankara University School of Medicine, Dept of Anaesthesiology & Intensive Care, Ankara, Turkey, ²Ankara University School of Medicine, Neurosurgery, Ankara, Turkey, ³Ankara University School of Medicine, Otolaryngology, Ankara, Turkey

Background: Recently endonasal endoscopic surgery (EES) became a standard approach for pathologies along the skull base. Nevertheless, regardless of the approach operating in this area could risk neurovascular injuries. Due to close anatomical relationship in sphenoid sinuses, internal carotid artery (ICA) injury may happen at any stage of surgery.

This case report focuses on the management of our only ICA injury in our endoscopic skull base unit (>700 cases).

Case report: In a 44 year old female EES was planned for pituitary adenoma resection. Routine ASA monitoring and anesthesia induction was performed. And, an invasive radial artery monitoring, and a 16 G iv line was placed. Intraoperatively a massive bleeding from left ICA has occurred leading hypotension. Immediately while starting norepinephrine, a femoral vein catheter was inserted, which led rapid perfusion for volume resuscitation (2 U RBC and 14 L crystalloid). As bleeding could not be controlled despite all packing efforts, an emergency surgical clipping of proximal ICA in the neck has been performed. The patient was then transferred to the angiography unit for endovascular management also showing contralateral retrograde perfusion. Nevertheless in order not to risk ophthalmic artery, the patient was taken back to operating room for transcranial clipping of distal ICA. At the end, the patient was once again transported to angiography to control leak sealing, followed by the ICU further intubated and mechanically ventilated, and was extubated in day 2 with a mild ptosis on her left eye.

Discussion: Although the ICA injury has a low incidence during EES, the response must be immediate, effective and organized. This could only be achieved through an algorithmic, well-prepared multidisciplinary team approach. The anesthesiologist plays a crucial role here in stabilizing the patient, which would facilitate time for optimal management. The anesthesiologist should be prepared for the management of unexpected massive hemorrhage as well as a multimodal approach by neurosurgeons, otolaryngologists and interventional radiologists. As such, our case needed not only transfers to the radiology unit, but also craniotomy and neck surgery for vascular sacrifice to completely control bleeding.

Learning Point: As a member of the EES team, anesthesiologists should be prepared to handle unexpected severe arterial hemorrhage especially from ICA to enable time for optimal management.

06AP01-3

Does the presence of an anesthesiologist improve the outcome after endovascular treatment for acute ischemic stroke?

Gabriela A.¹, Chui J.², Manninen P.³, Porta A.⁴, Pereira V.⁵, Venkatraghavan L.⁶

¹Toronto Western Hospital and Women's College Hospital - University of Toronto, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada, ²London Health Science Centre - University of Western Ontario, Dept of Anaesthesiology & Pain Medicine, London, Canada, ³Toronto Western Hospital and Women's College Hospital, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada, ⁴Toronto General Hospital - University of Toronto, Dept of Electrophysiology - Cardiology Division, Toronto, Canada, ⁵Toronto Western Hospital and Women's College Hospital - University of Toronto, Dept of Medical Imaging, Toronto, Canada, ⁶Toronto Western Hospital and Women's College Hospital - University of Toronto, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada

Background: Recently, there has been a growing interest on the impact of the type of anesthesia and the blood pressure control during endovascular treatment for acute ischemic stroke (AIS). In many centers, anesthesiologists might not routinely get involved except for patients who are unstable or require general anesthesia (GA). Aim of our study was to determine if the presence of an anesthesiologist improves the outcomes of patients undergoing endovascular treatment of AIS.

Materials and Methods: After Institutional ERB approval, we conducted a retrospective cohort study on patients undergoing endovascular treatment for AIS of the anterior circulation between 2012 and 2016. Clinical and procedural variables during the intervention were collected. Multivariate analysis was performed to identify predictors of hemodynamic intervention, failed hemodynamic control (systolic blood pressure, SBP, <140 and/or >180 mmHg), in-hospital death and favorable neurological outcomes (Modified Rankin Scale ≤ 2) at discharge.

Results: A total of 143 patients were analyzed (median age 74 years and 57% female). Most patients suffered from thrombotic stroke (97.9%) in the middle cerebral artery (79.3%). The mean (\pm SD) NIHSS and ASPECTS scores were 17.26 (± 6.8) and 8.21 (± 1.6) respectively. Anesthesiologists were present in 98.6% of the procedures. The majority of patients received monitored anesthesia care (MAC) with or without sedation (88.1%). Nine patients received GA

and 8 had intraoperative conversion to GA. Hemodynamic intervention was needed in 46.9% of the patients (23% for hypotension and 23.9% for hypertension), and this was significantly associated with GA (OR 5.88; $p=0.01$) and SBP at hospital admission (OR 1.02; $p=0.019$). Hemodynamic control failed in 47 patients and the main predictor for hypotension (OR 0.92, $p=0.001$) and hypertension (OR 1.08, $p=0.001$) was baseline SBP. Successful revascularization and favorable neurological status were achieved in 68.5% and 27.9% of patients respectively. In-hospital mortality was 16.3%. This was significantly higher among patients converted to GA (50%) compared to elective GA (25%), sedation (12.7%) and MAC (20%), $p=0.019$.

Conclusion: In our study, the involvement of anesthesiologists resulted in a low rate of GA, a tighter hemodynamic control and better outcomes. The presence of an anesthesiologist during endovascular thrombectomy should be routine practice to provide appropriate anesthetic care and better hemodynamic control.

06AP01-5

Effect of the degree of head elevation on the incidence and severity of venous air embolism in cranial neurosurgical procedures in the semi-sitting position

Ture H.¹, Harput M.V.², Bekiroglu N.³, Keskin O.¹, Koner O.¹, Ture U.²
¹Yeditepe University School of Medicine, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ²Yeditepe University School of Medicine, Dept of Surgery, Istanbul, Turkey, ³Marmara University School of Medicine, Biostatistics, Istanbul, Turkey

Background and Goal of Study: The semi-sitting position has numerous advantages in various neurosurgical procedures. Venous air embolism is one of the associated complications of this position. This study compared changes in the severity of venous air embolism according to the degree of head elevation (30 or 45 degrees) in patients undergoing elective cranial neurosurgical procedures in the semi-sitting position.

Materials and Methods: One hundred patients undergoing an elective infratentorial craniotomy in the semi-sitting position were included, and patients were divided into two groups. In group 1, each patient's head was elevated 30 degrees; in group 2, head elevation was 45 degrees. Patients were assigned to groups according to the location of their lesion. During surgery, the standard anesthetic protocol was used with total intravenous anesthesia, and transesophageal echocardiography was used to detect air in the blood circulation. Any air embolism seen on the echocardiography screen was classified as grade 0 to 4. If multiple events occurred, the worst graded attack was used for statistical analysis. During hemodynamic changes caused by emboli, fluid and vasopressor requirements were recorded. Surgical and anesthetic complications were also recorded. All results were compared statistically and a p value <0.05 was considered statistically significant.

Results and Discussion: There was a statistically significant difference between groups for the total rate of venous air emboli detected on transesophageal echocardiography: 22.0% ($n=11$) in group 1 and 62.5% ($n=30$) in group 2 ($p<0.0001$). The rate and severity of air embolism were significantly lower in group 1 than in group 2 ($p<0.001$). The rate of clinically important venous air embolism (grades 2, 3, and 4: venous air embolism with decreased end-tidal carbon dioxide levels and/or hemodynamic changes) was 8.0% ($n=4$) in group 1, and 50.0% ($n=24$) in group 2 ($p<0.0001$). There was no association between the rate and severity of venous air embolism with patients' demographics ($p>0.05$).

Conclusion(s): For patients in the semi-sitting position, an increase in the degree of head elevation is directly related to a higher rate of venous air embolism. With 30 degrees of head elevation and our standardized technique of positioning the semi-sitting position can be utilized safely in neurosurgical practice.

06AP01-6**Friedreich's ataxia (FA), comorbidities and anaesthetic management.**

Pardey Bracho G.F.¹, Brinzeu A.², Lukaszewicz A.-C.¹, Mertens P.², Lehot J.J.¹

¹Hopital Neurologique Pierre Wertheimer, Dept of Anaesthesiology & Intensive Care, Lyon, France, ²Hopital Neurologique Pierre Wertheimer, Departement of Fonctional Neurosurgery, Lyon, France

Background: FA an orphan disease, deserves the awareness of its particularities to avoid fatal complications. Guidelines for FA anesthesia management are scarce, especially in the elderly.

Case report: A 64 years-old male ASA IV with FA, confined to a wheel chair due to severe spasticity was scheduled to an intrathecal baclofen pump under GA. Preoperative evaluation: normal standard blood tests without diabetes, a bypassed ischemic cardiopathy [LA1] with RBB and LAHB, LVEF conserved. Anesthesia Management: Standard antibioprophylaxis, hydration and monitoring plus invasive monitoring. Etomidate, TCI Sufentanil and Rocuronium for induction; TCI Sufentanil, Sevoflurane, normocapnia and normothermia for maintenance. Noradrenaline infusion and Phenylephrine bolus to avoid >20% hemodynamic variations, Isoproterenol was started at HR <40 bpm and stopped after the surgery.

In PACU: Paracetamol, Morphine and Sugammadex were administrated with successful extubation at TOF 4/4 without post-operative complications.

Test spasticity decreased at low baclofen doses (50 µg/day) but this hindered patient transfers, higher doses led to complete loss of muscle tonus in the lower limbs. The test was negative and the pump was not implanted.

Discussion: Propofol was avoided due to depressant effects on mitochondria (1). High muscle relaxant (MR) sensitivity is described, so patient received Rocuronium and Sugammadex associated to TOF-watch monitoring to prevent aspiration risk and other respiratory complications (2), (3). Suxametonium was avoided to elude hyperkalemia and secondary arrhythmia. Patient develops an extreme bradycardia needing Isoproterenol administration without any cardiac ischemic event.

Conclusions: FA has a particular anesthesia approach. Cardiac failure and arrhythmia are frequent and potentiated by MR. Because of its cardioprotective effect Sevoflurane might be anesthetic of choice, associated with carefully hemodynamic monitoring. Rocuronium could be employed if Sugammadex is available. Normothermia, normocapnia and hemodynamic stability are imperative, early ischemic signs must be research. Postoperative metabolic and respiratory complications are frequent.

Learning points: No consensus for the anesthesia drugs choice, Propofol is not advised, MR can be employed with care. Cardiovascular, neuromuscular and core temperature monitoring are mandatory.

References:

1. AANA J 2013;81:237-243.
2. Anaesthesia 1986;41(3):296-301.
3. J Med Cases. 2014;5(4):232-233

06AP01-7**Multidisciplinary approach and anesthetic management in giant multiple aneurysms**

Dávila Arango N.A., García Fernández E., Ríos Llorente A., Martín Martín R.

Salamanca University Hospital, Dept of Anaesthesiology & Pain Medicine, Salamanca, Spain

Background: Giant aneurysms are a challenge in anesthetic management. The minimally interventional approach prior to resection surgery may reduce postoperative morbidity and mortality.

Case report: A 40-year-old woman with congenital aortic coarctation repaired at age 5; mitral valvular prosthesis, pacemaker for permanent flutter, with LVEF 40% and inferoanteroapical akinesia; was seen in ER due to confusion and spontaneous recovery aphasia. In CT, large aneurysms (>6cm) were present in left middle cerebral artery, right and left internal carotid arteries, with intraparenchymal bleeding in left frontal region displacing midline with collapsed ipsilateral ventricle. It was classified as Hunt-Hess I Fisher II subarachnoid hemorrhage. Due to its antecedents, angiography and subsequent embolization was decided. Both procedures were performed in two

phases. Anesthesia management was similar in each intervention: general anesthesia, with radial artery catheter, vesical catheter and anesthetic depth monitoring (SedLine) and cerebral oximetry (Invivo).

Induction: propofol and remifentanil, neuromuscular relaxation (rocuronium) in bolus iv. Extubation performed in neuroICU, checking before hemodynamic stability, absence of neurological complications and normothermia. Embolization excluded supraclinoid left internal carotid aneurysm.

Patient was discharged, adding nimodipine 60mg q.i.d suspending anticoagulation until resection surgery. 7 days after, a frontoparietotemporal craniotomy was performed after placement of CSF drainage under general anesthesia, with inability to monitor anesthetic depth or cerebral oximetry. Soft induction with propofol, remifentanil and cisatracurium. Maintenance same TIVA, IPPV, normocapnia, normoventilated. Gasometric and Hb controls were performed, trasfusing blood products(x2) to maintain Hb>10 g/dl (pre-surgical Hb 9.7 g/dl). Aneurysms were resected before clipping, with successful hemostasis.

Again, extubation performed in NeuroICU, verifying the absence of focality, normothermia, without changes hemoglobin and coagulation.

Discussion: Aneurysms involve delicate surgical and anesthetic management, which can be complicated by massive bleeding, vasospasm or cerebral hypoxia. Anesthesia must ensure: hemodynamic stability, good tissue oxygenation, protective mechanical ventilation, etc.

Learning points: Multidisciplinary approach is necessary in a complex, rare pathology with high morbimortality.

06AP01-8**Perioperative complications in Elderly patients undergoing Intracranial surgery - A Prospective observational study**

Kumar S.¹, Kumar K.², Naskar S.²

¹All India Institute of Medical Sciences, Dept of Anaesthesiology & Intensive Care, New Delhi, India, ²All India institute of Medical Sciences, Dept of Anaesthesiology & Intensive Care, New Delhi, India

Background and Goal of Study: Elderly people undergoing craniotomies present an extra set of challenges to the anaesthesiologist. Comorbidities and the ageing organs with decreased functional reserve amplify the perioperative risk in geriatric patients. Hence, this study was planned to assess the incidence and characteristics and associated risk factors of perioperative complications in patients undergoing intracranial procedures.

Methods: After institutional ethics committee clearance, Elderly patients scheduled for elective and emergency intracranial procedures at neurosciences centre, AIIMS between December 2012 to June 2014 were included in the study. Using a standard proforma, information pertinent to the preoperative history, examination, reports of investigations, premedication, induction, airway management, anaesthesia technique, intraoperative events and postoperative events were recorded. Preoperative medication, intraoperative patient management and postoperative care were at the discretion of the attending physician.

Results: 150 patients underwent elective and emergency neurosurgical procedures in elderly patients of age more than or equal to 60 years for various intracranial pathologies. Comorbidities like hypertension (59.3%) and diabetes mellitus (19.3%) were very common. Majority of patients presented for intracranial tumour (47.3%). The next common diagnosis was vascular disease. Raised intracranial pressure were present in 44% of patients and 18% patients were severely comatose (GCS 3-7). Hemodynamic fluctuations during intraoperative period occurred in 32% patients. The presence of intraoperative brain bulge occurred in 26.7% patients. Sixty four percent patients were ventilated in the postoperative period. The incidence of postoperative complications like electrolyte abnormalities (49.3%), neurosurgical (23.3%), cardiovascular (18.7%), pulmonary (15.3%) and metabolic (9.3%) complications were quite common. The incidence of poor outcome was high (26.7%) and overall mortality was 20% (30 patients).

Conclusion: Hemodynamic fluctuations were the most common intraoperative, while electrolyte abnormalities were the most common postoperative complication. The independent risk factors for poor outcome at hospital discharge were preoperative Glasgow coma scale <8, vascular pathology, intraoperative hemodynamic fluctuations, postoperative neurosurgical and cardiovascular complication.

06AP01-9**Preoperative evaluation of psycho-emotional and vegetative status in elective neurosurgical patients for optimization of premedication**

Savvina L., Petrova A., Orechova E.

Federal Almazov North-West Medical Research Centre, Dept of Anaesthesiology & Intensive Care, St Petersburg, Russian Federation

Goal of Study: Preoperative evaluation of psycho-emotional status and functional state of autonomic nervous system (ANS) in patients with neurosurgical pathology for the development of optimal premedication schemes.

Materials and Methods: 65 ASA II-III neurosurgical patients (33 female, 32 male, age 49.6 ± 3.8 years) were in the same department and environment waiting for elective surgery and were examined using:

1. Integrative anxiety test (IAT) (L. Wasserman et al., 2005) for assessment of anxiety level. To standardize the results were translated to scores of General anxiety scale and an auxiliary scale, stanine scale(SN)(standard nine).
2. Functional examination of suprasegmental and segmental parts of the ANS with Kerdo and Hildebrandt index, Dagnini-Aschner and Chermak-Goering reflexes, orthostatic test;
3. Measurement of hemodynamic parameters: arterial blood pressure, heart rate.

Results and Discussion: The patients were divided into 3 groups depending on the level of anxiety: I group - 19 patients with a normal level of anxiety (1-3 SN) and saved balance of the sympathetic and parasympathetic divisions of the ANS; II - 25 patients with an average level of anxiety (4-6 SN) with the prevalence of parasympathetic part of ANS; III - 21 patients with high levels of personal and situational anxiety (7-9 SN) with marked activation of sympathetic division of the ANS. In all groups, regardless of the initial level of anxiety on the day of surgery the level of situational anxiety and emotional discomfort were increased. In the 3 group personal anxiety was a constant feature in combination with predominance of sympathetic tone of ANS and it was a factor limiting the adaptive potential of circulatory system. Taking into account the identified characteristics of patients, the premedication schemes were prescribed (table 1).

groups	On the eve of neurosurgery	30 min before operation
1	Atarax (non-benzodiazepine anxiolytic) 25 mg	Phenorelaxan 1mg + ketoprophenum 100 mg
2	Phenorelaxan (benzodiazepine anxiolytic) 1mg	Phenorelaxan 1mg + ketoprophenum 100 mg
3	Phenorelaxan 1mg + moxonidine 0,2mg	Phenorelaxan 1mg + ketoprophenum 100mg + moxonidine 0,2mg

[Premedication schemes depending on functional ANS]

Conclusion(s): The functional state of the ANS and emotional status of the patient determine the individual choice of premedication before neurosurgery.

06AP01-10**Psychotherapy as a means of prevention and correction of possible cognitive decline when using general anesthesia**

Sinbukhova E.¹, Lubnin A.¹, Kononov N.², Shmigelskiy A.¹, Danilov G.²

¹Scientific Research Neurosurgery Institute named after the academician N. N. Burdenko, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation, ²Scientific Research Neurosurgery Institute named after the academician N. N. Burdenko, Dept of Surgery, Moscow, Russian Federation

Actualy: Cognitive decline when using anesthesia is a possible complication of its application that underlines the importance of study of the measures aimed at preventing or reducing negative consequences.

Abstract: Cognitive deficits can lead to significant functional disorders, decreased intellectual function, attention deficits, memory decline, changes in personality and behaviour, mood disorder, violation of physical and social function, at severe stages to dementia and daily necessity in the people providing care to these patients.

Hypothesis: Psychotherapy as a means of prevention and correction of possible cognitive decline when using anesthesia.

Objective: To assess the incidence of cognitive decline of patients of spinal neurosurgical department during the surgical treatment and anesthetic propofol and fentanyl application. To consider possible ways of its prevention and correction using psychotherapy.

Methods: MoCA, FAB, Schulte tables, HADS, Spielberger-Hanin anxiety test, Wechsler Memory Scale, Pain Detect, projective drawing method (Art -testing). The methods of descriptive statistics, hypothesis testing by Mann-Whitney U test.

Results: In the study 66 patients (43 women, 23 men) of the spinal neurosurgical department with chronic back pain. Patients were randomly divided into two equal groups of 33 persons each.

Group A (average age 50.25) had sessions with a psychologist in cognitive-behavioral psychotherapy aimed at decreasing levels of anxiety and depression before surgery and every day since the next day after surgery.

Group B (average age 49.03) did not have such activities.

All patients were tested by a psychologist using scales before surgery and on the sixth day after it. Anesthesia duration was in average 4 hour.

Conclusions: Cognitive assessment of Group B shows significant cognitive decline after anesthesia. While test results of Group A in which daily classes in psychotherapy with a psychologist were conducted did not show significant cognitive impairment after anesthesia.

Keywords: General anesthesia, cognitive decline, psychotherapy.

06AP01-11**Propofol pharmacology in patients with brain tumours**

Sahinovic M., Eleveld D., Struys M., Absalom A.

University of Groningen, University Medical Center Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: Although some animal and patient studies suggest that brain tumours and associated treatments alter the pharmacokinetics (PK) and pharmacodynamics (PD) of the anaesthetic drugs, the evidence is conflicting. PK/PD models developed in patients without brain pathology are widely used for target controlled infusion (TCI) of propofol during brain tumour excision operations.

The goal of this study was to determine if the presence of a frontal brain tumour influences propofol pharmacokinetics and dynamics and PK/PD model performance.

Material and methods: Twenty patients with a frontal brain tumour and 20 control patients received a propofol infusion to achieve an "induction, emergence-induction," anaesthetic sequence. No opioids were administered. Arterial propofol plasma concentration was measured every 4 minutes and at each of the transitions of conscious state. These measurements and continuously recorded BIS values were analysed by non-linear mixed effects modelling to generate a new PK and a PD propofol model.

We investigated the effect of different model adaptations on PK and PD performance. Subsequently we back-calculated the propofol concentrations predicted by the Marsh, Schnider and Eleveld models, and calculated the predictive performance of these models in terms of the Varvel criteria i.e. in terms of median prediction error (MdPE) and median absolute prediction error (MdAPE).

Results and Discussion: Hierarchical PK model development resulted in a three-compartment allometric model scaled to total-body-weight. Patients with brain tumours showed 40% higher propofol clearance than control patients. In patients with brain tumours, $MdPE_{pk}$ was -3.83%, and $MdAPE_{pk}$ 21.1%. Predictive performance of the Schnider model ($MdPE_{pk}$ -20.0%, $MdAPE_{pk}$ 23.4%) and Eleveld volunteer model ($MdPE_{pk}$ -8.58%, $MdAPE_{pk}$ 21.6%) were good. The Marsh model performed less well ($MdPE_{pk}$ -14.3%, $MdAPE_{pk}$ 41.4%) as did the Eleveld patient model ($MdPE_{pk}$ -30.8%, $MdAPE_{pk}$ 32.1%).

Hierarchical PD model development found that ke_0 (0.108 min^{-1}), Ce_50 (2.77 ml/l) and the γ (1.49) did not significantly differ between the two groups. Lower baseline BIS value were found in patients with brain tumours (90.2 vs 95.1).

Conclusion: Frontal brain tumours are associated with differences in the pharmacokinetics and pharmacodynamics of propofol. Caution and good clinical judgment should be exerted when using current propofol TCI in patients with frontal brain tumours.

06AP02-2

Toll-like receptor 3 inhibits working memory retention in a mouse model of nephrectomy-induced postoperative cognitive dysfunction

Chen C., Yu H., Li M., Ma Y., Liu J., Zhu T.

Sichuan University, Dept of Anaesthesiology & Pain Medicine, Chengdu, China

Background: Postoperative cognitive dysfunction (POCD) is a common complication after surgery, especially in elderly patients. Previous study and our group have well established a mouse model of POCD through a surgical operation of nephrectomy. However, the role of TLR3 in nephrectomy-induced POCD is still unknown. Therefore, in the present study, we aim to investigate whether TLR3 deficiency could attenuate postoperative cognitive impairment in aged mice.

Materials and Methods: C57BL/6 wild type (WT) and homozygous TLR3 knock out (KO) on a C57BL/6 background male mice aged 16 months were randomly assigned to 4 groups: WT plus sham surgery (WT+Sm), WT plus nephrectomy surgery (WT+Sy), TLR3^{-/-} plus sham surgery (KO+Sm) and TLR3^{-/-} plus nephrectomy surgery (KO+Sy). Briefly, mice were anesthetized by intraperitoneal injection of ketamine (120 mg/kg) and xylazine (4 mg/kg), a small transverse incision was made and the left kidney was removed (WT+Sy and KO+Sy), or only exposure of kidney was made without excision (WT+Sm and KO+Sm). Contextual fear conditioning test including both conditional stimulus (CS) and unconditional stimulus (US) (protocol by Terrando et al. PNAS, 2010) was used for cognitive assessment. All mice were trained the day before surgery in a fear conditioning chamber (Med Associates, St Albans, VT) under a paradigm including 2 pairs of CS (an auditory cue) and US (foot-shock) with an intertrial interval of 100 s. Freezing behavior in response to context expressed as percentage of freezing time was assessed on day 3 after surgery.

Results: Assessment of hippocampal-dependent learning and memory by fear conditioning in all groups at day 3 postoperatively demonstrated a significant reduction of the percentage of freezing time in the WT+Sy group compared to the WT+Sm group ($73.10 \pm 8.31\%$ vs. $39.08 \pm 5.46\%$, $***P < 0.001$), suggesting that unilateral nephrectomy induced a significant cognitive impairment in aged mice, therefore emulating POCD. Of note, TLR3 knockout surgical (KO+Sy) group had a significantly enhanced working memory retention, compared with the WT+Sy group ($64.72 \pm 3.12\%$ vs. $39.08 \pm 5.46\%$, $*P < 0.05$), indicating that TLR3 deficiency could attenuate POCD induced by unilateral nephrectomy in aged mice.

Conclusion: This study demonstrated that TLR3 may inhibit working memory retention in a mouse model of nephrectomy-induced postoperative cognitive impairment.

06AP02-3

Cognitive dysfunction in mice underwent cardiac arrest and cardiopulmonary resuscitation by contextual fear-conditioning test

Ma Y., Chen C., Li M., Wang Q., Liu B., Yu H.

Sichuan University, Dept of Anaesthesiology & Pain Medicine, Chengdu, China

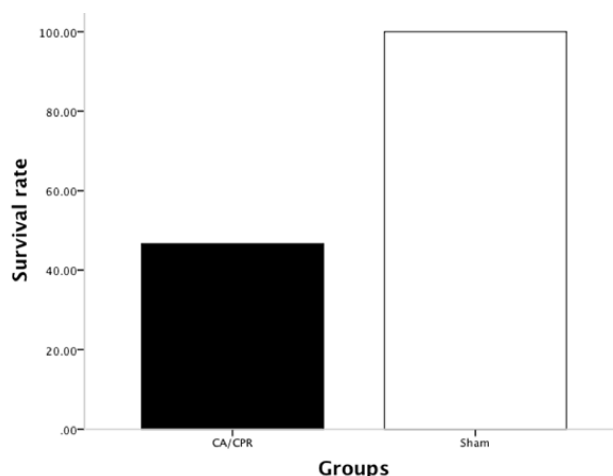
Background: Whole-body ischemia-reperfusion injury (IRI) induced by cardiac arrest (CA) and cardiopulmonary resuscitation (CPR) may lead to severe post-resuscitation organ dysfunction, especially neurological disorder. Cognitive problem has been reported after CA and CPR process. Fear conditioning has been used as a valuable test in several studies to assess learning ability and memory in rodents. However, the significance of fear conditioning to evaluate cognitive disorder in mice underwent CA and CPR has never been reported. Therefore, we investigated whether cognitive function in mice underwent CA and CPR could be confirmed through fear conditioning test.

Materials and Methods: C57BL/6 male mice weighted 20-25g were randomly assigned to 2 groups: sham and CA/CPR group. CA was induced by injection of 0.08mg/g potassium chloride through PE-10 catheter inserted into jugular vein. CPR was initiated 5 minutes after CA with the frequency of 300-400 beat per minute. At the meantime, 0.4ug/g epinephrine was given slowly. Recovery of spontaneous circulation (ROSC) was confirmed from electrocardiogram and visual heart beat. Mice were trained with conditional stimulus (cue tone) and aversive, unconditional stimulus (foot shock) the day before modeling in

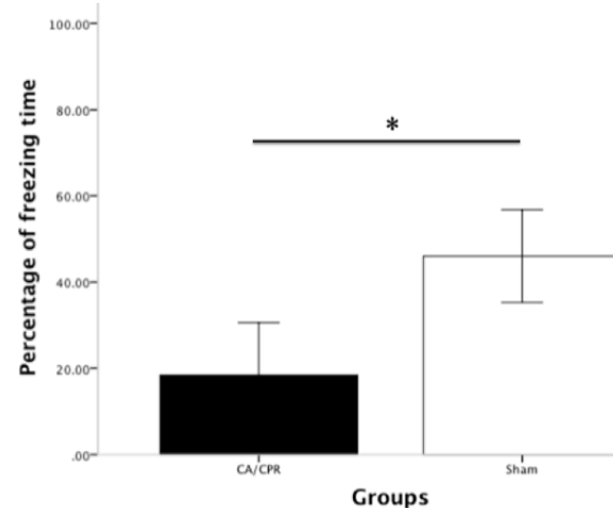
fear conditioning chamber. Fear conditioning test was conducted in the second day after modeling. Freezing behavior showed a better cognitive function when they were re-exposed in the conditional stimulus. We record the survival rate, freezing scores and mean freezing scores of mice.

Results: Survival rate on day 3 after modeling was 46.7% in CA/CPR group (n=15) and 100% in sham group (n=15) (Figure 1). Percentage of freezing time was significant lower in CA/CPR group (n=4) compared with sham group (n=4) ($18.38\% \pm 0.0613$ vs. $46.02\% \pm 0.0536$) (Figure 2), $*P < 0.05$, indicating a higher cognitive disorder with CA/CPR process.

Conclusion(s): This study demonstrated that mice could exhibit cognitive disorder after whole-body IRI. Also, contextual fear conditioning is a valuable test of cognitive dysfunction after CA/CPR process in mice.



[Figure 1]



[Figure 2]

06AP02-5

Long term application of salicylic acid protects neuronal cells from hypoxia/reoxygenation injury in-vitro

Zitta K., Gruenewald M., Schildhauer C., Steinfath M., Albrecht M. UKSH-Kiel, Dept of Anaesthesiology & Intensive Care, Kiel, Germany

Background and Goal of Study: Aspirin and its major metabolite salicylic acid (SA), confer protection against glutamate neurotoxicity via COX dependent and independent mechanisms. There is also evidence that SA may protect against hypoxia-induced neuronal cell damage which is associated with increased levels of reactive oxygen species (ROS). Here we investigated the effects of chronically increased levels of SA on the ability of neuronal cells to survive hypoxia-induced neurotoxicity in-vitro and evaluated the underlying mechanisms.

Materials and Methods: Human neuronal IMR-32 cells were cultured with or without SA (0.1, 1 and 10 μ M) for a total of 7 months. In-vitro hypoxia was induced for 3 hours using our recently described system. Cell morphology was evaluated by brightfield microscopy, cell damage was measured by lactate dehydrogenase (LDH) assays and cell metabolism was quantified by colorimetric MTS assays. Production of ROS was analyzed using fluorometric assays. Western blotting for catalase (CAT) and glutathione peroxidase (GPX) was performed.

Results and Discussion: Long term incubation (7 months) of neuronal IMR-32 cells with clinically relevant concentrations of SA (0.1, 1 and 10 μ M) did not change morphology or proliferative potential of the cultures. However, neuronal cells that were exposed to chronic SA treatment showed statistically significant protection against hypoxia/reoxygenation injury ($P < 0.001$ vs. hypoxia for all SA concentrations) and 1 μ M SA also significantly increased metabolic activity of IMR-32 cells under normoxic as well as hypoxic conditions ($P < 0.01$ vs. the respective normoxia/hypoxia control). Biochemical analyses using cell-free systems revealed that the activity CAT which is protecting cells from oxidative stress, is regulated by SA. However, compared to control cells, protein expression of CAT, GPX and hypoxia-induced ROS generation were not altered in IMR-32 cells exposed to SA. Moreover inhibiting GPX and CAT activity in culture did not increase hypoxia-induced cell damage.

Conclusion: Our data show that long term treatment with salicylic acid induces neuronal resistance to hypoxia/reoxygenation injury independently of GPX, CAT and ROS.

06AP02-6

Measurement based acute cerebral insufficiency by neural network modeling

Cherniy V.¹, Gorodnik G.², Andronova I.², Nazarenko K.²

¹Scientific and Practical Centre of Preventive and Clinical Medicine, Dept of Anaesthesiology & Intensive Care, Kiev, Ukraine, ²Donetsk National Medical University, Dept of Anaesthesiology & Intensive Care, Donetsk, Ukraine

Background and Goal of Study: Complex of neurophysiological monitoring of CNS functions, using neural network modeling methods in regression problems, allows high reliability to predict disease outcomes and dynamically assess the quality of the intensive therapy.

Materials and Methods: The study was conducted on the basis of Donetsk clinical territorial medical association for the period 2013-2016 years. The study included 102 patients with acute cerebral insufficiency (ACI). Depending on the reason divided into 3 groups: with severe traumatic brain injury (TBI), with acute stroke (AS) of ischemic, with toxic and circulatory encephalopathy (TCE).

Results and Discussion: In the course of the study designed a neural network model for task-based regression in the form of multilayer perceptron. The neural network has a satisfactory performance (control error- 0.17, control productivity- 0.75). Perceptron presented 3 layers and 14 input variables. The output of the model is calculated predicted value of the Glasgow outcome scale. When assessing the sensitivity of the input variables and assessment schedules responses revealed significant predictors, which seems to form into groups: the first indicators of the relative power spectral EEG and HRV second integrated quantitative EEG derivatives, 3rd, nonlinear EEG characteristics. Average value (median) by DFA-lead EEG analysis are directly dependent on the outcome.

On admission to the Department all patients underwent assessment of the severity of GCS scale. Produces 8-channel EEG recording ("standard 10-20") on encephalograph NIHON KOHDEN EEG-1200 ECG signal simultaneous recording and subsequent analysis of heart rate variability (HRV). Sampling frequency of 500 Hz. Record duration of 300 seconds. Neurophysiological data were subjected to spectral analysis techniques (Fourier transform, AR model), as well as non-linear methods of analysis (detrended fluctuation analysis for short series, the DFA). Quality assessment ACI outcomes assessed by the Glasgow outcome scale. Statistical data processing and building neural network models made in the package STATISTICA 6 programs.

Conclusion(s): Neural network model based on multilayer perceptrons are sensitive and specific methods for assessing and predicting outcomes. For diagnostic screening of the first group of indicators the most useful is the average value (median, on-lead) relative alpha power range.

06AP02-7

Patch-clamp analysis of mutant voltage-gated sodium channels causing congenital insensitivity to pain

Kiyosawa K.¹, Sugiyama Y.¹, Kashiwara T.², Nakada T.², Yamada M.², Kawamata M.¹

¹Shinshu University, Dept of Anesthesiology & Resuscitology, Matsumoto, Japan, ²Shinshu University, Dept of Molecular Pharmacology, Matsumoto, Japan

Background and Goal of Study: Congenital insensitivity to pain (CIP) is a rare disease associated with a loss of pain experience. We found a 73-year-old female who was clinically diagnosed to suffer from congenital insensitivity to pain. She had normal intelligence, but often experienced thermal injuries and bone fractures. We thus carried out a genetic analysis and identified a new mutation in SCN9A gene. The goal of this study is to analyze the biophysical properties of the mutant Na_v1.7 channels.

Materials and Methods: After approval of a study protocol by the ethical committee of our institution, informed consent was obtained from the patient, and her blood samples were collected for genetic analysis. We detected a novel homozygous missense mutation in a SCN9A gene encoding Nav1.7 channels. The mutated Nav1.7 (MT) and wild-type Nav1.7 (WT) were subcloned into pcDNA3 and transfected into a human embryonic kidney cell line, tsA201 cells to analyze its electrophysiological properties with the patch-clamp method.

Results and Discussion: We examined the voltage dependence of activation and steady-state fast inactivation. MT exhibited a significant depolarizing shift in channel activation compared with WT, whereas MT and WT exhibited a similar voltage-dependency of the fast inactivation.

However, MT exhibited significantly faster recovery from inactivation than WT. We also compared the currents of ramp depolarizations. Interestingly, MT had the significantly smaller ramp current amplitude than WT as assessed with either 0.2 or 0.6 mV/ms from -120 to +30 mV.

The peak ramp current amplitude (0.6mV/ms) normalized to that evoked by a square voltage step to -20 mV was $2.34 \pm 0.27\%$ for WT (n=4) vs. $0.90 \pm 0.40\%$ for MT (n=4) ($P < 0.05$).

Conclusion(s): This study suggests that the decreased overlap of the activation and inactivation curves results in the decreased ramp current, which would in turn cause hypo-excitability of dorsal root ganglion neurons and insensitivity to pain in this patient.

06AP02-9

The effects of sevoflurane and desflurane anesthetics on regional cerebral oxygen saturation during the operation of lower extremities with pneumatic tourniquet

Kumasaka A., Akimoto R., Sugiura A., Oda S., Kawamae K.

Yamagata University, Dept of Anaesthesiology, Yamagata, Japan

Background and Goal of Study: It is known that using a pneumatic tourniquet during lower extremity surgery causes hemodynamic instability and sometimes triggers severe complications to central nervous system.

As we reported previously (2016 ESA), we investigated the effects of sevoflurane and propofol on regional cerebral oxygen saturation (rSO₂) during the operation of lower extremities with pneumatic tourniquet.

Sevoflurane group indicated significantly higher levels of rSO₂ than propofol group, presumably by maintaining higher cerebral blood flow.

However, it is not certain whether the results is applicable to other inhalator anesthetic agents.

The goal of this study was to determine whether rSO₂ values differ between sevoflurane and desflurane anesthesia during lower extremity surgeries that require pneumatic tourniquet.

Material and methods: Forty-four patients undergoing lower leg operations were randomly divided into desflurane and sevoflurane group.

Patients with The American Society of Anesthesiologists physiological status 1 or 2 and without past history of cerebral disease were included in this research. Physiological parameters and rSO₂ were recorded under general anesthesia, at 5 minutes before, as well as 5, 10 and 15 minutes after deflation of pneumatic tourniquet. We also performed arterial blood gas analysis at the same time points. Using rSO₂ values at 5minutes before the deflation as a baseline, we compared all rSO₂ parameters between the groups.

The patients were followed for a week after the operation to record any complications.

Results: Sevoflurane group had significantly higher rSO₂ values than desflurane group at 5 minutes after deflation. ($p=0.002$) Sevoflurane group indicated continuous increase in rSO₂ after deflation. However, desflurane group showed decline in rSO₂ values after deflation, though it recovered within the recording period but not up to the baseline level.

There were no significant differences between the groups in terms of post-operative complications.

Discussion and Conclusion(s): At 5 minutes after deflation of pneumatic tourniquet, there were significant differences between two inhalational anesthetic agents on rSO₂. Even among the inhalator anesthesia, each agent might have unique physiological impact on cerebrovascular systems in the early phase of tourniquet deflation.

06AP02-10

Vasoactive peptide urotensin II in plasma is associated with cerebral vasospasm after aneurysmal subarachnoid hemorrhage and constitutes a potential therapeutic target

Clavier T.¹, Desrues L.², Gastaldi G.¹, Dubois M.², Compère V.¹, Castel H.²

¹Rouen University Hospital, Dept of Anaesthesiology & Intensive Care, Rouen, France, ²Rouen University, Inserm U 982, Mont Saint Aignan, France

Background and Goal of Study: Cerebral vasospasm (VS) is a severe complication of aneurysmal subarachnoid hemorrhage (SAH). Urotensin II (Ull) is a potent vasoactive peptide activating the UT receptor, potentially involved in brain vascular pathologies. We hypothesized that Ull may be associated with VS. Objectives were to search a correlation between plasma / cerebrospinal fluid (CSF) Ull level and VS, to investigate temporal variations of plasma and CSF concentrations of Ull, to leverage an experimental mouse model of SAH developing VS, to study the urotensinergic system antagonism on neurological outcome.

Materials and Methods: Prospective, observational clinical study setting in a neurosurgical intensive care unit. Inclusions of patients with SAH and external ventricular drainage, Ull levels were daily measured in plasma and CSF (radioimmunoassay method) during 9 days (from D0 to D8). A model of SAH was developed in mice to study the UT receptor antagonist ligand urantide vs NaCl on neurological outcome. Non-parametric tests (Mann-Whitney or Kruskal-Wallis tests) were used to determine statistical differences (α risk 5%). Receiver operating characteristic (ROC) curve analysis, including area under curve (AUC), was used to discriminate patients with symptomatic VS. This work had been approved by the institutional review board ("*Comité de Protection des Personnes Nord-Ouest*", n° 2010-001). The main objective was to look for a correlation between plasma Ull level and symptomatic VS.

Results and Discussion: Median Ull levels were 43 [14-80] pg/ml in plasma and 22 [5-68] fg/ml in CSF in 17 patients. No significant variation of Ull plasma and CSF levels from D0 to D8. Six patients developed a symptomatic and neuroradiology proved VS. The mean level of plasma Ull during the 9 first days post-SAH was higher in patients with symptomatic VS compared with patients without VS ($p<0.05$). No difference for level of Ull in CSF of patients with or without symptomatic VS. AUC (plasma Ull) for discriminating patients with symptomatic VS was 0.81 (95% CI, 0.57 to 1; $p<0.05$). In the mouse model, UT targeting by urantide prevented the fine motor coordination impairment due to SAH ($p<0.05$).

Conclusion(s): This study suggests that higher plasma Ull level could be a predictive marker of the onset of symptomatic VS due to SAH. The causality link between Ull and VS after SAH remains to be established, but our data position UT as a potential therapeutic target in SAH.

06AP02-11

The Anesthetic Biobank of cerebrospinal fluid: storing CSF for future neuroscientific research

Atmosoerodjo S.D., Absalom A.R.

University Medical Centre Groningen/University of Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background and Goal: To better understand the pathophysiology of degenerative brain diseases, and develop biomarkers, more knowledge of the neurobiology of the cerebrospinal fluid (CSF) is needed. Most current data on CSF comes from patients with neurological or cognitive problems. There is thus a need for CSF samples from healthier patients from a wider age span. In collaboration with colleagues from our neurology and clinical chemistry departments, we have thus set up the Anesthetic Biobank of Cerebrospinal fluid (ABC) to facilitate the banking of CSF from patients without clinical suspicions of cognitive or neurological problems, who are undergoing planned spinal anaesthesia.

Materials and Methods: The local ethical committee approved our study in accordance with the separate national regulations for biomaterial banking. All patients older than 18 years scheduled to undergo elective (inpatient or outpatient) surgery under spinal anaesthesia are invited to participate. Prior to surgery, a Montreal Cognitive Assessment and screening neurological examination are performed. Before lumbar puncture, 20 ml of blood is taken during IV cannulation for the establishment of blood-brain gradients. After puncture of the sub-arachnoid space and prior to administering spinal anaesthesia, 10 ml of CSF is aspirated with five 2 ml syringes (this takes approximately 3 minutes). The maximum block height and any subsequent episodes of PDPH are recorded.

The CSF and blood is immediately transferred on melting ice and sent to the laboratory. The first 2 ml of CSF and 10 ml of blood is used for cell count, glucose, albumin and protein analysis. The remaining 8 ml CSF and 10 ml blood is centrifuged and stored at -70° C in 0.4 ml aliquots. Data regarding patient characteristics, medical history, surgery, spinal anaesthesia and the postoperative period (length of stay, complications, clinical delirium scores) are stored in a database.

Current Status and Future Developments: Inclusion started recently and the first 20 patients have participated. No episodes of PDPH have occurred so far. At the current rate of inclusion, the Biobank is expected to contain 200 CSF and blood samples across all age groups before 2018. Internally, collaborations with the clinical laboratory have been established for fundamental research on biogenic amines and neural steroids. However, we are willing to collaborate with interested colleagues, both nationally and internationally, in the future.

06AP03-1

association between blood pressure lability and postoperative delirium in neurosurgical patients

Badenes R.¹, García-Pérez M.L.¹, Del Río M.E.¹, Lascorz L.¹, Taccone FS.², Bilotta F.³

¹Hospital Clinic Universitari de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²Erasmus ULB Bruxelles, Dept of Intensive Care, Bruxelles, Belgium, ³Sapienza University of Rome, Dept of Anaesthesiology & Intensive Care, Rome, Italy

Background and Goal of Study: Postoperative delirium (PD) is one of the most common complications following surgery with a reported incidence ranging from 10-70% depending on the type of surgery. One possible area of intervention to prevent PD is intraoperative blood pressure management. However, the relationship between intraoperative blood pressure and PD is unclear. The goal of this study was to test the hypothesis that intraoperative fluctuations in blood pressure increased the occurrence of PD in patients undergoing neurosurgery.

Materials and Methods: Study subjects were undergoing neurosurgery, who were enrolled in an ongoing prospective observational study of the pathophysiology of postoperative delirium. Intraoperative blood pressure was measured and predefined criteria were used to define hypotension. Delirium was measured by the Confusion Assessment Method on the first two postoperative days. Fluctuation in a patient's blood pressure during surgery was quantified by calculating the variance of the patient's blood pressure record during surgery. Variance is a measure of the data spread. Blood pressure fluctuation

was calculated according to the formula: variance = $(\hat{\sigma}_{i=1}^n (x_i - x_m)^2/n - 1$, where x_i is a patient's blood pressure at a particular time point, x_m is the mean of the patient's blood pressure, and n is the number of blood pressure measurements. Patients were categorized based on whether they developed PD. Dichotomous data were compared with the Fisher exact test. We used backwards step-wise multivariate logistic regression by including those univariate variables that differed between patients with and without PD.

Results and Discussion: PD was observed in 8 (12.5%) patients (n=64). Mechanical ventilation for <48 h [odds ratio (OR), 3.94; 95% confidence interval (CI), 1.72-9.03], intraoperative blood pressure variance (OR, 3.0; 95% CI, 1.29-6.96), prior stroke (OR, 2.79; 95% CI, 1.12-6.96), and age (per year of age; OR, 1.01; 95% CI, 1.01-1.07) were independently associated with PD.

Conclusion(s): Intraoperative fluctuations in blood pressure increased the occurrence of PD in patients undergoing neurosurgery. It's the first study that found that increased fluctuations in blood pressure in neurosurgical patients to be predictive of PD.

Maintaining blood pressure at a stable level, based on preoperative values, appears to help preventing PD.

06AP03-2

Brown-Séquard syndrome: a possible relationship with neurogenic shock

Paulo L., Rego S., Husson N., Costa G., Ribeiro P
Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology & Pain Medicine, Coimbra, Portugal

Background: Brown-Sequard syndrome (BSS) is a clinical manifestation of incomplete spinal cord injuries. It is a consequence of medullary hemisection and occurs frequently at the cervical level. It is characterized by contralateral loss, relative to the site of spinal cord injury, of pain and temperature sensation, and ipsilateral loss of motricity, proprioception and eventually loss of sympathetic nervous system (SNS) function.¹ These types of injuries can be of a varied nature, namely traumatic. Neurogenic shock can be a complication of this syndrome. It is manifested after a localized lesion of SNS fibers, with loss of sympathetic cardiac tone and consequent vasoplegia associated with hypotension.²

Case report: A 61-year-old male patient was a victim of industrial gate impact trauma in the posterior thoracic region. He presented with acute respiratory failure, right hemiplegia and left hemihypoesthesia, without face involvement. Vertebro-medullary, thoracic and abdominal trauma were diagnosed with rupture of the left diaphragmatic hernia and herniation of the stomach and colon. He was proposed for emergent diaphragmatic herniorrhaphy and hernioplasty. During the surgery, there were two episodes of marked hypotension without bradycardia that reversed with ephedrine. In the postoperative period, a detailed study of the cervical spine by magnetic resonance revealed a small focus of myelomalacia in the lower third of C4. On the hospital discharge day, patient showed a right hemiplegia sequel.

Discussion: In the case report presented, four main causes could have been in genesis of the two episodes of hypotension that occurred during surgery. They are: anesthetic drugs, surgical causes, hypovolemic shock or neurogenic shock. Those episodes of hypotension without bradycardia rapidly reversed with ephedrine and no blood transfusion was required. In view of this situation, it appeared unlikely to be a neurogenic or hypovolemic shock.

References:

1. CMAJ. 2014; 18: 186
2. Clinical anesthesia. 7th edition. 2013; 1021

Learning Points: Neurogenic shock caused by vertebro-medullary lesions (VML) is a differential diagnosis that should be considered in a hemodynamically unstable patient. BSS is one of the possible clinical manifestations of VML. When a patient presents with this clinical picture and hemodynamic instability, it should always be considered the existence of neurogenic shock and act accordingly.

06AP03-3

Effect of early intraoperative magnesium sulfate application on the incidence of vasospasm and postoperative clinical outcome in patients with aneurysmal subarachnoid haemorrhage - a retrospective cohort study

Weidinger C.¹, Sommer B.², Buchfelder M.², Schmitt H.¹
¹Friedrich-Alexander-Universität, Dept of Anaesthesiology & Intensive Care, Erlangen, Germany, ²Friedrich-Alexander-Universität, Dept of Neurosurgery, Erlangen, Germany

Background and Goal of Study: The benefit of magnesium in patients with aneurysmal subarachnoid haemorrhage (SAH) is under active debate. We investigated the effect of intraoperative intravenous magnesium sulfate (MgSO₄) application and compared the rate of vasospasm, delayed ischaemic deficit and neurological outcome in two patient groups.

Materials and Methods: Patient group 1 was a cohort of 20 individuals (15 female, 5 male, age 49.0 ± 11.0 yrs) that suffered from aneurysmal SAH and underwent microsurgical clipping in 2005 without MgSO₄.

The second group included 20 patients (15 female, 5 male, age 56.0 ± 11.0 yrs) treated in 2014 with early intraoperative application of magnesium sulfate 10% 50 mg/kg body weight as a continuous infusion with an infusion rate depending on blood pressure (MAP 60-65 mmHg) over a time period of max. 60 minutes.

In group 1, general anesthesia was maintained with sufentanil (0,15-0,30 µg kg⁻¹) or remifentanil (0,1-0,5 µg kg⁻¹ min⁻¹) and propofol 1% (6-8 mg kg⁻¹ h⁻¹).

In group 2, general anesthesia was maintained with sufentanil (0,15-0,30 µg kg⁻¹) or remifentanil (0,1-0,5 µg kg⁻¹ min⁻¹), esketamine (1mg kg⁻¹ h⁻¹) and sevoflurane 1,5-2,0 Vol%.

Clinical endpoints were:

1. incidence of vasospasm,
2. delayed ischaemic deficit,
3. neurological outcome using the modified Rankin Scale (mRS) 3 and 12 months after SAH.

Results and Discussion: Both groups had SAH Hunt and Hess grade I-III in 11 of 20 and grade IV-V in 9 of 20 patients. In the first group, cerebral vasospasm occurred in 10 patients (50%), in the second group in 9 patients (45%) as defined by transcranial ultrasound or digital subtraction angiography. Eight patients (40%) of group 1 had an associated delayed ischemic deficit, whereas in group 2, only 5 patients (25%) had an ischaemic deficit. Neurological outcome after 3 months was mRS 2.9 ± 1.5 and 12 months mRS 2.0 ± 1.8 in group 1, whereas group 2 had an 3 month mRS of 2.3 ± 1.5 and 12 months mRS of 1.8 ± 1.5.

Conclusion: In this retrospective cohort study, the incidence of a delayed ischaemic deficit due to cerebral vasospasm was lower in the group treated with early intravenous MgSO₄. Neurological outcome showed a tendency of better recovery from ischaemic deficits in the magnesium group, however, sample sizes are too small to show statistical significance.

06AP03-5

NeuroFast standardized Echo-Doppler assessment of the brain circulation for a rapid systematized evaluation in emergency context: preliminary results about feasibility

Marullo L., Pandin P., Van Obbergh L.
CUB Erasmus Hospital / ULB, Dept of Anaesthesiology & Intensive Care, Brussels, Belgium

Background and Goal of Study: Point-of-Care Ultrasound are now popular if not essential (1). Structured scans as FAST allow rapid patients' evaluation and diagnosis by saving time in critical situations (2). However, they do not include systematically brain circulation (BC) and ICP assessment (3, 4). In accordance to updated literature (4) We developed NeuroFast for BC, similar to the FORESIGHT concept (3). We report preliminary feasibility data.

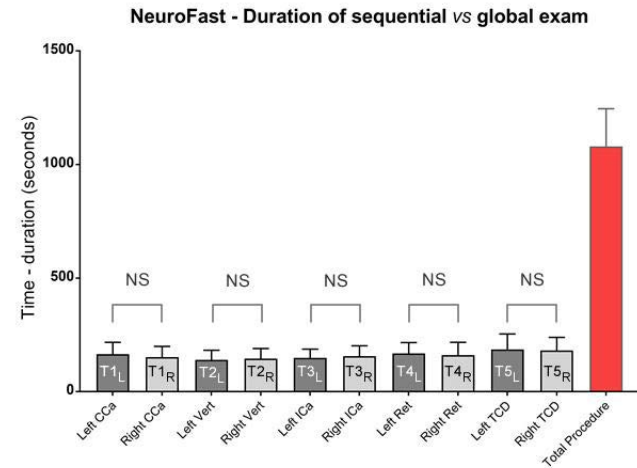
Materials and Methods: 32 ASA 1-3 adult patients (operated for superficial brain tumours without intra-cranial hypertension) were included into this prospective observational study. Two were excluded (US impermeability of at least one TCD temporal window). NeuroFast procedure as a sequential multi-site measurements (Fig1 & Tab) was performed before and after anaesthesia induction and after patient's awakening. Thus, we cumulated the 90 exams for assessing the feasibility this kind of procedure.

Results and Discussion: The preliminary results are presented as time duration (mean±SD) for each targeted artery and finally for the whole procedure (Fig2). Scans and recordings (morphological, color and pulse Doppler data in Fig1 & Tab) never failed. Regarding TCD (Tab), MCA, AComA, ACA and PCA were recorded in 86, 1.1, 10 and 2.9 percent. Finally, the sequential exams never exceed 3 minutes while the NeuroFast procedure last ± 20 minutes.

Conclusion: These encouraging results demonstrate the feasibility of NeuroFast procedure.

References:

1. Semin Respir Crit Care Med 2016; 37:68-87
2. Surg Clin North Am. 2011;91:195-207
3. Anesthesiology 2015; 123: 670-682
4. J Neuroimaging 2004; 14: 215-225



[Results - The respective sequential scan durations (mean±SD) of 90 procedures are displayed in dark grey for the left sites and in light grey for the right ones (Tab). For every category of site (Fig1), the left side has been compared to the right side. No significant statistical difference has been retrieved. No sequential scan exceeded 180 seconds (3 minutes), while the complete procedure (in red on right) lasted approximately 1200 seconds (20 minutes).]

RIGHT
LEFT

10 successive sites (sequential left/right assessment)

- 1 + 2: **common carotid CCa** (long axis)
- 3 + 4: **vertebral Vert** (long axis)
- 5 + 6: **internal carotid ICa & sinus Sin** (long axis)
- 7 + 8: **ophtalmic central retinal Ret** (short axis)
- 9 + 10: **transcranial TCD** (temporal windows) (long & short axis)

Each site:

- BW 2D morphological
- Color Doppler
- Pulse Doppler

US transducers:

- Sites 1-8: L18-5 linear array
- Sites 9-10: S5-1 sector array

[Methods - US sites & details]

Targeted Arteries (Fig)	Sites 1 & 2 Common Carotid	Sites 3 & 4 Vertebral	Sites 5 & 6 Internal Carotid (sinus)	Sites 7 & 8 Central Retina	Sites 9 & 10 TCD -Mid-cerebral (MCA) vs -Anterior communicating (AComA) vs -Anterior cerebral (ACA) vs -Posterior cerebral (PCA)	Sites 1 to 10
BW 2D sonography	-Caliber -Diameter -Shape -Depth	-Caliber -Diameter -Shape -Depth	-Caliber -Diameter -Shape -Depth	-Eyeballs axial & sagittal ∅ -Optic nerve ∅ -Optic nerve sheath ∅	-Median structures (shift) -VL and V3 -Peduncles -Depths	
Color Doppler	-Flow aspect qualification	-Flow aspect qualification	-Flow aspect qualification	-Arteries detection -Color pulses qualification	-Arteries and Willis polygon detection -Color pulses qualification	
Pulse Doppler	-Flux qualification -Angle (°) -Peak Systolic Velocity (Vs-cm/s) -Max End-Diastolic Velocity (Ved-cm/s) -Mean Velocity (Vm-cm/s) -Resistance Index (RI) -Pulsatility Index (PI) -Diameter (mm) & Area (mm²) -Flow Volume (FV)	-Flux qualification -Angle (°) -Peak Systolic Velocity (Vs-cm/s) -Max End-Diastolic Velocity (Ved-cm/s) -Mean Velocity (Vm-cm/s) -Resistance Index (RI) -Pulsatility Index (PI) -Diameter (mm) & Area (mm²) -Flow Volume (FV)	-Flux qualification -Angle (°) -Peak Systolic Velocity (Vs-cm/s) -Max End-Diastolic Velocity (Ved-cm/s) -Mean Velocity (Vm-cm/s) -Resistance Index (RI) -Pulsatility Index (PI) -Diameter (mm) & Area (mm²) -Flow Volume (FV)	-Flux qualification -Angle (°) -Peak Systolic Velocity (Vs-cm/s) -Max End-Diastolic Velocity (Ved-cm/s) -Mean Velocity (Vm-cm/s) -Resistance Index (RI) -Pulsatility Index (PI) -Diameter (mm) & Area (mm²) -Flow Volume (FV)	-Flux qualification -Angle (°) -Peak Systolic Velocity (Vs-cm/s) -Max End-Diastolic Velocity (Ved-cm/s) -Mean Velocity (Vm-cm/s) -Pulsatility Index (PI) -Diameter (mm) & Area (mm²) -Flow Volume (FV)	
Recorded duration time (seconds vs min)	L: left R: right	-T1 _L -T1 _R	-T2 _L -T2 _R	-T3 _L -T3 _R	-T4 _L -T4 _R	-T5 _L -T5 _R Complete NeuroFast procedure duration

[Methods]

06AP03-6

One year outcome of percutaneous tracheostomy in severe head injury

Martino C.¹, Russo E.¹, Di Prospero S.², Bilotta F.³, Agnoletti V.¹, Chieregato A.⁴

¹AUSL Romagna - Ospedale Maurizio Bufalini, Surgery and Trauma, Cesena, Italy, ²Ospedale Sant'Andrea- Sapienza, Università di Roma, Dept of Anaesthesiology & Intensive Care, Rome, Italy, ³Policlinico Umberto I, Dept of Anaesthesiology, Rome, Italy, ⁴Ospedale Niguarda, Dept of Anaesthesiology & Intensive Care, Milan, Italy

Background: In the setting of neurocritical care, percutaneous tracheostomy technique (PDT) indications and advantages are recognized; early tracheostomy decreases both pulmonary morbidity and critical care resource utilization. Conversely to early complications, the late outcome of PDT is less studied. The aim of the study was to verify prospectively the rate of late complications in a cohort of patients submitted to one year outcome evaluation after severe traumatic brain injury (TBI) and who underwent PDT in the acute phase.

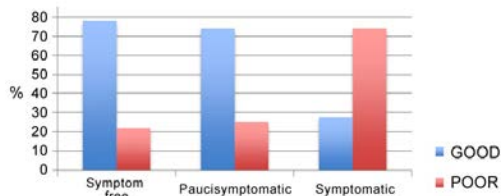
Materials and Methods: 247 TBI patients tracheostomized in the acute phase were evaluated after 1 year. All tracheostomies were performed in the ICU using the Ciaglia Percutaneous Tracheostomy Set with endoscopic guide. At one year follow up disability was quantified by means of the extended Glasgow Outcome Scale and PDT outcome was focused on symptom interview and the physician examination with the cutaneous scar assessment. After this initial screening the patients symptoms severity were summarized according their relevance in pauci symptomatic (1 symptom minimally significant), clearly symptomatic (2 or more symptoms presents or only one major intensity or need of surgical or medical treatment).

Results and Discussion: Tab 1 describes patients characteristics.

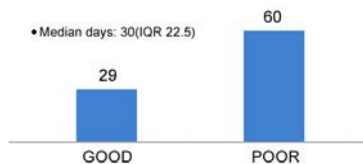
Tab 2 shows the late PDT complication rate.

The overall rate and the severity of complications seems to be associated with poorer neurological outcome and this correlation is significative (Fig 1) Time of cannulation is longer in patients with poorer recovery (Fig.2).

Conclusion: Late symptomatic complications seem to be associated with unfavourable neurological outcome. The longer time of cannulation in patients with poor neurological outcome is known to be associated to delayed complications.



[Figure 1. Rate of tracheostomy related symptoms and neurological outcome (p=0.0081)]



[Figure 2. Mean time of cannulation and neurological outcome (p<0.001)]

Age (years)	42.48 (19.47)	Mean (SD)
Male	44 (70.96)	N (%)
Apache chronic A	54 (87)	N (%)
Apache chronic B	6 (13)	N (%)
mGCS as NSH admissions	3.5 (3)	Median IQR
ISS	27 (14.5)	Median IQR
Length of tracheal intubation (days)	3 (2)	Median IQR

mGCS: motor component of Glasgow Coma Scale score, ISS: Injury Severity Score, NSH: neurological hospital

[Table 1. Patient characteristics (n=247)]

		N (%)
Scar assessment	Retraction	44 (18)
	Cheloid	9 (4)
	Tracheo-cutaneous Fistula	5 (2)
Dyspnea		2 (0.8)
Dysphonia (minimal)		20 (8)
Cough	Minimal	9 (3.6)
	Severe	1 (0.4)
Stridor		3 (1.2)
Disfagia (minimal)		39 (15.8)
Surgical therapy for complications	Tracheo-cutaneous fistula	4 (1.6)
	Tracheal stenosis	3 (1.2)

[Table 2. Late complications rate at one year follow up (N247)]

06AP03-7

Prediction of outcome and diagnosis of brain death in neurosurgical patients

Cherniy V.¹, Gorodnik G.², Andronova I.², Nazarenko K.²

¹Scientific and Practical Centre of Preventive and Clinical Medicine, Dept of Anaesthesiology & Intensive Care, Kiev, Ukraine, ²Donetsk National Medical University, Dept of Anaesthesiology & Intensive Care, Donetsk, Ukraine

Background and Goal of Study: Improved methods of evaluating brain death (BD) in its irreversible traumatic injury.

Materials and Methods: 60 patients aged 18 to 60 years in a critical state with a primary brain injury (PBI). Determined by the depth of coma Glasgow coma scale (GCS). Conducted brain imaging evaluation of cerebral blood flow, the disconnection test, quantitative EEG, invasive monitoring of intracranial pressure (ICP) system (Codman ICP Express), and monitoring cerebral perfusion pressure (JRS). Researched cerebrocortical relationships (cross-correlation analysis of EEG and heart rate variability (HRV), detrended fluctuation analysis of ECG).

Results and Discussion: Diagnosis of BD was performed in 32 patients in a state of terminal coma (GCS 3 points). One of the reasons for an adverse outcome is the increase in edema-swelling with the increase of the edema area 4-6 times higher benchmarks. It was revealed the reduction of systolic blood flow velocity, an increase in circulatory resistance observed in all arteries; reducing the level of the venous outflow in the straight sinus and the deep veins of Rosenthal. All patients were excluded the influence of drugs, oppressive Central nervous system and affect neuromuscular transmission. In all patients there was no intoxication, metabolic disorders and infectious lesions of the GM. Body temperature составляла 36.3±0.40 C. Systolic blood pressure was maintained at 125±15 mm Hg. article on the background infusion of vasopressors (dopamine, phenylephrine). Conducted mechanical ventilation respirators "Drager-Carina", "Hamilton" oxygen-air mixture with Fi O2 0.4-0.8 in. Partial pressure of blood gases were: PaCO2 of 39.8±2.6 mm Hg. article, PaO2 135±6 mm Hg.St., the pH of 7.42±0.12. 20 of patients the observation period was reduced from 8±4 to 4-6 hours after applying confirmatory test ultrasound (absence or inversion of arterial cerebral blood flow). At the end of the observation period was spent disconnecting the test.

Conclusion(s): The above set of studies allows to identify the cessation of brain functions and set its irreversible character, which allows you to diagnose brain death.

06AP03-8

Predictors and ICU outcomes of neurogenic pulmonary edema in aneurysmal subarachnoid hemorrhage

Mebaouj S.¹, Panigot N.², Dhif N.², Stojeba N.², Pain L.²

¹Nouvel Hopital Civil, Dept of Anaesthesiology & Intensive Care, Strasbourg, France, ²University Hospital Strasbourg, Dept of Anaesthesiology & Intensive Care, Strasbourg, France

Background and Goal of Study: Aneurysm subarachnoid hemorrhage (ASH) could be complicated with neurogenic pulmonary edema (NPE). For years, a poor grade ASH was considered as the main factor for the occurrence of NPE. However, the location of aneurysm (posterior circulation) has been proposed as predictive of NPE with no role for patient factors or clinical features of ASH (2).

Objectives were to determine:

1. Predictive factors for the occurrence of early NPE in patients with ASH,
2. Outcomes of patients with or without NPE in intensive care unit (ICU).

Materials and Methods: We analyzed records of patients who were admitted (Day0) at University Hospital for ASH during a 5 years period. Diagnostic of NPE was set up by clinical and preclinical criteria. Data collected were: demographic, medical history, clinical features of SH, aneurysm characteristics, ICU parameters at Day 2 and Day 7, and ICU outcomes. A multivariable logistic regression model included all independent variables with $P < 0.25$ in the univariate analysis.

Results and Discussion: Cases files of 193 patients were analyzed; NPE observed in 17 patients. On stepwise logistic regression, sex, hypertension, vascular pathology, WFNS grade, aneurysm location (grouped as anterior or posterior; posterior location defined as any aneurysm of the vertebral or basilar segment) were found to be relevant factors.

On multivariate logistic regression modeling, the occurrence of PNE, sex, hypertension, vascular pathology, aneurysm location were found to be independent predictors. Comparing the two groups of patients with or without NPE, we did not observe any statistical differences in terms of mortality, length of stay and neurological status at discharge from ICU.

In addition, no statistical differences were observed as regards to sodium level, or presence of vasospasm.

Conclusion(s): In our series of patients, an incidence of clinical PNE of 8.8 % was observed. For patients with ruptured aneurysm, both patient specified factors (female, vascular pathology) and aneurysm specified factors (posterior location, particularly with bad neurological status) need to be carefully considered as high risk factors of developing NPE.

References:

1. Prunet and al. Critical Care 2014 18:R131
2. Inamasu and al. Neurol Med Chir 2012 52:49-55

Acknowledgements: Neurosurgery Department, M Santin, H Cebula and F Proust for discussion

06AP03-9

Preoperative serum lactate measurement as a prognostic biomarker for patients with primary brain tumor

Shih C.C., Wu C.Y.

National Taiwan University Hospital, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China

Background and Goal of Study: Malignant primary brain tumors are the most aggressive cancer. Thus, accurate diagnosis and progression detection is imperative for brain tumor patients. No serum biomarkers are currently used in routine practice because of imprecision or inconvenience. We sought to identify potential biomarker for diagnostic or prognostic prediction in primary brain tumors.

Materials and Methods: A total of 74 patients were retrieved from supratentorial glioma patient cohort designed for intraoperative goal-directed therapy between 2013 and 2015.

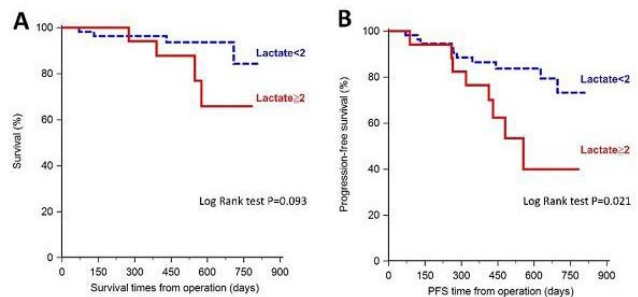
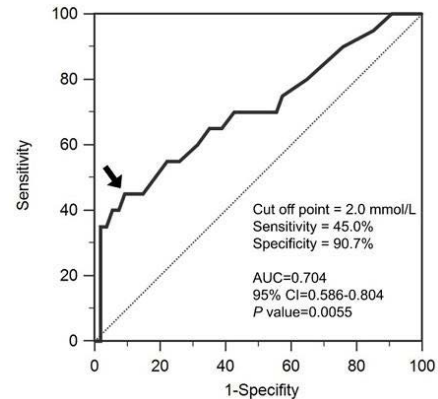
Data analysis included patient demographics, co-morbidities, tumor histology, and serum biomarkers, including lactate.

Characteristic	Total (N=74)	High grade (N=20)	Low grade (N=54)	P Value
Age (years)	56.55±11.4	54.2±12.5	57.4±10.9	0.293
Male no. (%)	23 (31.1)	8 (40.0)	12 (27.8)	0.398
Body weight (kg)	60.40±9.6	58.9±8.7	60.9±9.9	0.455
Comorbidities, No. (%)				
Cardiovascular disease	6 (8.1)	2 (10.0)	4 (7.4)	0.659
Hypertension	14 (18.9)	5 (25.0)	9 (16.7)	0.308
Diabetes	7 (9.5)	3 (15.0)	4 (7.4)	0.379
Other cancer	5 (6.8)	1 (5.0)	4 (7.4)	0.589
Tumor size (cm)	4.39±1.75	4.50±1.78	4.31±1.73	0.450
Serium biomarkers				
Lactate (mmol/L)	1.38±0.92	1.91±1.06	1.19±0.78	0.011
LDH (mU/ml)	38.22±36.73	39.6±31.28	37.7±38.8	0.401
NGAL (ng/ml)	0.483±0.544	0.544±0.535	0.465±0.554	0.516
GFAP (mg/L)	0.243±0.483	0.14±0.35	0.28±0.52	0.097
NSE (ng/ml)	15.22±54.79	10.77±14.67	16.86±63.62	0.339
S100β (pg/ml)	87.06±128.95	93.61±131.76	84.59±129.06	0.353

[Fig 1. Patient baseline characteristics]

Results and Discussion: Serum lactate level is significantly higher in patients with high grade tumors than that of low grade tumors ($p = 0.011$). However, the remaining biomarkers were not significantly different.

Receiver operating characteristic analysis yielded area under the curve of 0.705 in discriminating high grade from low grade brain tumors



[ROC curve and Kaplan-Meier survival analysis]

Elevated lactate was also significantly related to poor progression-free survival with hazard ratio (HR) of 1.658 and 95% confidence interval (CI) from 1.078 to 2.548 ($p = 0.021$) and overall survival (HR, 2.049; CI, 1.006-4.174; $p = 0.048$).

Factor	univariate analysis			Multivariate analysis		
	HR	95% CI	P Value	HR	95% CI	P Value
Age (years)	1.041	0.973-1.114	0.247	—	—	—
Gender (male:female)	4.349	1.037-18.247	0.045	3.785	0.903-15.859	0.0686
Body weight (kg)	0.994	0.925-1.070	0.881	—	—	—
Tumor size (cm)	1.214	0.835-1.763	0.310	—	—	—
Serium biomarkers						
Lactate (mmol/L)	2.046	1.078-3.886	0.029	2.049	1.0057-4.1747	0.0482
LDH (mU/mL)	1.013	0.998-1.028	0.084	—	—	—
NGAL (ng/mL)	2.987	1.067-8.363	0.037	—	—	—
GFAP (mg/L)	0.983	0.169-5.704	0.985	—	—	—
NSE (ng/mL)	0.936	0.867-1.069	0.478	—	—	—
S100β (pg/mL)	0.997	0.987-1.006	0.490	—	—	—

Factor	univariate analysis			Multivariate analysis		
	HR	95% CI	P Value	HR	95% CI	P Value
Age (years)	1.0290	0.985-1.076	0.195	—	—	—
Gender (male:female)	3.0190	1.192-7.645	0.020	2.951	1.161-7.496	0.0229
Body weight (kg)	1.0110	0.965-1.059	0.647	—	—	—
Tumor size (cm)	1.1230	0.868-1.453	0.378	—	—	—
Serium biomarkers						
Lactate (mmol/L)	1.6190	1.079-2.428	0.020	1.658	1.078-2.548	0.0211
LDH (mU/mL)	1.0090	0.999-1.019	0.067	—	—	—
NGAL (ng/mL)	2.0620	0.993-4.279	0.052	—	—	—
GFAP (mg/L)	1.2600	0.460-3.447	0.653	—	—	—
NSE (ng/mL)	0.9980	0.989-1.008	0.740	—	—	—
S100β (pg/mL)	1.0010	0.997-1.004	0.733	—	—	—

[Cox regression analysis]

Conclusion(s): Elevated preoperative serum lactate predicts higher grading of primary brain tumor. High serum lactate is significantly associated with poor progression-free survival. Serum lactate measurement may have potential as a practical biomarker in the treatment planning of brain tumor.

06AP03-10**Prevention of postoperative pain after lumbar spine surgical procedures: systematic review of randomized clinical trials**

Terracina S., Prete A., di Bella V., Savarese B., Gori R., Sergi P.G.
Sapienza University of Rome, Dept of Anaesthesiology & Intensive Care, Rome, Italy

Background and Goal of Study: Spine surgery has had the highest increase in case volume trends in the 1990-2010 period among neurosurgical procedures, driven by an apparent epidemic increase in low back pain - among the leading causes of disability-adjusted life-years.^{1,2} This systematic review (SR) report recent clinical evidence (original RCTs published between January 2012 and November 2016) related to safety and efficacy of pharmacological (systemic and local) and non-pharmacological (electrical stimulation) therapies to prevent postoperative pain after lumbar spine procedures.

Materials and Methods: After screening for eligibility on PubMed database, from a total of 2328 studies 50 RCTs (n = 3742 patients, age 18-86 years) were selected for this SR. Selected RCTs are displayed according to the timing of provided therapy, into the following 3 subcategories: preoperative (22 studies), intraoperative (22 studies) and postoperative (6 studies).

Results and Discussion: Gabapentinoids, ketamine and epidural analgesia (24 studies) effectively and safely prevent postoperative opioid consumption and pain. Ketamine intraoperative results in lumbar surgery are an important novelty compared to previous literature outcomes.³

In selected patients, spinal anesthesia is safer, more comfortable and more economical alternative to general anesthesia. In patients treated with spinal anesthesia, the use of bupivacaine (5 studies) along with systemic multimodal analgesia resulted in best cooperative effects. Nonsteroidal anti-inflammatory drugs (5 studies) and electrical stimulation therapies (3 studies) are effective in the prevention of postoperative pain, while intraoperative use of dexmedetomidine is controversial.

Conclusion(s): In the last 4 years new evidence have expanded the knowledge on safety and efficacy of post-operative pain prevention after lumbar spine procedures and evidence-based therapeutic approach can be selected among pharmacological and non-pharmacological therapies.

References:

1. Devin CJ. J Clin Neurosci 2015;22:930-8.
2. Murray CJ. N Engl J Med 2013;369:48-57.
3. Sharma S. Reg Anesth Pain Med 2012;37:79-98

06AP03-11**Relationship between body temperature and neurological outcome in patients with acute brain injury: systematic review of clinical evidence**

Pegoli M.¹, Sergi P.², Zanello M.¹

¹U.O.C Anestesia e Rianimazione, Istituto delle Scienze Neurologiche di Bologna - IRCCS, Bologna, Italy, ²Policlinico Umberto I, Dept of Anaesthesiology, Rome, Italy

Background and Goal of Study: Temperature alterations in neurocritical care setting are common and have striking effect on brain metabolism leading or exacerbating neuronal injury. Fever (T >38,3°C) also negatively impact on acute brain injury (ABI) patients outcome. Conclusive evidence linking temperature control to improved outcome is still lacking. Aim of this review article is to evaluate the relationship between changes in body temperature in ABI and outcome.

Materials and Methods: A literature search of 2 medical database was accomplished: PubMed Medline. Only complete studies (no abstracts), published in English in peer-reviewed journals were included. Two authors (M.P and P.S) independently screened and assessed titles, abstracts, and the full-text papers, using inclusion and exclusion criteria. A total of 32401 papers were screened and 32354 were excluded. We present 47 articles into 5 sub-chapters: mixed acute brain injury (7), brain trauma (6), intracranial hemorrhage (5), subarachnoid hemorrhage (12); ischemic stroke (17).

Results and Discussion:

ABI: fever correlates with increased in-hospital mortality and functional outcome increasing brain metabolism and reducing blood flow.

Brain trauma: fever in the first 48 hours after trauma did not predict mortality. Both the degree and duration of early post-trauma hyperthermia were strongly related with outcome.

Intracranial hemorrhage: fever determines prognosis. Also subacute fever in large volume hematoma is a driver of neurological deterioration.

Subarachnoid hemorrhage: the impact of fever on poor outcome is related to cerebral inflammatory response initiated at the time of aneurysm rupture, increased rate of vasospasm and delayed ischemic neurological deficits (DIND), increased ICP related to metabolic distress.

Ischemic stroke: delayed hyperthermia is adverse associated with long-term outcomes and mortality compared with early period after an ischemic stroke. In patients treated with recanalization the role of hyperthermia on outcome is still controversial.

Conclusion(s): Fever, infectious or central, is strongly correlated with poor neurological and functional outcome. Optimal patient temperature management and optimal method to recognise and treat infections in absence of fever remain still to define.

References: Greer DM, Funk SE, Reaven NL, Ouzunelli M, Uman GC, Impact of Fever on Outcome in Patients With Stroke and Neurologic Injury A Comprehensive Meta-Analysis, Stroke. 2008;39: 3029-3035

06AP03-12**Results from a ICU follow up after severe traumatic brain injury**

Martino C.¹, Russo E.¹, Silvia D.P.², Chierigato A.³, Bilotta F.⁴, Agnoletti V.¹

¹AUSL Romagna- Ospedale Maurizio Bufalini, Surgery and Trauma, Cesena, Italy, ²Ospedale Sant'Andrea- Sapienza, Università di Roma, Dept of Anaesthesiology & Intensive Care, Rome, Italy,

³Ospedale Niguarda, Dept of Anaesthesiology & Intensive Care, Milan, Italy, ⁴Policlinico Umberto I, Dept of Anaesthesiology, Rome, Italy

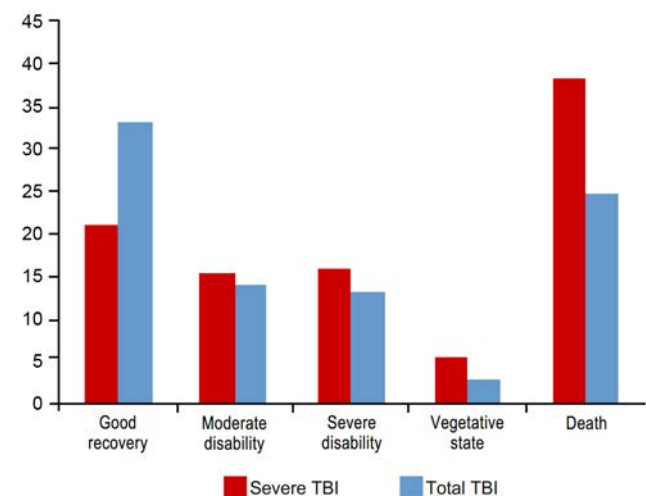
Background: Severe traumatic brain injury (TBI) survivors, after prolonged hospital care, may have long-term physical, cognitive and psychological disorders which may disrupt previous relationships and preclude return to work with severe economic and social impacts. The aim of this study is to describe the experience of an ICU Follow up System in TBI patients.

Materials and Methods: In this retrospective observational study we report data from 15 years follow up system based on post discharge phone call interview made, to the patients or to his/her relatives, by a staff intensivist at >6 months after discharge.

The primary endpoint, focused in telephone interview, was to evaluate the residual disability using the Glasgow Outcome scale (GOS extended). The secondary end points, focused in outpatient follow up, was to assess the quality of life (QOLIBRI-OS), residual motor and cognitive impairment, post ICU pathway, outcome of intensive management of the acute phase, PTSD and any still present clinical problems.

Results and Discussion: We have analyzed 1945 patients from y 2001 to y 2016, 1145 completed telephone follow up and 277 the face to face follow up. Case mix in Tab1.

Neurological outcome assessed by telephone interview is described in Fig1. Clinical problems assessed by outpatient follow up are described in Tab 2.



[Figure 1. Neurological outcome at 6 months (percent data)]

	N	(%)	Clinical Problems	N	(%)
Age meida (± S.D.)	42.63	(22.7)	Decubitus	51	(21)
Extra-cranial lesions N (%)	1237	(64)	Sleep disorders	32	(13)
Severe traumatic brain injury N (%)	1012	(52)	Endocrinopathy	7	(3)
Pupillary abnormality N (%)	569	(30)	Motor disorder	154	(57)
mGCS median (IQR)	5		Post traumatic stress disorder (PTSD)	47	(20)
ICP monitoring N (%)	822	(42)	Problem solving deficit disorder	41	(17)
Mass lesions N (%)	789	(40)	Executive functions disorder	153	(64)
Shift >5mm N (%)	542	(27)	Speech disorder	42	(17)
Cisterns compressed / absent N (%)	707	(36)	Behavioural disorder	100	(42)

[Table 1.]

Conclusion: The follow-up system is an essential component of intensive care to identify evolving clinical problems, to monitor the continuity of care, to understand healthcare utilization, to obtain indicators for clinical governance and to close the circle of human relationships between the ICU staff, patients and caregivers started in the "open ICU".

This, however, requires an organized system of care, a systematic data collection, financial resources and a solid supportive network.

06AP04-2

Stress cardiomyopathy in aneurysmal subarachnoid hemorrhage

Nastasovic T.¹, Milakovic B.¹, Stosic M.¹, Petrovic O.², Grujicic D.³, Milenovic M.¹

¹Clinical Center of Serbia, Dept of Anaesthesiology & Intensive Care, Belgrade, Serbia, ²Clinical Center of Serbia, Clinic for Cardiology, Belgrade, Serbia, ³Clinical Center of Serbia, Clinic for Neurosurgery, Belgrade, Serbia

Background: Aneurysmal subarachnoid hemorrhage (SAH) can be followed by cardiac abnormalities. Occurrence of stress cardiomyopathy (takotsubo cardiomyopathy) in SAH is rare. We describe a case report of stress cardiomyopathy after SAH.

Case report: A 48-years-old female patient 2 days after SAH attack and ventricular external drainage operation because of hydrocephalus was subjected to craniotomy and aneurysm of the left posterior inferior cerebellar artery clipping. The fourth day after hemorrhage, patient developed acute heart failure. On ECG, deep, negative T-waves were found in inferior and anterolateral leads. Troponin I was elevated to 2.9ng/ml. Transthoracic echocardiogram showed ballooning apex of left ventricle and hypercontractile basal segments. On chest radiography, bilateral pulmonary infiltrates were seen. Pro-BNP level was 5829pg/ml and troponin I was 0.16ng/ml. Mechanical ventilation and loop diuretics were initiated. A repeated study 3 days after showed stress cardiomyopathy in regression. Weaning from mechanical ventilation was done and patient was extubated.

Discussion: To our knowledge, there are two series of SAH patients with stress cardiomyopathy and few case reports [1,2]. Literature reviews in 2011 showed that there were 61 cases of stress cardiomyopathy in SAH from 1990 [3]. An explosive rise in intracranial pressure may cause sympathetic activation via hypothalamic damage and may represent a risk factor for possible cardiac damage. Routine transthoracic echocardiography may be necessary in patients with SAH. There is no consensus about treatment of stress cardiomyopathy.

References:

- Lee VH, Connolly HM, Fulgham JR, et al. Tako-tsubo cardiomyopathy in aneurysmal subarachnoid hemorrhage: an underappreciated ventricular dysfunction. *J Neurosurg* 2006;105(2):264-270.
- Otomo S, Sugita M, Shimoda O, et al. Two cases of transient left ventricular apical ballooning syndrome associated with subarachnoid hemorrhage. *Anesth Analg* 2006;103(3):583-586.
- Guglin M, Novotorova I. Neurogenic stunned myocardium and takotsubo cardiomyopathy are the same syndrome: a pooled analysis. *Congest Heart Fail* 2011;17:127-132.

Learning points: Cardiac dysfunction after aneurysmal SAH can mimic acute coronary syndrome. In patients with diagnosis of acute myocardial infarction and neurological dysfunction, we should consider presence of SAH. Also, in patients with diagnosis of SAH and cardiac dysfunction, we should think about TCM.

06AP04-3

Cerebral oxygen saturation monitoring during spinal neurosurgery in prone position using near infrared spectroscopy

Murniece S.¹, Skudre A.¹, Stepanovs J.¹, Vjugins J.¹, Vanags I.², Mamaja B.¹

¹Riga East University Hospital, Dept of Anaesthesiology, Riga, Latvia, ²Riga Stradin's University, Dept of Anaesthesiology, Riga, Latvia

Background and Goal of Study: Near infrared spectroscopy (NIRS), used to monitor cerebral oxygenation during surgery, can prevent from complications like cognitive dysfunction, organ failure and improves postoperative outcome. The goal of the study was to determine whether prone position during spinal neurosurgery impacts cerebral oxygen saturation using NIRS devices intraoperatively.

Materials and Methods: 25 patients (mean age 56y) were scheduled for spinal surgery in prone position (transpedicular fixation, microdiscectomy, removal of spinal tumours). Cerebral oxygen saturation (rScO₂) was continuously monitored using INVOS 4100 NIRS device. NIBP, HR, EtCO₂, SpO₂ were also monitored. We assessed blood loss, postoperative complications (stroke, organ dysfunction, wound infection, days spent in ICU) and cognitive dysfunction. Anesthesia methods: induction with fentanyl 0.1-0.2mg, propofol 1-2mg/kg, cisatracurium 0.2mg/kg; maintenance-fentanyl 0.03-0.06µg/kg/min, cisatracurium 0.06-0.1mg/kg/h, sevoflurane to MAC 0.7-1.0, FiO₂ 0.5. All patients were extubated in the operating room.

Results: Mean rScO₂ during the whole surgery was 73% for left side(L), 73% right side(R). Lying supine during induction L72%, R73%, in prone position L74%, R74%, returning back to spinal position L74%, R73%. Significant difference in calculated mean rScO₂ values between supine and prone position was not observed. Despite the calculated mean rScO₂ values 11/25 patients showed a slight to significant decrease in rScO₂ in prone position. The minimum rScO₂ value observed during the whole surgery was 55%. One patient's with adipositas rScO₂ values decreased by 26% from baseline values when turned to prone position (from 85% supine to 58% in prone position). One patient with stroke in anamnesis showed initial values lying supine 21% lower than average (57% compared to average rScO₂ lying supine 72%). No incidence of cognitive dysfunction, stroke, organ dysfunction was observed, no patients were admitted to ICU.

Conclusions: Although our first experience revealed that the mean intraoperative cerebral oxygen saturation changes during spinal neurosurgery in prone position from baseline values were not significant, 11/25 patients showed a mild to moderate decrease in cerebral oxygen saturation and that could influence the postoperative period.

Regional cerebral oxygen saturation is a valuable intraoperative measurement in patients undergoing neurosurgical spine surgery in prone position.

06AP04-4

Comparison of nasal and frontal BIS monitoring in neurosurgery. Does site of sensor placement effect BIS values?

Hajjiyeva K.¹, Meco B.C.¹, Ozgur O.², Yildirim Guclu C.¹, Yorukoglu D.¹

¹Ankara University School of Medicine, Dept of Anaesthesiology & Intensive Care, Ankara, Turkey, ²Ankara University School of Medicine, Neurosurgery, Ankara, Turkey

Background and Goal of Study: Intraoperative awareness is a serious but preventable complication of general anaesthesia. Bispectral index (BIS) is the most widely used method to monitor anaesthesia depth. BIS monitoring require attachment of forehead sensors, posing a challenge when the surgical field involves the forehead. We aimed to compare the gold standard forehead position of BIS sensors with an alternative position across the nasal dorsum for neurosurgical procedures. Additionally, assuming that local surgical manipulation might affect BIS values in cranial cases, caseload was divided equally between cranial and vertebral procedures to be assessed.

Materials and Methods: After ethical committee approval and informed consent, 62 ASA I-III adult patients scheduled for elective neurosurgical operations were enrolled in this prospective observational study. In all patients both

frontal and nasal BIS sensors were placed before anesthesia induction. Total intravenous anaesthesia with propofol and remifentanyl were used and guided by frontal BIS for depth of anesthesia in all. Frontal and nasal BIS scores were recorded before induction and repeated at 15 minutes intervals after intubation, during the intraoperative period and emergence. Frontal and nasal BIS values were compared in all, but also separately according to the site of surgery in cranial (n:31) versus vertebral (n:31) cases. Collected data were analyzed with the SPSS for Windows version 15.0. Descriptive statistics were given as mean±SD. Interclass correlation coefficients (ICC) were calculated.

Results and Discussion: The mean BIS value from frontal versus nasal sensors were 49±22 and 49±21 respectively (n:62). These values were statistically correlated (ICC 0.78, $p < 0.001$) indicating that nasal BIS measurement does not reveal a disadvantage for routine use when needed. A subgroup analysis regarding the site of surgery between cranial (frontal: 45±22 and nasal: 44±21) and vertebral (frontal: 54±21 and nasal: 53±21) procedures also did not revealed a significant change in the results.

Conclusion: Our data reveal that for measuring anesthesia depth BIS sensor placement on nasal dorsum shows comparable efficiency in comparison to standard frontal measurement, regardless of site of neurosurgical procedure either cranial or vertebral. Thus, in situations like some cranial surgeries where sensor positioning may interfere with surgical site, nasal dorsum can be a good and safe alternative.

06AP04-5

Correlation of cerebral oximetry and transcranial Doppler with intraoperative neurological monitoring during awake carotid endarterectomy

Kulikov A.¹, Shmigelsky A.¹, Tere V.¹, Lukshin V.², Usachev D.², Lubnin A.¹

¹Burdenko Neurosurgery Institute, Dept of Anaesthesiology, Moscow, Russian Federation, ²Burdenko Neurosurgery Institute, Dept of Neurosurgery, Moscow, Russian Federation

Background and Goal of Study: Carotid endarterectomy (CEA) is a surgical procedure used to reduce risk of stroke in patients with significant carotid stenosis. However surgery itself can provoke stroke due to thromboembolism or ischemic injury at the time of cross-clamping. 'Gold standard' of cerebral monitoring during CEA is a continuous intraoperative neurological assessment based on regional anesthesia and moderate sedation during procedure. But many experts prefer general anesthesia for CEA due to secure airways and comfort for patient. In this situation cerebral oximetry (NIRS) and transcranial Doppler (TCD) are typically used for intraoperative cerebral blood flow monitoring. We decided to compare intraoperative NIRS and TCD changes with neurological monitoring during awake CEA.

Materials and Methods: We retrospectively analyzed 142 awake CEA (mean age of patients = 71 ys). During all of these operations NIRS and TCD were used. New neurological deficit during cross clamping was qualified as obvious sign of cerebral ischemia. Decreasing of blood flow velocity lower than 30 cm/c measured by TCD or decreasing of regional saturation (rSO_2) >10% measured by NIRS were recorded as markers of cerebral ischemia.

Results and Discussion: In 19 of 142 (13%) patients we mentioned intraoperative cerebral ischemia by neurological assessment. Only in 9 of these 19 patients (47%) TCD indicate critical drop of blood flow and in 5 (26%) - there wasn't significant decreasing of blood flow velocity. In this group NIRS indicated ischemia in 15 (79%) patients and in 4 (21%) patients decreasing wasn't significant. On the other hand in 123 patient which hadn't intraoperative neurological deficit we mentioned 10 cases (8%) of critical decreasing of blood flow velocity by TCD and 34 cases (28%) of significant NIRS decreasing.

So in our group false negative and false positive rates were rather high both for NIRS and TCD. We can speculate that in general anesthesia clinical decision based on NIRS or TCD can be wrong. Main limitation of our conclusion is potential cerebral protective effect of anesthetics during general anesthesia.

Conclusion(s): Continuous neurological assessment during CEA remains 'gold standard' for early diagnosis of intraoperative ischemia. Cerebral oximetry and transcranial Doppler can produce doubtful data and further studies have to be performed to determine the role of this types of neuromonitoring in clinical practice.

06AP04-6

Density Spectral Array of BIS VISTA Monitoring System in a functional hemispherectomy

Luis C., Vilà E., Fernández J., Moltó L., Pardo A., Pacreu S.
Hospital del Mar, Dept of Anaesthesiology, Barcelona, Spain

Background: Bilateral Bispectral index (BIS) was designed to record and display four channels of EEG; two from each side of the brain. This monitor equally shows changes in the power spectrum distribution through the Density Spectral Array (DSA)¹. Functional hemispherectomy (FH) is a surgical technique used in pediatric population to treat drug-resistant epilepsy caused by extensive hemispheric lesions. There are few cases in the literature about FH in adults, but there are not cases about the use of DSA in this surgery. We present a case where we observed changes in DSA during a FH.

Case report: A 40-year-old woman with epilepsy caused by cortical focal dysplasia was underwent a mesial frontal lobe section 25 years ago. However, she continued with epileptic crisis, daily disconnections and presented mild mental retardation and left hemiparesis. She was scheduled for a right FH to treat epilepsy.

On entering the operating room, the electrocardiogram, non invasive blood pressure and the percentage oxygen saturation were monitored. Bilateral BIS electrode strip was placed on the front temporal position according to the International 10-20 system. Anaesthesia was maintained with propofol TCI (4.7 mg/kg/h) and infusion of remifentanyl (0.1 mcg/kg/min) to keep BIS values within 45-60 range. Rocuronium was also administered (0.3 mg/kg/h). At the beginning of surgery, we observed a power increase in low frequency (0.1-4 Hz) and alpha bands (8-12 Hz) in the right hemisphere, where the epileptogenic focus was.

After frontal disconnection, there was a marked decrease of power in low frequency and alpha bands in the right side. During other cerebral areas disconnection, there were no changes in DSA. Unlike DSA, BIS trend did not reflect differences between two hemispheres. The patient was extubated in the operating room and transferred to recovery room. There was not any difference in neurological exploration.

Discussion: DSA provides information about the depth of anaesthesia and sedation. One possible limitation of DSA is the location of epileptogenic focus. In our patient, it was useful because the epileptogenic focus was in the frontal area². In this case, it was helpful to monitor the effectiveness of the surgery too.

Learning points: DSA is useful in epilepsy surgery to detect the side of epileptogenic focus. If this patient is scheduled for any future surgery, there will be no differences in basal DSA between two hemispheres.

06AP04-7

Effects of retractors on endotracheal tube cuff pressure and recurrent laryngeal nerve palsy during anterior cervical discectomy and fusion: a preliminary study

Yuwapattanawong K., Tuchinda L., Somboonviboon W., Lerdsirirupon S., Sangtongjaraskul S., Saiwaew K.
Chulalongkorn University, Dept of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: The surgical retractor had been applied to visualize the anterior cervical spine during anterior cervical discectomy and fusion (ACDF). As a result, the recurrent laryngeal nerve was trapped between retractor and endotracheal tube (ETT) cuff. An increasing of ETT cuff pressure with retractor placement might produce recurrent laryngeal nerve palsy. Symptoms included dysphagia, hoarseness and sore throat.

The aim of the present study was to observe the effects of retractors and changes in ETT cuff pressure and to evaluate the influence of ETT cuff pressure adjustment after retractor placement on postoperative dysphagia, hoarseness and sore throat.

Materials and Methods: After written informed consent and Ethics committee approval, a prospective randomized and observational study was undertaken. Patients were randomized into four groups:

Group (A) ETT cuff pressure was adjusted and maintained at 20 mmHg after retractor placement without N₂O anesthesia,
Group (B) ETT cuff pressure was not adjusted without N₂O anesthesia,
Group (C) ETT cuff pressure was adjusted and maintained at 20 mmHg with N₂O anesthesia and;

Group (D) ETT cuff pressure was not adjusted with N₂O anesthesia. ETT cuff pressures and peak airway pressures were continuously recorded.

Postoperative dysphagia (the Bazaz dysphagia scale), hoarseness (GRBAS) and sore throat (NRS) were followed up at 24 hr and 1 mo.

Results and Discussion: 24 ASA physical status I-III patients were evaluated. There was significantly increased in ETT cuff pressure values after retractor application when compared to the baseline values in 4 groups. There was no significant difference in changed ETT cuff pressure and peak airway pressure values between N₂O anesthesia (C,D) and without N₂O anesthesia (A,B) groups at the same period of time. Postoperative dysphagia, hoarseness and sore throat were found in all patients. The data showed significant lower of the Bazaz dysphagia scale in groups A,C at 24 h postoperatively ($p < 0.001$). The GRBAS at 24 h was about 1-2, and also was statistical significant lower score in group A, C than B, D ($p < 0.001$). However, there was no significant difference in the NRS of sore throat among 4 groups (NRS 5-10/10).

Conclusion(s): ETT cuff pressure significantly increased after retractor replacement during ACDF. To adjust and maintain the ETT cuff pressure at 20 mmHg, after cervical retractor was applied, reduced the severity of dysphagia and hoarseness.

06AP04-8

Intraoperative neurophysiological monitoring improves safety in cervical chordomas surgery

Gomez Diago L.¹, Hernández-Cádiz M.J.¹, Torres-Caño N.², Vicente-Fernández P.¹, De Andrés J.¹

¹Consorcio Hospital General Universitario de Valencia., Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²Hospital Francisco de Borja, Neurophysiology, Gandia, Spain

Background: Chordomas are rare benign tumors that develop from embryonic notochord, can arise anywhere along the neuroaxis, being more unusual in the cervical spine. The treatment is based on surgery. The intraoperative neurophysiological monitoring (IONM) in cervical chordomas should include continuous electroencephalogram (EEG) monitoring if a vertebral arteries compromise exists, as well as somatosensory (SEPs) and motor evoked potentials (MEP).

Some anesthetic agents, like inhalational anesthetics and neuromuscular blocking drugs, might interfere in IONM.

Case report: A 69 yr-old woman with a history of cervical tumor, which consists in a cervical C4-C6 chordoma lateralized to the right side. The patient refers right cervicobrachialgia and 2 months ago she presents an episode of respiratory insufficiency, needing an emergent tracheostomy. Due to the risk of the patient, an en bloc resection of the chordoma is scheduled in two surgical times.

Previously to surgery, under radiological control a right vertebral artery occlusion test was done without any incidence in continuous neurological control. The IONM that is performed consists in the register of SEPs of lower limbs, MEP of upper and lower limbs and continuous EEG.

Discussion: During the surgery, the ligation of the right vertebral artery was performed, observing a loss of right SEPs, which never recovered during the whole surgery. (Image 1) Moreover, a discrete reduction of the MEP was recorded, without any specific valuable changes in the EEG, which is consistent with the test results of vertebral artery occlusion prior to surgery. During the IONM there was a close control of the use of anesthetic drugs to obtain the correct responses of the evoked potentials performed.



[Right SEPs loss]

Learning points: The IONM through SEPs and MEP, as well as continuous EEG recording, are techniques which should be necessary in this kind of surgery. This set of techniques gives us more information at an early stage indi-

cating the risk of neurological deficit and it also avoids complications during the anesthetic management. A close cooperation between the anesthesiologist and neurophysiologist is essential for the management of these patients.

06AP04-9

Optic nerve sheath diameter (ONSD) in supratentorial brain tumor surgery: an option for non invasive raised ICP detection and management. Preliminary results and feasibility assessment

Aspide R.¹, Pegoli M.¹, Neri M.¹, Zanello M.²

¹IRCCS Istituto delle Scienze Neurologiche, Bellaria Hospital, Dept of Anaesthesiology & Intensive Care, Bologna, Italy, ²University of Bologna and IRCCS Istituto delle Scienze Neurologiche, Bellaria Hospital, Dept of Anaesthesiology & Intensive Care, Bologna, Italy

Background and Goal of Study: Increase in optic nerve sheath diameter (ONSD) in transorbital sonography has been proven to be able to non-invasively detect elevated intracranial pressure in different clinical scenarios. The aim of this study is to assess the feasibility of ONSD sonography method detecting changes in intracranial pressure in patients with supratentorial brain tumors.

Materials and Methods: After a learning curve of 25 cases, for two intensivists, high-frequency linear probes 7 Mhz are used to measure ONSD (ophthalmic artery - optic nerve cross point) in a patients population with supratentorial brain solid tumors scheduled to elective neurosurgery.

A convenience small sample of patients' cohort with supratentorial brain tumors scheduled to elective neurosurgery was analyzed.

ONSD was measured, also, in preoperative RMN and/or CT scan and compared with postoperative CT scan in another small cohort of patients.

Results and Discussion: A total of 25 encounters were completed. ONSD was enlarged in 94.3% of patients bilaterally (cut off > 5.5 mm). The mean ultrasound ONSD before surgery was 6,64 +/- 0,33 mm preoperatively and 5,31 +/- 0,10 mm postoperatively. Mean ONSD on CT/MRI scan was respectively 5,62 +/- 0,51 mm preoperatively and 5,42 +/- 0,46 mm postoperatively. We also found a good correlation between the side of lesion and raised ONSD.

Conclusion(s): ONSD ultrasound measurement in supratentorial tumors patient population could be an optional non invasive method, beside CT or MRI to detect changes in intracranial pressure even if the paucity of the sample can't allow us to make a precise assessment.

References:

- Moretti R, Pizzi B Ultrasonography of the optic nerve in neurocritically ill patients, Acta Anaesthesiol Scand 2011; 55: 644-652.
- Bekerman I, Sigal T, Kimiagar I, Almer ZE, Vaiman M., Diagnostic value of the optic nerve sheath diameter in pseudotumor cerebri. J Clin Neurosci. 2016 Aug;30:106-9.
- Frederick A. Zeiler, Markus T.Ziesmann, Patrick Goeres, Bertram Unger, Jason Park1, Dimitrios Karakitsos, Michael Blaivas, Ashley Vergis and Lawrence M. Gillman - A unique method for estimating the reliability learning curve of optic nerve sheath diameter ultrasound measurement - Crit Ultrasound J (2016) 8:9

06AP05-1

An unreported life-threatening vaso-respiratory disturbance during endovascular embolisation of vein of Galen malformation - a case report

Krishnan P., Herod J., Rennie A.

Great Ormond Street Hospital, Dept of Anaesthesiology, London, United Kingdom

Background: Patients with vein of Galen aneurysmal malformation (VGAM) present with cardiac failure or raised intracranial pressure. Treatment usually involves medical management and embolising the arteriovenous shunt¹. We present an unreported severe vaso-respiratory disturbance during a VGAM embolisation.

Case report: A 10 month old girl presented for re-embolization of her VGAM. Under general anaesthetic, cerebral angiograms were obtained via the internal carotid artery (ICA) and a microcatheter was advanced into the posterior choroidal artery.

A sudden fall in lung compliance, severe hypotension and tachycardia was seen. The patient required multiple boluses of a crystalloid and infusions of adrenaline and noradrenaline.

Other causes were ruled out clinically and by imaging. On withdrawing the catheter, the vaso-respiratory disturbance resolved completely and the patient was extubated.

After five days, the patient had a repeat embolisation. When her VGAM was approached via the vertebral artery, she had a transient fall in lung compliance but was haemodynamically stable.

Discussion: Autonomic reactions have been reported during superselective ophthalmic arterial chemotherapy for retinoblastoma treatment and included bradycardia, hypotension and a fall in respiratory compliance. They occurred when the catheter was in the ICA or the ophthalmic artery^{2,3}. These may be due to stimulation of trigeminal afferents³ and abrupt changes in peripheral pulmonary vascular resistance³.

We did not note any bradycardia. Approaching the VGAM via the vertebral artery led to a fall in compliance but no haemodynamic disturbance.

References:

1. Jun Yan et al. Outcome and complications of endovascular embolization for vein of Galen malformations: a systematic review and meta-analysis. *J Neurosurg*, 2015 Oct
2. Phillips, T. J. et al (2013). Autonomic cardio-respiratory reflex reactions and superselective ophthalmic arterial chemotherapy for retinoblastoma. *Paediatr Anaesth*, 23: 940-945.
3. Kato, M. A. et al (2015). A retrospective analysis of severe intraoperative respiratory compliance changes during ophthalmic arterial chemosurgery for retinoblastoma. *Paediatr Anaesth*, 25: 595-602.

Learning points:

1. Life-threatening vaso-respiratory disturbance can happen during ICA catheterisation which may resolve with removal of the catheter.
2. An autonomic pathway linking intracranial vasculature and the respiratory system needs further investigation.

06AP05-2

Assessment methodology of brain functional status in the perioperative period in subarachnoid and parenchymal hemorrhage patients

Cherniy V.¹, Gorodnik G.², Smirnova N.², Andronova I.², Gerasimenko A.², Group

¹Scientific and Practical Centre of Preventive and Clinical Medicine, Dept of Anaesthesiology & Intensive Care, Kiev, Ukraine, ²Donetsk National Medical University, Dept of Anaesthesiology & Intensive Care, Donetsk, Ukraine

Background: A version of assessment methodology of brain functional status in spontaneous subarachnoid and parenchymal hemorrhage patients due to rupture of cerebral aneurysms was presented.

Goal of Study: Anesthesia, perioperative intensive therapy and brain functional status monitoring improvement in spontaneous subarachnoid and parenchymal hemorrhage patients.

Materials and Methods: 45 spontaneous subarachnoid and parenchymal hemorrhage as a result of cerebral aneurysm rupture patients were examined. The severity of patients condition according to Hunt-Hess scale was equal to grade IV. The level of consciousness was GCS 6-8 points. Philips Brilliance CT computed tomography (CT scan), Philips AlluraXper cerebral angiography, Spiegelberg ICP-monitor and Spiegelberg Compliance-Monitor intracranial pressure (ICP), mean arterial pressure (MAP), cerebral perfusion pressure (CPP) invasive monitoring, INVOS - 4100 Somanetics cerebral oxymetry (CO), monitoring were performed. BIS monitoring for the adequacy of sedation, Nihon Kohden Corporation EEG-1200K for postoperative encephalography were used.

Results and Discussion: Selection method of anesthesia at such operations is general anesthesia based on sevoflurane with tracheal intubation and automatic lung ventilation in the mode of norm or moderate hyperventilation. Neuroprotective therapy: nimodipine, choline alfoscerate - was performed according to preoperative, intraoperative and postoperative neurophysiological data monitoring. Modern concepts concerning pathophysiology of spontaneous subarachnoid hemorrhage, course disease periods were taken into account.

In order to study the uniformity of edema-swelling of the white and gray brain matter and to determine the degree of their hydration in a various topical areas of the brain the CT scan analyzes was held.

Conclusion(s): It was revealed that the CT method enables to estimate the hyperhydration of white and gray brain matter. Intensive therapy with choline alfoscerate reduces the severity of the hydration of white and gray brain matter, reducing the effects of edema-swelling. Invasive ICP, MAP, CPP monitoring, cerebral oximetry and EEG is a highly neuromonitoring component, use of which helps to clarify the tactics of intensive therapy in subarachnoid and parenchymal hemorrhage patients.

06AP05-3

Awake craniotomy - the anaesthesiologist's view

Mladić Batinica I.¹, Rotim K.², Sajko T.², Zmajević Schonwald M.², Salkičević S.³

¹UHC Sisters of Mercy, Dept of Anaesthesiology & Intensive Care, Zagreb, Croatia, ²UHC Sisters of Mercy, Department of Neurosurgery, Zagreb, Croatia, ³Faculty of Humanities and Social Sciences, Department of Psychology, Zagreb, Croatia

Background: Compared with surgery under general anaesthesia (GA), awake craniotomy (AC) is associated with advantageous outcomes. It is standard of care for tumors in eloquent brain areas. For anaesthesiologist it is a challenge because there is no standardized anaesthetic technique.

Clinical case-series: During last three years, AC with monitored anaesthesia care (MAC) is successfully implemented in Croatia. We present single centre experience with thirteen patients (age 32-64 yrs; 7M, 6F; ASA II). After selection by multidisciplinary team patients were sedated and breathed spontaneously during the procedure.

We used target controlled infusion pumps for fine titration of remifentanyl and propofol, and for local infiltration at the site of pin insertion, skin incision and nerve blocks mixture of 0.5% bupivacaine and 2% lidocaine with adrenalin. Monitoring included: ECG, invasive and non-invasive BP, SPO₂, RR, ET-CO₂, BIS and hourly urinary output. There were no surgical, neither anaesthesiological complications. Maximum alert and minimally stressed patients were optimal for awake brain mapping.

Discussion: In anaesthetic management exists large variability and implementing AC is challenging for anaesthesiologist. Avoidance of GA prevents associated physiological disturbance, need for mechanical ventilation and utilization of anaesthetics that can play a role on antitumor immunity and tumor progression. It is difficult to differentiate the benefits related to anaesthetic care from those attributable to surgical technique. Using MAC, surgeon's credit is an ability to increase the extent of resection and survival, while preserving neurological function. Anaesthesiologist's credit is competence to avoid a complications of general endotracheal anaesthesia. Avoiding these factors may contribute to better outcome after AC.

Our experience shows patients' satisfaction (evaluated by psychologist), with optimal intraoperative working conditions for neurosurgeon.

Learning points: Crucial steps in establishment of an awake surgery is creation of a competent neuroanaesthesiologist, who are able to provide care for awake patients. Drugs fine titration, accurate respiratory function monitoring, good plan in dealing with possible respiratory complication and constant training in management of difficult airways are milestones of favourable outcome. In view of that, anaesthesiologist contribution to AC is essential.

06AP05-4

Can we predict patient's panic attack during awake craniotomy?

Kamata K.¹, Hasegawa H.¹, Uchiide Y.², Maruyama T.³, Muragaki Y.³, Ozaki M.¹

¹Tokyo Women's Medical University, Dept of Anaesthesiology, Tokyo, Japan, ²Tokyo Women's Medical University Yachiyo Medical Centre, Dept of Psychiatry, Yachiyo, Japan, ³Tokyo Women's Medical University, Dept of Neurosurgery, Tokyo, Japan

Background and Goal of Study: Intraoperative psychological disorder disturbs the surgical achievement of awake craniotomy. In spite of careful evaluation of the patients, psychological and physiological stress caused by surgery itself can trigger patient decline. However, the factors that correlate to panic

attack (PA) during awake craniotomy have not been elucidated. The aim of this study is to clarify the risk factors of PA among awake craniotomies.

Materials and Methods: After the approval of the local ethics committee (4141), a retrospective case review of consecutive awake craniotomy was conducted. From November 1999 to October 2016, 407 patients were operated at our institution. Two patients, who were set-up as awake craniotomy before induction but required general anaesthesia due to unforeseen circumstances, were excluded. Sixteen (4.0%) of 405 patients met the diagnostic criteria of PA as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). The detailed characteristics of these 16 patients (Group PA) were compared with the remaining 389 patients (Group non-PA) who were not referred to as PA. Non-parametric data was compared with the chi-square test or Goodness-of-Fit test as appropriate. Parametric data was compared using an unpaired Student's *t* test. Multivariate logistic regression analysis was used to explore the relationships between PA and patient characteristics. Statistical significance was considered as $p < 0.05$.

Results and Discussion: The demographics and operative backgrounds of the patients were comparable. The average number of physical and cognitive symptoms that occurred in Group PA was 4.3, whereas this number was 0.9 in Group non-PA ($p < 0.0001$). Univariate analyses showed significant correlation between the incidence of PA and age ($p = 0.0108$), ASA-PS ($p = 0.0140$), marital status ($p = 0.0405$), intraoperative headache ($p = 0.0344$), or intraoperative agitation ($p < 0.0001$). Similarly, multivariate analyses with the logistic regression model showed that younger than median level of age (38 years; $p = 0.0486$) and intraoperative agitation ($p = 0.0018$) were significantly correlated with the incidence of PA during awake craniotomy. Three patients (0.7%) of Group PA required general anaesthesia with a secured airway because of emotional intolerance that occurred subsequent to PA.

Conclusion: In patients undergoing awake craniotomy, intraoperative agitation and younger age are considered to be risk factors of PA.

06AP05-5

Drug-induced sleep endoscopy (DISE) - diagnostic tool used for adjustment of vagus nerve stimulator (VNS) settings

Caldeira A., Orvalho C.

Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background: DISE is a technique for studying the dynamic airway in a sleeping patient with Obstructive Sleep Apnea (OSA). It reflects the use of sedative agents, reproduction of airway behavior during sleep and endoscopic upper airway evaluation.

VNS is an effective nonpharmacological treatment for patients with refractory epilepsy, which reduces seizures frequency rate but increases the Apneas/Hypopneas Index (AHI) and desaturation episodes.

Case report: We present a case of a 23-year-old man submitted to DISE for adjustment of VNS settings.

The patient had a medical history of OSA and refractory epilepsy for which he had a VNS implanted since 2005.

Premedication with midazolam 2 mg was administered. In the operating room, he was placed in supine position, and monitored according to ASA standards and BIS index.

A sedation was planned with an initial bolus of propofol 50 mg and titrated with 10 mg every 3-5 minutes, to maintain BIS between 50-70.

The procedure and anaesthesia were uneventful requiring close coordination between the neurologist and the pneumologist. By decreasing the stimulus frequency, it was possible to achieve the optimal VNS settings that allowed to control seizure episodes while not increasing the AHI.

During the procedure, the patient remained hemodynamically stable and with good oxygen saturation levels, no analgesia was required.

Discussion: This technique is a reliable tool to detect and analyze the larynx dynamic during induced sleep, and in this case, allowed to adjust the VNS settings with the objective of diminishing the AHI. Propofol is an "ideal" agent because it is a hypnotic drug with a very short half-life and any adverse effects are reversed rapidly after discontinuation. It could be administered by manual bolus, standard pump system or TCI, depending on the anaesthetist experience.

Complications associated with DISE include nasal bleeding, laryngospasm, pulmonary aspiration, desaturation, need for intubation, cardiac dysrhythmias and hypertension.

References:

Shallik N.. Review Article-Anesthetic Management For Drug Induced Sleep Endoscopy. M.E.J. ANESTH 23(2), 2015.

Ebben M., et al. Vagus Nerve Stimulation, Sleep Apnea, and CPAP Titration. Journal of Clinical Sleep Medicine, Vol. 4, No. 5, 2008.

Learning Points: In our case, DISE was successfully used to adjust VNS settings, despite being intended for a different purpose originally. It needed a multidisciplinary approach and adaptation of the anaesthetic technique.

06AP05-6

Effect of different anesthesia regimens on microelectrode recordings of the anterior nucleus of the thalamus during deep brain stimulation surgery for epilepsy patients

Bos M.¹, Ackermans L.², van Zundert A.³, Schaper F.⁴, van Kranen-Mastenbroek V.⁵, Janssen M.⁴

¹Maastricht University Medical Center, Dept of Anaesthesiology & Pain Medicine, Maastricht, Netherlands, ²Maastricht University Medical Center, Department of Neurosurgery, Maastricht, Netherlands, ³The University of Queensland & Royal Brisbane & Woman's Hospital, Department of Anesthesia & Perioperative Medicine, Brisbane, Australia, ⁴Maastricht University Medical Center MUMC, Department of Neurology, Maastricht, Netherlands, ⁵Maastricht University Medical Center MUMC, Department of Neurophysiology, Maastricht, Netherlands

Background and Goal of Study: Deep brain stimulation (DBS) of the anterior nucleus of the thalamus (ANT) is an effective treatment for patients with intractable epilepsy. Optimal therapeutic effects of DBS depend on accurate positioning of the stimulating electrodes. Microelectrode recordings (MER) show typical burst firing neurons in the ANT-region. This electrophysiological hallmark confirms the anatomical target determined by the surgeon. DBS electrodes in epilepsy patients are generally implanted under general anesthesia (GA). The type and depth of anesthesia might interfere with the MER. In this case series of 23 patients with intractable epilepsy we describe our experience with different anesthesia regimens and the quality of the MER.

Materials and Methods: Data of anesthesia records and MER were retrospectively reviewed of all epilepsy patients who underwent DBS surgery of the ANT from November 2011 till November 2016. Quality of MER data between different anesthesia regimens used were compared.

Results: Twenty-three patients underwent surgery for implantation of bilateral DBS electrodes in the ANT under GA. Twenty-two patients received GA with propofol, ranges from 50 mg/kg/min to 135 mcg/kg/min, with remifentanyl 0.2 mcg/kg/min to 0.3 mcg/kg/min or sufentanil 0.003 mcg/kg/min. In these patients, good quality MER could be obtained. In one patient, sevoflurane 0.9 MAC with sufentanil in bolus was used.

During the procedure, with standard MER, no neuronal activity was present. Therefore, the type of anesthesia was switched from sevoflurane to propofol 135 mcg/kg/min. At the contralateral side, classical bursty neuronal activity was present. A post-operative CT-scan showed that the DBS leads were situated at the predefined target.

Conclusion(s): The type of anesthesia influences the quality of MER in the thalamus. Sevoflurane completely abolished MER and should therefore be avoided. Propofol, in normal maintenance dosages with opioids can be used safely without suppression of the neuronal firing in the ANT. We therefore advise to use standardized protocols with intravenous anesthetics during DBS-ANT surgery.

06AP05-7**General anesthesia in DBS for Parkinson's disease.****Retrospective single center study**

García Claudio N.¹, Ferrandis Comes R.², Argente Navarro M.P.¹, Gutiérrez Martín A.³, Giménez Jiménez I.¹

¹Hospital Universitario y Politécnico La Fe, Dept of Anaesthesiology, Valencia, Spain, ²Hospital Universitario y Politécnico La Fe, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ³Hospital Universitario y Politécnico La Fe, Dept of Surgery, Valencia, Spain

Background and Goal of Study: The technique of local anesthesia with sedation continues being the most frequent for Parkinson's surgery.

- Main objective: General anesthesia is an effective alternative in this surgery - Secondary objectives:

1. Reduction of dopaminergic medication by the equivalent daily dose of levodopa (LEDD), comparing the values prior to the surgery and those obtained per year
2. Improvement in the scale UPDRS III (*Unified Parkinson's Disease Rating Scale*) prior to surgery and the year of surgery

Materials and Methods:

- **Design:** Retrospective single center study.
- **Study period:** 2 years (2012-2014).
- **Reference population:** patients undergoing deep brain stimulation surgery on subthalamic nucleus for Parkinson's disease.
- **Inclusion criteria:** over 18 years old. Absence of cognitive or psychiatric deficit. Patients with side effects from medical treatment.
- **Exclusion criteria:** deep brain stimulation by tremor or chronic pain. Evidence of cognitive impairment. Several comorbidities that contraindicate any type of surgery. Deep brain stimulation on the globus pallidus or ventralis intermedialis nucleus.
- **Follow-up:** one year from surgery.
- **Statistical analysis:** The R statistical software was used to analyze the variables. We have performed mixed linear regression models.

Results and Discussion: We present the case of 29 patients (10 men and 19 women, 55-67 years old) operated from deep brain stimulation on the subthalamic nucleus due to Parkinson's disease under general anesthesia (2012-2014).

The surgical procedure was performed under intravenous general anesthesia with endotracheal intubation using propofol and remifentanyl. Excellent quality of electrophysiological recordings was obtained and there were no complications. General anesthesia does not prolong surgical time.

The values of UPDRS III decreased after surgery, from an average of 37.5 and a median of 37.5 (30-43) to a year of 25.93 with a median of 25.5 (18-29.25). The LEDD also varied, going from 1188.35 mg of mean and median 1102.88mg (888.5-1401.75) before surgery to 790.49mg of mean and median of 780mg (540-958) a year of the same.

Conclusion(s): General anesthesia is an alternative safe and effective to perform deep brain stimulation surgery. Deep brain stimulation improves motor symptoms and reduces dopaminergic medication.

06AP05-8**How does propofol affect sensory processing? Single-unit and intracerebral EEG recording in humans shows disruption of cortical-cortical connectivity**

Krom A.J.¹, Marmelshtein A.², Hayat D.³, Strauss I.⁴, Fried I.⁵, Nir Y.⁶

¹Hadassah Medical Center, Dept of Anaesthesiology, Jerusalem, Israel, ²Tel Aviv University, Sagol School of Neuroscience, Tel Aviv, Israel, ³Tel Aviv Sourasky Medical Center, Dept of Anaesthesiology, Tel Aviv, Israel, ⁴Tel Aviv Sourasky Medical Center, Dept of Neurosurgery, Tel Aviv, Israel, ⁵Tel Aviv Sourasky Medical Center & University of California Los Angeles, Dept of Neurosurgery, Tel Aviv, Israel, ⁶Tel Aviv University, Sackler School of Medicine & Sagol School of Neuroscience, Tel Aviv, Israel

Background: It is still unclear how, despite diverse molecular and cellular mechanisms, a wide range of anesthetics all bring about loss of consciousness (LOC) and how responses to sensory stimuli differ between wakefulness and anesthesia. Specifically, it remains undecided whether "just hypnotic"

anesthesia primarily disrupts feed-forward activity up to primary sensory regions or whether it mainly affects inter cortical connectivity.

Methods: We recorded intracerebral EEG, microwire LFPs, and neuronal firing across multiple brain regions of five epilepsy patients as they were sedated for routine deplanning of intracranial depth electrodes serving for clinical monitoring. The auditory system was chosen as the model for sensory processing. Propofol infusion rate was increased gradually while auditory stimuli (40Hz click-trains and words) were presented during wakefulness, as sedation deepened, and after achieving unresponsiveness.

Results and Discussion: During wakefulness, significant intracerebral EEG responses to 40Hz click-trains (n=328 depth electrodes) were widespread across the cortex, whereas during anesthesia responses were strongly attenuated and restricted to regions around auditory cortex. This attenuation occurred transiently around LOC. In the auditory cortex, the effects of anesthesia on 40Hz responses were more moderate and variable. In response to words during wakefulness, auditory LFPs showed an increase in gamma (40-110Hz) power and concurrent alpha/beta (10-20Hz) desynchronization. During anesthesia, gamma effects (likely reflecting feed-forward processing) were preserved, whereas alpha/beta effects (likely reflecting top-down processing) were strongly attenuated. Preliminary results from isolated auditory neurons (n=7) showed robust attenuation of responses to words during anesthesia.

Conclusions: Anesthesia preferentially disrupts intercortical aspects of auditory responses such as the spread of activity from A1 to high-order cortical nodes and top-down response signatures, while sparing early bottom-up signaling up to A1.

Acknowledgements: Supported by ISF 51/11 (I-CORE cognitive sciences), ISF 1326/15 & 762/16, FP7 CIG, and Adelis Foundation.

06AP05-9**Propofol-dexmedetomidine versus propofol-remifentanyl conscious sedation for awake craniotomy during epilepsy surgery**

Ibrahim E., Elbakry A.A.

Menoufia University, Dept of Anaesthesiology, Shebeen ElKoom, Egypt

Background and Goal of Study: Conscious sedation during awake craniotomy requires balanced anesthesia technique to achieve optimum sedation and analgesia. This technique should be without respiratory depression or loss of consciousness. The present study was designed to evaluate the effect of propofol-dexmedetomidine versus propofol-remifentanyl conscious sedation during awake craniotomy for epilepsy surgery.

Materials and Methods: Sixty patients undergoing awake craniotomy for epilepsy surgery were randomly allocated into two groups, group PD and group PR, thirty patients in each group. Patients in PD group received propofol and dexmedetomidine intravenous infusion and patients in PR group received propofol and remifentanyl intravenous infusion for conscious sedation. Sedation score, patients' satisfaction, surgeons' satisfaction, heart rate, mean arterial blood pressure, oxygen saturation, and side effects such as respiratory depression, nausea, vomiting, airway obstruction, and oxygen desaturation were recorded.

Results and Discussion: Sedation score was higher in PR group compared to PD group (P <0.05). There was no significant differences in patient's satisfaction scores between groups. The heart rate was lower in the PD compared to the PR group (P <0.05). The incidence of nausea, vomiting, oxygen desaturation, and respiratory depression was statistically higher in PR group compared to PD group (P <0.05).

Conclusion(s): Propofol-dexmedetomidine is as effective as propofol-remifentanyl combination with fewer side effects for conscious sedation during awake craniotomy for epilepsy surgery.

06AP05-10**Speech brain mapping by direct cortical stimulation during the awake craniotomy and possible increase in sympathetic activity: a case report**

Mladić Batinica I.¹, Zmajević Schonwald M.², Rotim K.², Sajko T.², Salkičević S.³

¹*UHC Sisters of Mercy, Dept of Anaesthesiology & Intensive Care, Zagreb, Croatia,* ²*UHC Sisters of Mercy, Department of Neurosurgery, Zagreb, Croatia,* ³*Faculty of Humanities and Social Sciences, Department of Psychology, Zagreb, Croatia*

Background: During the last three years awake craniotomy (AC) was successfully implemented in Croatia, using monitored anaesthetic care (MAC) as anaesthetic technique. Patient was a 44-year-old female with an expansive tumor in the left fronto-temporal cortex. Mapping of primary motor cortex (M1) and Broca's area was performed by direct cortical stimulation (DCS) during AC. We were monitoring the change of vital parameters during speech brain mapping intraoperatively in awake patient.

Case report: The patient was sedated and breathed spontaneously during the procedure. We used target controlled infusion pumps for fine titration of remifentanyl and propofol with local infiltration at the site of pin insertion, skin incision and nerve blocks. The DCS paradigm of 5 monophasic pulses of 0.4 ms duration, repetition rate of 2.2 Hz, intensity up to 15 mA was used over the left primary motor cortex and over the Broca's area. The corticobulbar motor evoked potentials (CoMEPs) were recorded from laryngeal muscles as short latency responses (SLR), while long latency responses (LLR) were elicited by premotor cortex mapping in the caudal opercular part of inferior frontal gyrus, including Broca's area. During the DCS, patient's clinical response was video recorded and correlated with continuously monitored invasive BP and HR.

Discussion: During DCS that elicited the response of M1 for laryngeal muscles, CoMEP with SLR of 5.62 ms was recorded, and the patient developed clinical picture of dysarthria / anarthria. During that period patient's BP and HR were unchanged. During DCS mapping of premotor cortex in the caudal opercular part of inferior frontal gyrus, including Broca's area, patient manifested clinical onset of verbal paraphasia and speech arrest, recorded as the CoMEPs with LLR of 37.4 ms. Ten minutes after the symptoms onset, the BP increased 20 mmHg. Five to seven minutes after BP change, HR increased 10 to 15 bpm. The raising pattern of BP and HR was detected each time when severe central motor speech deficit was induced by DCS.

Learning Points: We had successfully performed mapping of Broca's area, as a part of AC. During the DCS, the clinical signs of central motor speech - the significant central failure in speech tasks - were accompanied by raising in BP and HR, as indication of possible onset of increased sympathetic activity. This should be kept in mind because of potentially life-threatening conditions accompanied by increased sympathetic activity.

06AP05-11**The research of EEG predictors of neuroglial and neurotransmitter activity, the features of the restructuring of the brain intracentral relations in patients with severe head injury in patients**

Cherniy V.¹, Gorodnik G.², Andronova I.², Cherniy T.¹, Nazarenko K.²

¹*Scientific and Practical Centre of Preventive and Clinical Medicine, Dept of Anaesthesiology & Intensive Care, Kiev, Ukraine,* ²*Donetsk National Medical University, Dept of Anaesthesiology & Intensive Care, Donetsk, Ukraine*

Background and Goal of Study: The investigation of the influence of cytoflavin to the restructuring of the brain intracentral relations, changes of the neuroglial and neurotransmitter activity in patients with severe TBI.

Materials and Methods: Open prospective study of the type of "case-control", which was held with a group of patients with severe TBI. 1st group - 30 patients who were treated according to standard protocol. 2nd group - 30 patients who accept the therapy of the standard protocol treatment additionally received drug cytoflavin - 5 ml in 100 ml saline solution per day from the first day of the therapy (1st group received placebo) slow intravenously injections during 7 days. The electrical activity of the brain in patients with severe TBI were studied.

Results and Discussion: In both groups of patients with severe TBI was installed the initial decrease in activity of all studied neurotransmitter systems in almost all the studied regions of the cortex, which reflected a profound depletion of stress-realizing and stress-limiting CNS reactions.

In patients with severe TBI who were treated with drug cytoflavin the predictors of transformation of the stress reactions is the increasing importance of coherence in the alpha-EEG frequency ranges in Central cortex (C3-C4), projection zone nonspecific thalamus, the recovery of upper brainstem and the limbic system (increased interhemispheric diagonal coherent linkages (C3-C4, O1-O2) background EEG Alpha - band. The intense therapy of patients with severe TBI with cytoflavin during a week restored neurotransmitter balance, modulating the activity of adrenergic, serotonergic and dopaminergic, cholinergic neurotransmitter systems, when the stress-realizing reaction in the process of restoration of the CNS functions were replaced by a stress-limiting reactions, more than the required level homeostasis).

Conclusion(s): The application of cytoflavin provided adequate energy compensing the stress-realizing and stress-limiting processes in severe traumatic brain injury, their gradual inclusion in the homeostasis of the CNS recovery. In the group of patients with severe TBI, who in addition to standard protocol treatment received drug cytoflavin, the chance of recovery of consciousness up to 11 or more points on the GCS (OR \pm 95% CI = 0,22 (0,054-0,914)) significantly increased, significantly reduced the risk of death ((RR) \pm 95% CI = 3 (1,09-8,2)) by the 3rd day of therapy.

06AP05-12**The study of EEG predictors in patients with acute cerebral insufficiency, complications of vegetative state**

Cherniy V.¹, Irina A.², Gorodnik G.², Cherniy T.¹, Nazarenko K.²

¹*Scientific and Practical Centre of Preventive and Clinical Medicine, Dept of Anaesthesiology & Intensive Care, Kiev, Ukraine,* ²*Donetsk National Medical University, Dept of Anaesthesiology & Intensive Care, Donetsk, Ukraine*

Background: Depression of consciousness and levels of recovery of mental activity after the coma is an actual neurological problem. Minimally conscious state or vegetative state is one of the variants of exit from protracted coma. The timely neurophysiological monitoring, pathogenetic treatment aimed on the stimulation of neuroplasticity, and a correct prediction of the course of this disease are relevant for the entire period of observation.

Goal of Study: Examine EEG-predictors in patients with acute cerebral insufficiency, complicated with vegetative state, the study of the affectivity of neurotropic drugs in patients with apallic syndrome.

Materials and Methods: We conducted the examination and treatment of 10 patients with acute cerebral insufficiency (IN), complicated with vegetative state. The diagnosis of the vegetative state was exposed with dynamic observation of the patients on the basis of accepted international criteria. We used computer digital EEG NIHON-KOHDEN and Neuron-Spectrum, which have the ability to produce synchronous recording 8 channel EEG and 1 channel ECG in standard abduction to conduct the studies.

Results and Discussion: The results of the research showed the reduction of interhemispheric coherence in all frequency bands of the EEG in all parts of the brain, which is a neurophysiological predictor of the development of a vegetative state and will be maintained throughout the course of the disease. The cause of the decline of hemispheric relationship interaction was ischemic lesion of the cerebral cortex and deep brain areas. This leads to disruption of connections between subcortical ganglia and the cerebral cortex, called "separation phenomenon". The transformation of a vegetative state in "the state of small consciousness," accompanied on EEG by increasing the consistency in alpha and beta ranges in a symmetrical Central areas (C3-C4), which is a sign of recovery of activity of structures of the midbrain and diencephalic structures.

Conclusion(s): After conducting the pharmacological tests with the drug glytaton showed a significant decrease ($p \leq 0.05$) of the level of disorganization of the EEG-pattern, bilaterally in the right and left hemisphere. The use of choline alfosceratus in the treatment of patients with apallic syndrome, led to the transformation of a vegetative state into "the state of small consciousness," in five of the eight patients.

06AP06-1**Retrospective analysis of intraoperative cardiorespiratory reflex responses in retinoblastoma patients receiving ophthalmic arterial chemotherapy**

Arslan E., Karagöz A.H., Akça B., Ankaç Yilbas A., Üzümcügil F.
Hacettepe University, Dept of Anaesthesiology & Intensive Care,
Ankara, Turkey

Background and Goal of Study: Superselective ophthalmic arterial chemotherapy is an endovascular treatment method performed under general anesthesia that is commonly used in retinoblastoma patients. Many studies have reported severe cardiorespiratory reactions in patients during ophthalmic artery catheterization. In this study, we aimed to investigate intraoperative cardiorespiratory reactions and anesthesia management in patients who underwent superselective ophthalmic arterial chemotherapy in our clinic retrospectively.

Materials and Methods: 91 patients who received intraarterial chemotherapy at Hacettepe University Medical Faculty Hospital between January 2012 and October 2016 were included in the study. All patients received a standard treatment and anesthesia protocol. Demographic variables, electrocardiography, SpO₂ and non-invasive blood pressure data, end-tidal carbon dioxide levels and ventilation parameters of all patients were recorded.

Results and Discussion: There were a total of 245 procedures, ranging from 1-7 for each patient, performed in a total of 91 patients. Cardiorespiratory reflex response (CRR) was found in 11% of all patients and in 5.3% of all procedures. CRR was observed in the first procedure in 2 patients and in subsequent procedures in other patients. In all 13 procedures that CRR was observed, end-tidal CO₂ and SpO₂ levels decreased and peak inspiratory pressure increased. There was no hypotension or bradycardia that requires vasopressor treatment in any of CRR cases. Although the age of patients that CRR occurred (2,3) was found to be lower than that of patients CRR was not seen (3,0), there was no significant relationship determined between CRR and age, weight, sex or any concomitant disease.

Conclusion(s): In our study, the rate of cardio-respiratory reflex response during super-selective ophthalmic arterial chemotherapy was found much lower than reported in literature. CRR can cause serious hemodynamic disturbances so we believe that it is utmost importance to stop all catheterization maneuvers and start manual ventilation with %100 O₂ as soon as the symptoms appear.

06AP06-2**Safety of the sitting position. A pseudorandomised non-inferiority methodology study**

Brinzeu A., Dumot C., Georgoulis G., Dailler F., Sindou M., Mertens P

Université de Lyon 1, Neurosurgery, Lyon, France

The persistence of a debate concerning the relative risk and the yet unproven benefit of the sitting position is mainly due to methodological issues of previous studies lacking group homogeneity and generally biased as to the choice of the position. We aim in this study to compare the sitting position to its alternatives, in terms of safety, with an improved methodology. Given the small variances between surgeons we used Chiari decompression as our model including only patients in whom the intention to treat was in the sitting position. Preoperative trans-esophageal echocardiography was used to dichotomize the two groups. The groups were compared for complication rates, intraoperative course and outcome at day 2, one month and one year.

From 2003 to 2013 116 chiari decompressions meeting our inclusion criteria were performed 86 sitting, 30 prone. The two groups were homogenous in terms of preoperative status and demographics. Major complications occurred in 3 patients (2 sitting/1 prone p=0.84). Outcome was comparable for the two groups. Hospital length of stay (19/25 days p=.64) was not significantly different. Surgical time was shorter for the sitting position (184/203 minutes, p=0,0002) and bleeding (84/378 cc, p=0,0001) was more important in the prone position. VAE occurred more frequently (21%, p=0,009) in the sitting position without any clinical consequences. No differences in hemodynamic parameters were noted.

Operating patients in the sitting position is not associated with significantly increased risks. Methodological obstacles to high level of proof prospective studies could be overcome using this paradigm.

06AP06-3**Spinal anesthesia versus general anesthesia for lumbar disc surgery**

Bermede A.O., Yörükoğlu D.

Ankara University School of Medicine, Dept of Anaesthesiology & Intensive Care, Ankara, Turkey

Background: Lumbar spine surgery can be performed using different anesthetic techniques such as general endotracheal anesthesia (GA) or spinal-based regional anesthesia (SA) (1). Several studies have been performed comparing these two anesthetic techniques and have revealed disparate results. SA is a safe but rarely used alternative to general anesthesia for lumbar disc surgery. It reduces blood loss, avoid pressure necrosis and nerve injuries, and it provides a more comfortable postoperative period (2). Regional anesthetics may also lower the incidence of pulmonary complications when compared to general anesthetics. Some additional advantages of spinal anesthesia include early discharge from the post-anesthesia care unit, little pain and less nausea and vomiting. (3) The aim of this study was to compare the safety and efficacy of the intraoperative parameters and postoperative outcomes associated with SA and GA in patients undergoing lumbar disc surgery.

Materials and Methods: Following Institutional Review Board approval, 760 patients were evaluated who underwent lumbar disc surgery between January 2013 and December 2015. Demographic, clinical, laboratory and perioperative information was determined from the patients' medical records.

Results and Discussion: Spinal anesthesia (n=370) was associated with shorter length of stay (p <0.001, Pearson Chi-Square test) comparing with general anesthesia (n=390). Nausea and vomiting was less common in SA group (p <0.005, Pearson Chi-Square test). In addition, headache was significantly less in SA group (p <0.001, Pearson Chi-Square test).

Conclusion(s): Spinal anesthesia can be performed safely in patients undergoing lumbar spine surgery. It has the potential to reduce hospital stay, nausea and vomiting, and headache. Further prospective evaluation will help to validate these findings.

References:

1. Jellish WS, Thalji Z, Stevenson K, Shea J. A prospective randomized study comparing short and intermediate term perioperative outcome variables after spinal or general anesthesia for lumbar disc and laminectomy surgery. *Anesth Analg* 1996;83:559-564.
2. McLain RF, Kalfas I, Bell GR, et al. Comparison of spinal and general anesthesia in lumbar laminectomy surgery: a case-controlled analysis of 400 patients. *J Neurosurg Spine* 2005;2:17-22.
3. McLain RF, Bell GR, Kalfas I, Tetzlaff JE, Yoon HJ. Complications associated with lumbar laminectomy: a comparison of spinal versus general anesthesia. *Spine* 2004;29:2542-7.

06AP06-4**The calm before the storm: haemorrhagic cardiac arrest during lumbar disc surgery**

Gritti P¹, Passoni M.¹, Brembilla C.², Re M.¹, Cadisco A.¹, Lorini FL.¹

¹ASST Papa Giovanni XXIII^o Bergamo, Dept of Anaesthesiology & Intensive Care, Bergamo, Italy, ²ASST Papa Giovanni XXIII^o Bergamo, Neurosurgery, Bergamo, Italy

Background: Lumbar disc surgery is very common in neurosurgery. Although several surgical complications could be happened during the approach to the disc, hemorrhage due to vascular injuries is rare (0.01-0.05%) and underhanded event¹. Here we report a case of hemorrhagic cardiac arrest due to vascular injury follow lumbar disc surgery.

Case report: A 53-year-old female underwent lumbar disc surgery for a disc protrusion (L5-S1 level). During the closure phase of the surgery time the patient became bradycardic and unresponsive to atropine. Suddenly carbon dioxide curve decrease to 10 mmHg, the plethysmography curve disappeared and non-invasive blood pressure was immeasurable. The final neurosurgery phase was interrupted and the patient was rapidly turned to the supine position. She was pulseless so advanced cardiac life support maneuver were started. The abdomen was distended so intraabdominal bleeding was suspected and vascular surgeon alerted. After opening the retroperitoneal space and evacuation of the hematoma, a 3 mm of right iliac artery laceration were founded. The laceration was repaired with double overlook suture. The

cardiac massage was protracted for fifty-five minutes. It was stopped just ten minutes after the vascular surgery reparation. Valid pulses were founded sustained by a continuous infusion of adrenaline. An overall of 18 mg of adrenaline, 4 mg of atropine, one liter of colloid, six unit of fresh frozen plasma, one unit of platelets and eleven units of whole blood were administered to the patient. The patient was sent to intensive care unit were the next day regained consciousness and motility. She was rapidly extubated and three day after discharged to neurosurgical ward.

Discussion: The lesions of the large pelvic vessels are described more often when working on the intervertebral space L4-L5 or L5-S1 because at this level the great vessels are relatively "real estate" and very close to each other (Fig 1). The most dramatic context is obviously an arterial laceration. In these cases you can get in a short time to hemorrhagic shock, with a mortality rate up to 80% to 100%. The most often affected vessel is the left common iliac artery, which lies immediately in front of the fourth intervertebral disc.

References: Papadoulas S et al. Vascular injury complicating lumbar disc surgery. A systematic review. *Eur J Vasc Endovasc Surg* 24:189-95,2002

Learning points: Anesthesiologists should be aware of the risks of vascular injury follow lumbar disc surgery.

06AP06-5

The effect of laryngoscopy and intubation on the qNOX and qCON in spinal surgery

Grytsan A.¹, Dovbysh N.¹, Korchagin E.², Chernetsky O.²

¹Krasnoyarsk Regional Clinical Hospital, Krasnoyarsk State Medical University, Dept of Anaesthesiology & Intensive Care, Krasnoyarsk, Russian Federation, ²Krasnoyarsk Regional Clinical Hospital, Dept of Anaesthesiology & Intensive Care, Krasnoyarsk, Russian Federation

Background and Goal of Study: To evaluate the information value of the qNOX and qCON on stressfull effect of laryngoscopy and intubation.

Materials and Methods: Data was recorded from 12 patients - 8 men and 4 women, age 40,6±9.6 years (II-III class according to ASA), who were spinal surgery. Surgical intervention took place under general anesthesia. Induction was carried out on the basis of propofol 2.8±0.7 mg/kg and fentanyl 2,5±0,4 µg/kg, maintenance - on the basis of sevoflurane 0.7 to 1.1 MAC and fentanyl 1.8±0.3 µg/kg. Before and after laryngoscopy and intubation were evaluated hemodynamic parameters (monitor Phillips MP 20): systolic pressure (SP), diastolic pressure (DP), mean arterial pressure (MAP), heart rate (HR), assessment of the qNOX and qCON (monitor ICARDQ Chirana); the presence of go and the lack of motor response to laryngoscopy and intubation. The level of qCON and qNOX was considered adequately in the range of 40-60. Statistical analysis was performed using the t-test for dependent samples, considering a statistically significant change in p value < 0.05.

Results and Discussion: The values of the qNOX and qCON decreased to the target values 43.6±15.4 and 44.4±9,5 respectively after administration of propofol and fentanyl before conducting laryngoscopy and intubation (see table 1).

	HR, b*min-1	SP, mmHg	DP, mmHg	MAP, mmHg	qCON	qNOX
before laryngoscopy and intubation	89.8 ± 15.6	123 ± 23.4	76.1 ± 15.6	91.7 ± 16.3	44.4 ± 9.5	43.6 ± 15.4
after laryngoscopy and intubation	73.6 ± 18.4	93 ± 18.1	56.3 ± 14.7	68.7 ± 14.7	46.4 ± 17.6	37.8 ± 20.1
p	<0.05	<0.05	<0.05	<0.05	0.20	0.15

[Table 1]

Laryngoscopy and intubation did not cause pressor hemodynamics reactions and even there were statistically significant decrease of the estimated hemodynamic parameters, which can be attributed to the relative hypovolemia and the patients are on his side, when non-invasive BP was measured on the raised hand.

Statistically significant changes qNOX and qCON after intubation and laryngoscopy did not happen, these parameters remained within the target values.

Conclusion: Focus on the values of the qNOX and qCON, and not on hemodynamic parameters, allows to prevent the decrease of the flow of inhaled anesthetics in the further maintenance of anesthesia, and it is advisable correction of hemodynamic to conduct additional infusion.

Acknowledgements: no conflict of interest.

06AP06-6

Trigemino-cardial reflex in the skull base surgery

Savvina I., Anna P., Rutkovskiy R.

V.A. Almazov Federal N-W MRC, Dept of Anaesthesiology & Intensive Care, St Petersburg, Russian Federation

Background and Goal of Study: During operations on the skull base tumour removing various types of hemodynamic reaction could be registered: full reflexes with afferent, central and efferent link -peripheral subtype of trigemino-cardial reflex (TCR), and central TCR subtype when Gasser's node and central part of trigeminal nerve are irritated. Repeated provoking of TCR by surgical intervention, can lead to simplification of effectors response due to the formation of new reflex connections, on the one hand, and the formation of stable pathological focus excitation in the reticular formation of the brain stem.

Materials and Methods: 207 patients (4-74 years, 20 female, 187 male) with of the skull base tumours operated in 2010-2016 yy with invasive and non-invasive methods of hemodynamic monitoring (PICCO, PhilipsIntelliVue"MX800"), BIS-monitoring under condition of TIVA (propofol+fentanyl) with artificial lung ventilation and total myorelaxation with rocuronium.

Results: In 105 patients with tumours located in the base of the posterior cranial fossa (vestibular, trigeminal schwannoma) TCR was observed after mechanical stimulation of the trigeminal root, the impact of bipolar coagulation (BIS=32±3). In 42 patients with large craniofacial tumours TCR was diagnosed during manipulation on the periorbital region and maxillar-mandibular branches (BIS=33±2). In 16 patients with pterygopalatine fossa tumours and 44 patients with anterior cranial fossa tumours we also observed episodes of sudden bradycardia due to trigeminal nerve stimulation (BIS=31±3). The both subtypes of TCR were manifested with sudden bradycardia, bradycardia or asystolia with arterial hypotension in some cases (more than 20% from initial means) and arterial hypertention (more than 30% from initial means). All episodes of TCR required pharmacological correction (atropine iv).

Conclusion(s): Manipulation along the entire length of the trigeminal nerve should exclude its rough tension, physical and chemical irritation. Registration of cardiac rhythm disorders in the form of bradycardia, bradycardia or asystolia, recurring repeatedly and clearly associated with manipulations of the surgeon, and the relatively high doses of opioid analgesics (fentanyl) and propofol required for adequate neurovegetative stabilization during operation, are indications for prolonged anesthesia in the postoperative period.

06AP06-7

Acute onset severe thrombocytopenia after brain tumor resection under total intravenous anesthesia

Matas M., Sekulić A., Miklič-Bublić M.

University Hospital Zagreb, Dept of Anaesthesiology & Intensive Care, Zagreb, Croatia

Background: Drug induced thrombocytopenia can be easily overlooked (1). Postoperative drop in platelet count, after brain tumor surgery, can cause hematoma formation (2) and significant mortality.

Case report: ASA II 70-year neurosurgical patient, without focal signs, was scheduled for left frontal lobe tumor resection. Preoperative platelet count was 180x10⁹. Laboratory tests were normal. Two prior surgeries were uneventful. Infection prophylaxis included cefazoline 2 g iv. Premedication consisted of midazolam 5 mg im. Anesthesia with fentanyl, propofol and rocuronium was induced and maintained with infusions of propofol and fentanyl. Haemoglobin levels during surgery were stable. Anesthesia went uneventful.

After transfer to ICU, the first postoperative finding was thrombocytopenia of 4 x10⁹ platelets. Twenty minutes later platelet count was 8 x 10⁹. Both the citrate and EDTA tests showed similar low platelet count. Five hours after the admission to the ICU new left hemiplegia was the reason for an emergency MSC. After transfusion of 8 units of platelets in site hematoma was evacuated. The second anesthesia was performed with midazolam and ketamine. The patient fully recovered with no new neurologic deficits. Platelet count remained normal. Heparin induced thrombocytopenia antibodies were not found. Specific drug antithrombocyte antibodies test wasn't available.

Discussion: Possible causes of acute postoperative thrombocytopenia in our patient were: dilutional effect of fluid resuscitation, unrecognized platelet pathology, nonimmune and immune thrombocytopenia not related to medications, heparin induced thrombocytopenia, pseudothrombocytopenia and other drug induced thrombocytopenias. Heparin induced thrombocytopenia

and pseudothrombocytopenia were excluded. The diagnosis of drug induced thrombocytopenia was the most probable. For the second surgery we decided to avoid cefazoline, propofol, fentanyl and rocuronium. The platelet count remained stable during and after the second surgery.

References:

1. Aster RH, Bougie DW Drug-Induced Immune Thrombocytopenia *N Engl J Med* 2007; 357:580-587.
2. Chan KH, Mann KS, Chan TK. The significance of thrombocytopenia in the development of postoperative intracranial hematoma. *J Neurosurg.* 1989;71(1):38-41

Learning points: Platelet count after brain tumor surgery in total intravenous anesthesia should be monitored in short intervals during first hours.

06AP06-8

Autonomic reactions during posterior cranial fossa surgery

Rumyantseva M., Petrova A., Nazarov R., Kondratiev A.
Russian Neurosurgical Institute named after Professor A.L.Polenov, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation

During operations on posterior fossa tumors specific autonomic reactions could occur. Since 1989 in our Department we successfully apply the method of anesthesia, which includes combined use of fentanyl and clonidine. This method of anesthesia creates conditions for neurovegetative stability which are optimal for the brain surgery and allows to detect autonomic reactions.

The 1-st type of vegetative reactions is the consequence of irritation of local centers relevant to the regulation of blood pressure and heart rate.

The 2-nd type occur because of a massive loss of brain function resulting from hypoperfusion, and irritation of the midline structures with subsequent hypercatecholaminemia.

Aim: to evaluate the efficacy of more selective alfa2-adrenoagonist (Dexmedetomidin) as a component of anesthesia during operations, accompanied by vegetative reactions.

Materials and Methods: 80 patients underwent elective operations on posterior fossa tumors.

Induction of anesthesia: pipecuronium 0,1 mg/kg followed by rocuronium 0,6 mg/kg, propofol 1,5-2,35 mg/kg, fentanyl 3,54-5,9 µg/kg + ALPHA2-adrenoagonists (clonidine or dexmedetomidine). All patients were divided into three groups depending on ALPHA2-adrenoagonists and dosages: group I (22 patients) were administered clonidine 1-2,63 µg/kg, in group II (38 patients) - dexmedetomidine 1,05- 2,33 µg/kg, in group III (20 patients) - dexmedetomidine 0,54-0,95 mg/kg.

Maintenance of anesthesia: propofol 2 -8,4 mg/kg/h, fentanyl 0,65 -2,08 µg/kg/h + ALPHA2-adrenoagonists (in group I - clonidine 0,22-0,81 µg/kg, in group II - dexmedetomidine 0,21- 1,04 µg/kg/h in group III- dexmedetomidine 0,11 - 0,42 µg/kg/h).

Monitoring "NihonKohden", "PICCO PULSION", control of the depth of sedation - "BISAspect".

Results: In all three groups, the 1-st type of vegetative reaction were observed as short episodes of bradiarytmias and/or arterial hypertension, the 2-nd type reactions (I -II groups) - as persistent hypertension.

In group I, the 1-st type of reactions were observed in 14 patients (64%), the 2 -nd type - in 1 case (0,05%).

In group II the 1-st type of reactions - in 24 patients (63%), the 2 -nd type - 1 case (0,03 %).

In group III, the 1-st type of reactions - in 14 patients (70%).

Conclusion: Application of dexmedetomidine in the structure of anesthesia allows to identify emerging autonomic response and could be applied during operations on posterior fossa tumors.

06AP06-9

Brainstem cavernous angioma in an octogenarian cardiopathic patient: anesthesiologic and neurosurgical challenges

Urli T.¹, Nicolini F.², Giulioni M.², Sturiale C.², Zanello M.³

¹IRCCS Istituto delle Scienze Neurologiche, Bellaria Hospital, Dept of Anaesthesiology & Intensive Care, Bologna, Italy, ²IRCCS Istituto delle Scienze Neurologiche, Bellaria Hospital, Dept of Neurosurgery, Bologna, Italy, ³University of Bologna and IRCCS Istituto delle Scienze Neurologiche, Bellaria Hospital, Dept of Anaesthesiology & Intensive Care, Bologna, Italy

Background: Cerebral cavernous angiomas are uncommon diseases mostly affecting young and middle-aged people. The brainstem location can be related to severe complications both in case of conservative and surgical management. Anesthesiologic concerns are the hemodynamic instability due to manipulation of the brainstem (dysrhythmias, hypertension, hypotension), and the risk of cranial nerve dysfunction.

Case report: An 81-year-old male presented with painful dysesthesias and gait instability. MRI revealed a large multicystic lesion in the medulla oblongata, with signs of previous hemorrhage. The patient had a cardiopathy with previous heart surgery (Bentall procedure, biological valve prosthesis); the artificial aortic valve was degenerating with moderate regurgitation. In accordance with the patient's will, surgical intervention was scheduled for reducing the brainstem compression and the risk of rebleeding. Preoperative anesthesiologic evaluation pointed out the high risk of the procedure. The anesthetic plan included: prone position, balanced anesthesia with sevoflurane and remifentanyl, endocarditis prophylaxis, and hemodynamic management suitable for a patient with aortic regurgitation. External pacemaker-defibrillator pads were applied in advance. Surgical resection was carried out until the occurrence of sudden bradycardia with hypotension, managed with atropine. After a short stay in ICU, the patient was transferred to the ward and then to the rehabilitation unit. Postoperatively, he showed hemiparesis slowly improving after physical therapy. The histopathological analysis confirmed the diagnosis of cavernoma.

Discussion: We found no previous report of brainstem cavernoma surgery in octogenarian cardiopathic patients, but the advanced age is not a sufficient reason to deny surgical treatment if the patient may benefit. In this case the usual concern about intraoperative hemodynamic instability was increased by the type of cardiac valvulopathy: intraoperative dysrhythmias, especially bradycardia, can worsen the degree of aortic regurgitation and can precipitate left ventricular failure. The medical team weighed carefully the risk-benefit ratio as well as the patient's will.

Learning points: Neurosurgery of brainstem cavernomas can be performed in selected elderly patients in hospitals with specific neurosurgical and anesthesiologic experience. The presence of comorbidities should not rule out the possibility of anesthesiologic and surgical treatment.

06AP06-11

Comparison of the effects of vecuronium and cisatracurium on electrophysiologic monitoring during neurosurgery: a randomized controlled study

Chung Y.H., Kim S.-H., Park J.-W.

Soonchunhyang University Bucheon Hospital, Dept of Anaesthesiology & Pain Medicine, Bucheon, Korea, Republic of

Background and Goal of Study: Continuous intravenous neuromuscular blockade (NMB) drug infusion is occasionally used for successful intraoperative motor evoked potentials (MEP) monitoring during neurosurgery. However, the difference between each NMB drug on efficacy of MEP monitoring has not been established with clinical study. We compared the effects of vecuronium and cisatracurium on efficacy of intraoperative MEP monitoring.

Materials and Methods: Seventy two patients undergoing neurosurgery with MEP monitoring were enrolled. Subjects were randomly allocated into one of the two groups: Group V, maintain continuous intravenous vecuronium infusion during surgery; Group C, maintain continuous intravenous cisatracurium infusion during surgery. The target of partial NMB level was to maintain T1/Tc 50%. The MEP amplitude value and the coefficient of variation (CV, %) of all measured MEP amplitude were compared. We also compared the frequency of NMB dose change and other anesthesia related profiles.

Results and Discussion: The mean propofol-remifentanyl dose and other anesthesia related profiles were not significantly different between the groups. The mean MEP amplitude, the CV of MEP amplitude and latency of all four limbs were not significantly different between the groups. MEP monitoring was successful in both groups. The frequency of continuous NMBA dose change in Group V was significantly lower than Group C; 4 (interquartile range, 3-5) vs. 6 (interquartile range, 5-8) ($P=0.021$).

Conclusion(s): There was no significant difference between vecuronium and cisatracurium on the variability and mean amplitude of MEP. However cisatracurium needed higher frequency of dose changes to maintain target train of four (TOF) level.

06AP06-12

Decompressive craniectomy after traumatic brain injury: a systematic review of recent evidences

Marocchi L., Spennati V., Cinicola M., Caroletti F., Caiazza I., Colacchi D.

Sapienza University of Rome, Dept of Anaesthesiology & Intensive Care, Roma, Italy

Background and Goal of Study: The role of decompressive craniectomy (DC) in the treatment of patients with high intracranial pressure (hICP) after traumatic brain injury (TBI) is controversial. Aim of this systematic review (SR) is to summarize recent clinical evidences on DC in hICP after TBI.

Materials and Methods: A SR literature search of PubMed using (brain injury) AND (DC) and (brain injury) AND (ICP) as key words of papers published

between January 2011 to November 2016, has been accomplished. Only full text papers published in English and presenting original data were included. The articles were evaluated according to PRISMA recommendations and details recorded using a dedicated data extraction form.

Results and Discussion: This SR, includes 4 studies: 2 RCTs ($n=553$ patients) and 2 observational ($n=627$ patients). The 2 RCTs report partially conflicting results.^{1,2} The DECRA trial, tested early DC for hICP management and showed a better control of ICP in DC group vs. medical therapy group (14.4 mmHg vs. 19.1 mmHg, $P<0.001$). Paradoxically, better ICP control was associated with higher unfavorable outcomes (GOS-E 1-4 70% vs. 51%; OR 2.21; 95% CI, 1.14 to 4.26; $P=0.02$) and worse functional outcome (6 months GOS-E median score, 3 vs. 4; OR 1.84; 95% confidence interval [CI], 1.05 to 3.24; $P=0.03$). The RESCUEicp trial, tested DC as a last tier therapy for hICP, and reported lower mortality in DC group than in control (26.9% vs. 48.9%; $P<0.001$). Of interest, GOS-E at 12 months, confirmed the clinical benefit associated with DC: a higher rate of patients treated with DC had higher "upper severe disability - good recovery" at follow up than the control group (45.4% vs. 32.4%; $P=0.01$). The 2 observational studies reported an association between good outcome and: age <60 , early timing (DC when ICP <20 mmHg), bone flap >130 cm², and GCS >5 before DC.^{3,4}

Conclusion(s): The benefit of DC remains controversial but recent evidence displayed positive results. Optimal timing and presence of prognostic parameters are associated with better outcome. Indiscriminate application of DC is not appropriate and possible clinical benefit deserve specific circumstances and pts selection.

References:

1. Cooper DJ. NEJM 2011;364(16):1493-502.
2. Hutchinson RJ. NEJM 2016;375(12):1119-30.
3. Fotakopoulos G. According to which factors in severe TBI craniectomy could be beneficial. Surg Neurol Int 2016;7:19
4. Tagliaferri F Acta Neurochir (Wien) 2012; 154: 919-26.

Cardiac, Thoracic and Vascular Anaesthesiology

07AP01-1

Haemorrhagic risk of Marfan syndrome after cardiac surgery

Tadros S.-P., Provenchère S., Longrois D.

Hôpital Bichat Claude Bernard, Dept of Anaesthesiology & Intensive Care, Paris, France

Background and Goal of Study: There is limited evidence that Marfan syndrome is associated with platelet (grey platelet syndrome) and tissue abnormalities that can lead to increased risk of bleeding. The goal of this study was to test the hypothesis that in patients with Marfan syndrome that undergo cardiac surgery, blood loss is increased as compared to matched non-Marfan syndrome patients

Materials and Methods: Patients were included from the registry of cardiac surgery in Bichat Hospital, Paris between January 2005 and June 2015. All patients with elective valvular surgery, associated or not to ascending aorta surgery, were included consecutively.

Patients with Marfan syndrome were matched to controls with a propensity score. The propensity score integrated demographic, biologic, and surgery values: type of surgery, surgery duration, cardiopulmonary bypass and aortic clamping durations, post operative variables (24h and total blood loss, ICU and hospital length of stay and mortality). Results are expressed as median, student test was used to evaluate imbalance between groups.

Results and Discussion: One hundred and twenty one patients with Marfan syndrome were included, over 7718 procedures. They have been compared to 2504 «Non Marfan» patients. Before matching, Marfan patients were significantly younger, had longer surgery, CBP and aortic clamping times. The 24h and the total blood loss volumes were significantly higher in the Marfan group: 650mL {525-940} vs 420mL {310-580}, $p<0,0001$ and 800mL {650-1012,5} vs 610mL {415-920}, $p<0,0001$.

After matching over the propensity score, fifty three Marfan patients were compared to 53 non Marfan. The 24h and the total bleeding were still significantly higher in the Marfan group, : 660mL {485-920} vs 480mL {330-780}; $p=0.023$ and 800mL {650-1012,5} vs 610mL {415-920}, $p=0.01$. Other variables did not differ between the two groups. Overall mortality was 2% in the Marfan group vs 3.6% in the «Non Marfan» group. Hospital length of stay did not differ between the groups: 9 days vs 10 days $p=0.94$

Conclusion(s): This study suggests that after matching patients with Marfan syndrome had a small but statistically significant increase of blood loss after cardiac surgery. These results are an incentive to realize a prospective study to identify platelets and primary hemostasis abnormalities of patients with Marfan syndrome.

07AP01-2

Prevention of atrial fibrillation with low-dose landiolol in post-cardiovascular surgery patients: a systematic review and meta-analysis

Tamura T., Yatabe T., Takeuchi M., Yokoyama M.

Kochi Medical School, Dept of Anaesthesiology & Intensive Care, Nankoku, Japan

Background and Goal of Study: Atrial fibrillation (Af) incidence is associated with in-hospital mortality after cardiovascular surgery [1]. Several studies have reported that low-dose landiolol might prevent postoperative Af in patients who undergo cardiovascular surgery [2,3]. We conducted a systematic review to reveal whether low-dose landiolol administration could prevent Af in post-cardiovascular surgery patients, compared with placebo.

Materials and Methods: To identify randomised controlled studies investigating the preventive effect of landiolol on Af incidence in post-cardiovascular surgery patients, a search was conducted in PubMed, Cochrane, and ICHUSHI Web (the largest database for Japanese medical journals) on 8 November 2016 by using the following search terms: ([random OR randomized] AND [short acting beta blocker] OR landiolol). Two independent reviewers screened the abstracts and study titles and subsequently reviewed the full-text articles for inclusion. The primary outcome was Af incidence after surgery, and the secondary outcome was hospital mortality and complications (including severe bradycardia). Review Manager Version 5.3 was used for all statistical analyses. A P value of <0.05 indicated statistical significance.

Results and Discussion: Among 430 articles screened in the primary search, 404 were excluded based on the title and abstract review. Six articles were included for the systematic review after their full-text review (571 patients; all research was performed in Japan). Af incidence within a week after surgery was significantly lower in the landiolol group than in the control group (odds ratio (OR), 0.27 [95% confidence interval (CI):0.18-0.42] [$p < 0.00001$]). Three of the 6 manuscripts included hospital mortality and complications, with no differences in the secondary outcome between two groups (hospital mortality: OR, 0.45 [95% CI:0.07-2.74] [$p = 0.39$]; complications: OR, 0.45 [95% CI:0.16-1.23] [$p = 0.12$]). In the meta-analysis, we found that low-dose landiolol might be an optimal agent for prevention of postoperative Af in terms of the benefit and risk.

Conclusion: Low-dose landiolol administration can prevent Af in post-cardiovascular surgery patients. Further large trials are needed to confirm these findings.

References:

1. Villareal RP, et al. *J Am Coll Cardiol* 2004;43:742-8.
2. Sezai A, et al. *J Thorac Cardiovasc Surg.* 2015;150:957-64.
3. Ogawa S, et al. *Asian Cardiovasc Thorac Ann.* 2013;21:265-9.

07AP01-3

Economic Impact of TAVI under monitored local anesthesia in Japan: single center study

Ota T.¹, Nomura T.², Nagamine K.³, Fukui K.³, Toyota K.³, Koide Y.³
¹Shonan Kamakura General Hospital, Dept of Anaesthesiology & Intensive Care, Kamakura, Kanagawa, Japan, ²Yokohama City University, Dept of Anaesthesiology, Yokohama, Kanagawa, Japan, ³Shonan Kamakura General Hospital, Dept of Anaesthesiology, Kamakura, Japan

Backgrounds: As TAVI gets widespread even in Japan, the anesthesia method begins to be found in facilities to transition from general anesthesia (GA) to local anesthesia (LA). In Japanese health insurance system, there is a very large cost coverage difference when TAVI is performed by GA or LA. Therefore, in Japan TAVI is prefer to performed under GA because of the economic aspect of the facilities. Despite of various advantages of LA for TAVI procedure in patients, the economic barrier is still strong to LA. Therefore, this retrospective single center study was conducted to examine how anesthetic method affects the hospital economic managements and also the operation managements.

Material and method: We examined TAVI cases (GA: 57 cases LA: 15 cases) in our hospital during the period from September 2015 to December 2016 retrospectively. Cases that changed to surgical AVR due to the occurrence of adverse events, or that data were insufficient were excluded. Main subjects were the staying time in the OR, secondary subjects were the operation time, GA time. Main subjects were analyzed in independent t-test between the GA group and the LA group.

Result: According to the provisions of Japan, the cost coverage by the insurance system is below: GA: ¥91,800- ~ €740, LA: ¥1,500- ~ €12. The staying time in the OR were 113.8 ± 32.7 min in the GA group, 103.1 ± 35.7 min in the LA group ($p = 0.27$). The operation time were 57.4 ± 22.3 min in the GA group and 59.2 ± 29.9 min in the LA group ($p = 0.80$). The GA time was 87.6 ± 30.6 min.

Assessment & Discussion: In our hospital, we changed the TAVI operation under GA to under LA from September 2016 because of the Cardiologist's will. The fact that there was no difference in the OR staying time and operating time between the GA group and the LA group, Our procedures and anesthesia in TAVI surgery were sufficiently rationalized. If there is no difference in the OR staying time and operating time due to the anesthesia method, GA is superior in terms of management as the cost coverage by the insurance system.

Conclusion: TAVI under GA in our hospital does not differ from that under LA in the operating room staying time. GA is superior in terms of the cost coverage.

07AP01-4

A comparative study: autologous blood donation with normovolemic haemodilution in a tertiary cardiac unit, UK

Kalamkar Y.¹, Jeeji R.¹, Mehta V.¹, Butterworth G.¹, Balacumaraswami, L.²

¹University Hospitals of North Midlands, Dept of Anaesthesiology & Intensive Care, Stoke on Trent, United Kingdom, ²University Hospitals of North Midlands, Cardiothoracic Surgery, Stoke on Trent, United Kingdom

Background: It is estimated that cardiac surgical units utilise about 4% of all red cell transfusions[1.] The national blood transfusion audit (NBA) reveals wide variation in transfusion rates and product usage between units[2]. Autologous Blood Donation (ABD) with normovolemic haemodilution is an established strategy for blood conservation.

Method: This is a retrospective study of blood transfusion practice in our adult cardiac unit. Two groups, 78 patients in each, undergoing elective and emergency cardiac surgery were included. Normovolaemic haemodilution was performed with one unit of autologous blood (500ml) collected via a PA sheath under all asepsis before skin incision in ABD group. Autologous blood was reinfused after heparin reversal. Anonymised data were collected from a theatre management system, patient's anaesthetic notes and transfusion databases. Comparison was made with the NBA.

Results: A total of 156 patients were analysed. The largest procedure groups were coronary artery bypass grafts (CABG) on-pump and off pump, followed by aortic valve surgery and single valve with CABG procedures. The gross transfusion rates for packed red cells (PRC), fresh frozen plasma (FFP), cryoprecipitate (Cryo) and platelets (Plt) were 15.3%, 6.4%, 5.1% and 2.5% in ABD group and 69.2%, 47.4%, 62.8% and 56.4% in Non-Autologous transfusion group respectively.

National Comparative Audit of blood transfusion 2011 shows that the average rate transfusion rate of 43% for Packed red cells, 13% for FFP and 15% Platelets. Blood transfusion rate in all patients on-pump and off pump, elective and non-elective CABG is 42% in our centre.

Conclusion: The overall transfusion rates are significantly less in patients with autologous blood donor group. Homologous blood transfusion can have adverse effects on clinical outcomes. Patients undergoing urgent or emergency coronary artery bypass grafting (CABG) are usually on single or dual anti-platelet agents this is associated with increased need for homologous blood transfusion perioperatively. Autologous blood donation significantly reduces allogeneic blood requirement in cardiac surgery. We recommend Autologous blood donation should be considered as a cost-effective and safe alternative to reduce allogeneic blood consumption.

References:

1. Tinegate et al. Ten-year pattern of red blood cell use in the North of England. *Transfusion* 2013; **53**: 483-9.
2. Grant-Casey J. Audit of blood transfusion in adult cardiac surgery, 2011.

07AP01-5

Heparin induced thrombocytopenia in patients undergoing open heart surgery using cardiopulmonary bypass

Ezelsoy M.¹, Saracoglu A.², Oral K.¹, Saracoglu K.T.³, Akpinar B.¹
¹Istanbul Bilim University Medical School, Dept of Surgery, Istanbul, Turkey, ²Istanbul Marmara University Medical School, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ³Istanbul Bilim University Medical School, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey

Background and Goal of Study: Heparin induced thrombocytopenia (HIT) is a potentially lethal complication of unfractionated or low-molecular weight heparin therapy. HIT is characterized by thrombocytopenia and it is presented with a platelet count $< 150 \times 10^9/l$ compared to greater than a 50% fall in platelet count. HIT is also associated with thromboembolic events including venous thromboembolism or arterial thrombosis. With the initiation of heparin treatment the reaction usually occurs within five to ten days postoperatively. The aim of this study was to determine the incidence of HIT in patients undergoing open heart surgery using cardiopulmonary bypass.

Materials and Methods: The study protocol was approved by the Institutional Review Board of our University Medical School. This was a retrospective matched cohort analysis of cardiac surgery patients undergoing valve sur-

gery and/or bypass. "Thrombocytopenia" was defined as: either a decrease from the initial level of 50% or an absolute count $<80.000 \text{ mm}^3$. Platelet counts were performed before and after the initiation of heparin therapy and tests were performed in all the patients to detect antibodies against heparin/PF4 complex.

Results and Discussion: Thrombocytopenia was detected in 257 patients. Heparin/PF4 complex antibodies were positive for 20 patients. Mean body mass index was 28.2 (28.8 ± 2.3), mean value of left ventricular ejection fraction was 47.5% ($48.3 \pm 6.7\%$), cardiopulmonary bypass time was 110 min (113.0 ± 35.0 min), aortic cross clamping period was 82.5 min (88.0 ± 32.7 min), the average intensive care unit length of stay was 10 days (10.9 ± 4.9 days), mean preoperative platelet count was 300.000 (307.250 ± 88528), mean postoperative platelet count was 233.000 (243.050 ± 89.354), mean duration of heparin therapy was 7 days (6.9 ± 2.9 days), and the mortality rate was 45% (9 patients). There was not a significant correlation between the duration of heparin therapy and age, body mass index, cardiopulmonary bypass time, cross clamp time, mechanical ventilation time, intensive care unit length of stay. There was no significant difference between the duration of heparin therapy and preoperative-postoperative blood product use and the platelet count.

Conclusion(s): Although the HIT incidence is rare in patients undergoing open heart surgery, it may be associated with an increase in early mortality.

Acknowledgements: The authors state no conflict of interest.

07AP01-6

Validation of an ideal body weight adjusted heparin regimen for cardiopulmonary bypass surgery in obese patients. A prospective randomized study

Vienne M., Haas E., Wipf T., Lévy F., Mertes P.-M., Steib A.
Hopitaux Universitaires de Strasbourg, Dept of Anaesthesiology & Intensive Care, Strasbourg, France

Background and Goal of Study: Optimal regimen for unfractionated heparin infusion (UFH) during cardiopulmonary bypass (CPB) is not well established in obese patients. Standard regimen based on Total Body Weight (TBW) resulted in excessive plasma heparin concentrations and more intraoperative bleeding in this population [1]. This overdose might be avoided by an adjusted calculation model based on Ideal Body Weight (IBW). This model suggested an initial bolus of 340 IU/kg IBW, targeting an ideal plasma heparin value of 4.5 IU/ml at the onset of CPB [2]. The aim of this prospective randomized study was to test this adjusted formula in obese patients.

Materials and Methods: Sixty patients ($\text{BMI} \geq 30 \text{ kg/m}^2$) scheduled for cardiac surgery were randomly assigned into a control group receiving an initial UFH bolus of 300 IU/kgTBW and an experimental group receiving 340 IU/kg IBW before the onset of CPB. Additional boluses of respectively 100 IU/kg TBW or 110 IU/kg IBW were injected to maintain the activated clotting time (ACT) > 400 seconds throughout the whole procedure. Protamin was used to antagonize heparin after the CPB weaning. ACT and plasma heparin concentration were measured at different time points. The primary study endpoint was the value of heparin concentration at T1 (3mn after bolus). Demographic and surgical data, total doses of heparin and protamin, transfusion and postoperative blood loss at 6 and 24 hours were recorded. Statistical analysis used a Student t test, a chi2 test and a correlation test of Pearson and Spearman.

Results and Discussion: Demographic characteristics, type and length of surgery were similar. Heparin concentration at T1 reached the target value in the experimental group whereas excessive levels were observed in the control group (4.54 ± 0.20 vs 6.52 ± 0.18 IU/ml $p=0.0001$). ACT remained over the target in both groups during CPB and was poorly correlated to heparin concentration. Hemoglobin levels, postoperative bleeding and transfusion requirements were similar. No thrombotic events occurred. The adjusted calculation model based on IBW achieved the expected mean plasma heparin concentration and avoided overdose and its potential bleeding complications.

Conclusion: Adjusted regimen of heparin infusion calculated on IBW could be used safely and efficiently in obese patients scheduled for cardiac surgery.

References:

1. Haas and al. Eur J Anaesth 2016; 34:1-10
2. Finley and al. Anaesth Analg 2013; 116:1210-1222.

07AP01-7

Sufficiency of brain cooling before circulatory arrest during aortic arch surgery: a combined assessment

Miyerbekov Y.

National Scientific Centre of Surgery, Dept of Anaesthesiology & Intensive Care, Almaty, Kazakhstan

Background and Goal of Study: Monitoring of temperature and EEG are routine approach to assess the brain cooling sufficiency in pts undergoing aortic arch surgery. The jugular bulb fiberoptic oxymetry is valuable method to evaluate of brain oxygenation and metabolism (1,2).

The aim of study was to determinate efficiency of hypothermic brain protection in pts underwent aortic arch surgery.

Materials and Methods: After local Ethic Committee approval and informed consent 35 pts 13-69 yo (44.9 ± 10.1) were operated on aortic arch with deep hypothermic circulatory arrest (HCA). To determinate sufficiency of brain cooling in pts we used monitoring of temperatures (nasal+rectal) and EEG. We studied EEG, PO₂, PCO₂, SO₂, glucose (Glu) level in arterial and jugular bulb blood. Arteriovenous oxygen and carbon dioxide difference (a-jbO₂, jb-aCO₂), oxygen extraction and arteriovenous glucose difference (a-jbGlu) were assessed.

Results: Duration of HCA was 48.6 ± 12.8 min. Deep depression of EEG, T_{nasal} 13.5 ± 0.5 and T_{rectal} 15.0 ± 0.6 °C were achieved before HCA.

S_{jbO₂} curve characterized by gradual rising during cooling and «plateau», reaching arterial oxygenation level ($98.4 \pm 0.4\%$). Correlation of EEG activity and S_{jbO₂} with core temperatures was found. a-jbGlu decreased 4 fold before HCA. We observed most high values of P_{jbO₂} and S_{jbO₂} (201.8 ± 54.5 mmHg and $98.4 \pm 0.4\%$, respectively), PaO₂ and SaO₂ were 410.2 ± 84.8 mmHg and 99%, respectively before HCA. Early postoperative mortality was 28.6%. None of lethality related to brain injury.

Discussion and conclusion: Brain protection with hypothermia in pts aims to reduce oxygen demand and suppress its metabolism. The brain oxygenation and metabolism monitoring should be used to estimate adequacy of its protection with cooling during deep HCA.

We suggest as additional metabolic criteria of brain cooling sufficiency before HCA:

1. S_{jbO₂} curve with gradual increasing and «plateau» reaching during HCA (fiberoptic oxymetry);
2. Equalization of S_{jbO₂} with SaO₂;
3. Significant reducing of oxygen and glucose extraction by brain. The problem is not highlighted enough yet and needs further research.

References:

1. Leyvi G et al. J Cardiothorac Vasc Anesth. 2006 Dec;20(6):826-33.
2. de Vries JW et al. J Clin Monit. 1997 Sep;13(5):303-7.

07AP01-8

The intraoperative pulmonary artery pressure elevation after transapical transcatheter aortic valve implantation is correlated with systemic arterial stiffness

Toyota K., Kimura M., Tomita A., Kosobe K., Yamashita S.
Kurashiki Central Hospital, Dept of Anaesthesiology, Kurashiki, Japan

Background and Aim: Elderly patients with severe aortic stenosis undergoing transcatheter aortic valve implantation (TAVI) often have an increased arterial impedance. Previous studies report that TAVI procedure does not reduce systemic arterial compliance or vascular resistance although it reduces the valvuloarterial impedance. An acute increase of ejection blood momentum after valve deployment and a subsequent increasing vascular load may induce cardiac congestion in patients with a higher arterial impedance.

We retrospectively investigated the impact of TAVI on intraoperative pulmonary pressure and its correlation with arterial stiffness.

Method: We investigated the data of patients who underwent transapical TAVI procedure in our institution between November 2014 and October 2016. The mean arterial blood pressure and pulmonary arterial pressure before balloon valvuloplasty (BAV) and after deployment were collected from the anesthetic record, from which the mean pulmonary arterial pressure to mean systemic arterial pressure ratio (Pp/Ps) was calculated.

The preoperative cardio-ankle vascular index (CAVI), which represents arterial stiffness, was also collected.

Continuous variables were compared using the paired Student's t test. The correlation between CAVI score and %change of Pp/Ps was calculated using the Pearson product-moment correlation coefficient. A p value of <0.05 was considered as significant.

Results: The data of 39 patients were included in this study. The mean pulmonary pressure significantly increased after valve deployment (21.4 ± 3.8 mmHg vs. 23.4 ± 4.6 mmHg, $p < 0.001$). The mean Pp/Ps also significantly increased after valve deployment (0.32 ± 0.06 vs. 0.39 ± 0.08 , $p < 0.001$). The %change of Pp/Ps was positively correlated to the preoperative value of CAVI ($P < 0.01$, $r = 0.43$).

Conclusion and Discussion: These results indicate that transapical TAVI can induce an elevation in intraoperative pulmonary arterial pressure, especially in patients with severe arterial stiffness. Even after a successful valve deployment, our study indicates the necessity of the continuation of careful circulatory management.

07AP01-9

Anterior spinal artery syndrome after routine cardiac surgery

Aguiar I., Ferreira E., Pontes R., Rodrigues H., Delgado I., Vaz T.
Centro Hospitalar Vila Nova de Gaia/Espinho, Dept of Anaesthesiology, Vila Nova de Gaia, Portugal

Background: Neurologic complications are a major cause of morbidity and mortality after cardiac surgery. Anterior spinal artery syndrome due to spinal cord ischemia (SCI) is one of the rarest, with only a few cases reported, and its underlying mechanisms remain poorly understood. The present report describes a case of an anterior spinal artery syndrome due to SCI after routine cardiac surgery in otherwise uneventful surgical and anesthetic procedures.

Case report: A 75-year-old man underwent elective coronary artery bypass grafting (CABG) and aortic valve replacement for triple vessel coronary artery disease and moderate calcific aortic stenosis. Both surgical and anesthetic management were uncomplicated and the patient remained hemodynamically stable throughout the intraoperative period. A postoperative neurological examination revealed a fully awake, oriented patient with autonomic dysfunction and complete loss of motor function, pain and temperature sensation below the T6-T7 level. MRI findings were strongly suggestive of recent spinal cord ischemia at the territory of the anterior spinal artery. A therapeutic strategy was implemented but there were no neurologic improvements. After five months of rehabilitation his neurological status is still unchanged.

Discussion: Reports of spinal cord ischemia following CABG with or without aortic valve replacement were nearly always related to use of an intraaortic balloon pump (IABP) and an aortic dissection. At the presented case no IABP was used and aortic dissection was excluded. A plausible explanation for SCI would be atherosclerotic microembolization to the anterior spinal artery or its augmenting arteries caused by aortic clamping and aortic manipulation. Another possible causing mechanism of SCI would be the harvest of arteries responsible for collateral blood supply of the anterior spinal cord for CABG performance. Despite the unfavorable and most probable inevitable outcome, diagnosis of spinal cord ischemia was made early and therapies proved as contributors for postoperative neurologic deficits reversion or minimization were considered.

References: Sevuk U., Kaya S., Ayaz F and Aktas U. Paraplegia Due to Spinal Cord Infarction After Coronary Artery Bypass Graft Surgery. *J Card Surg* 2016;31: 51-56.

Learning Points: Routine neurologic evaluation of all patients submitted to cardiac surgery is crucial. Any case of neurologic deterioration should lead to immediate investigation.

07AP01-10

PaO₂/FiO₂ ratio in cardiac surgery, can we trust it?

Guarnieri M., Gianni S., Saglietti F., Di Lullo A., Gemma M., Bignami E.
San Raffaele Scientific Institute, University Vita Salute San Raffaele, Anesthesia and Intensive Care Unit, Milan, Italy

Background and Goal of Study: PaO₂/FiO₂ ratio is frequently used in ICU and non-cardiac surgery settings as a sign of respiratory failure and more widely as a marker of lung injury. However, this ratio is not validated for pa-

tient's follow-up after cardiac surgery. The aim of our study is to test its value as a predictor of the need for postoperative non-invasive mechanical ventilation (NIMV).

Materials and Methods: After Ethics Committee approval, we retrospectively collected data from 14.249 patients who underwent cardiac surgery from 2003 to 2015 in our Hospital. 6.071 patients were used for the final analysis. We used a logistic regression model to assess the odds ratio for postoperative NIMV. Statistical significance was considered if $P < 0.05$. Continuous variables are reported as mean \pm SD.

Results and Discussion: The mean age of our patients was 63 ± 13 yrs. The most frequent (39%) surgery was combined surgery (Coronary Artery Bypass Graft + valvular procedure), followed by simple valvular surgery (36.3%). PaO₂/FiO₂ at ICU discharge was 292.6 ± 114.0 and exhibited a normal distribution. The incidence of the need for NIMV was 4.2%. After variable selection we built a predictive model entailing six predictors, as follows. Positive predictors for the need for NIMV:

- Highest plasma creatinine during ICU stay (OR 1.36; 95% CI 1.19-1.57; $p = 0.000$). Plasma creatinine is conceivably a marker of general health status.
- Use of inotropes during ICU stay (OR 1.65; 95% CI 1.22-2.25; $p = 0.001$).
- Transfusion of blood or derivatives during ICU stay (OR 2.68; 95% CI 1.83-3.93; $p < 0.001$). This could be accounted for by the well-known harmful effects of transfusions.
- Body Mass Index (OR 1.08; 95% CI 1.03-1.12; $p = 0.001$).

Negative predictors (protective factors):

- Haematocrit during ICU stay (OR 0.94; 95% CI 0.90-0.97; $p = 0.001$). A low haematocrit is an index of haemodilution, which could lead to an increase in interstitial water and to reduced alveolar gas exchange.
- PaO₂/FiO₂ ratio at ICU discharge (OR 0.992; 95% CI 0.99-0.994; $p < 0.001$).

Conclusion(s): Pre and post-operative factors may help in predicting the need for NIMV. Among these, PaO₂/FiO₂ could be studied to find a cut-off value that could identify patients that need more intensive respiratory treatment.

References: 1. Esteve et al. Evaluation of the PaO₂/FiO₂ ratio after cardiac surgery as a predictor of outcome during hospital stay. *BMC Anesthesiol* 2014. 14.1: 1

07AP01-11

Sudden intraventricular conduction system defect prior to urgent coronary artery revascularization

Harky A.¹, Bashir M.², Wong J.¹, Lees M.¹, Roberts N.²
¹*Barts Heart Centre, St. Bartholomew's Hospital, Dept of Anaesthesiology & Intensive Care, London, United Kingdom,*
²*Barts Heart Centre, St. Bartholomew's Hospital, Department of Cardiothoracic Surgery, London, United Kingdom*

Background: Intraventricular conduction abnormalities have been thoroughly described in the setting of cardiac surgery. It's widely known that several anaesthetic factors are known to cause autonomic disturbances resulting in unmasking of a sinus node dysfunction.

However, little is known on asymptomatic episodes prior to coronary artery surgery.

Case report: 61-year-old male, admitted to our centre with sudden onset of chest pain. He was diagnosed with NSTEMI. His angiogram revealed a severe diffuse three vessel disease, he was deemed suitable for coronary artery bypass grafting surgery (CABG).

On induction of anaesthesia, he developed acute episode of sinus tachycardia followed by sinus bradycardia of 40 beats per minute. A bolus dose of 5 mcg of adrenaline was given to maintain his heart rate. Cardiopulmonary bypass was instituted immediately and patient's stabilized. Three days following CABG, patient became haemodynamically unstable with alternate episodes of tachy-brady arrhythmias and decision made to insert a dual chamber permanent pacemaker.

Discussion: Electrical conduction abnormalities are well-recognized complications of acute MI [1]. The most common consequence is bradycardia, which may or may not be symptomatic. Complete heart block is a potentially fatal event if not detected and treated promptly.

Anaesthesia related autonomic imbalance may unveil an undiagnosed sick sinus syndrome [2].

However, in diagnosed, asymptomatic patients one would contemplate pre-operative insertion of a temporary pacemaker prior to anaesthetic induction as the latter had clearly been described altogether with surgical manoeuvres to induce an autonomic imbalance leading to serious dysrhythmias resistant to conventional pharmacological treatment.

References:

1. Trappe, Hans-Joachim. "Tachyarrhythmias, Bradyarrhythmias and Acute Coronary Syndromes." *Journal of Emergencies, Trauma and Shock* 3.2 (2010): 137-142.

2. Nag K et al - Role of temporary pacing at the right ventricular outflow tract in anesthetic management of a patient with asymptomatic sick sinus syndrome. *Anesthesia, Essays and Researches*. 2015;9(3):423-426.

Learning Points:

Slow heart rate while inducing anaesthesia should not be assumed due to medication induced and immediate necessary steps should be taken to sustain proper heart rate

Unique experience that opens the scope for further studies to predict occurrence of asymptomatic intraventricular conduction abnormalities prior to CABG.

07AP02-1**Use of the Ez-blocker through the I-gel airway device for video thoracic sympathectomy**

Arevalo J., Pagazaurtundúa A., Alvarez Remetería R., Arcas Bellas J.J.

University Hospital Fundacion Jimenez Diaz, Dept of Anaesthesiology, Madrid, Spain

Background: Video-assisted thoracic (VAT) sympathectomy is used for patients with hyperhidrosis refractory to medical treatment¹. Bronchial blockers (BB) are one of the main choices for achieving one lung ventilation (OLV).

Case report: A 43 years old female with severe axillary-palmar hyperhidrosis was scheduled for VAT sympathectomy. In the preanesthesia visit she asked not to be intubated because she worked as a radio-tv host and was afraid of suffering laryngeal injury.

One-lung ventilation was achieved using the I-gel mask and the EZ BB in order to avoid intubation. After confirming proper ventilation through the I-gel, the EZ BB was inserted through it with the aid of a 6.5 mm endotracheal tube (ETT), as both legs of the blocker must be kept together before passing the vocal cords so as not to damage them. The bevel of the ETT was left just above the vocal cords and the EZ BB was then passed through them under fiberoptic view. Finally, the ETT was removed and the blocker was properly placed over the carina. Peak pressures did not exceed 25 cmH₂O during surgery and no air leakages were observed. The patient did not suffer any airway injury.

Discussion: Although the use of supraglottic devices can cause airway injuries, laryngeal morbidity has been more frequently related to endotracheal intubation². Direct laryngoscopy, which is not needed for supraglottic device insertion, can also damage the airway. In addition, postoperative hoarseness, sore throat and vocal cords lesions occur more frequently with double lumen tubes than with BB³.

References:

1. Milanez de Campos JR, et al. Video-Assisted Thoracic Sympathectomy for Hyperhidrosis. *Thorac Surg Clin*. 2016 Aug;26(3):347-58.

2. Saeki H, et al. [Postoperative sore throat and intracuff pressure: comparison among endotracheal intubation, laryngeal mask airway and cuffed oropharyngeal airway]. *Masui*. 1999 Dec;48(12):1328-31.

3. Knoll H, et al. Airway injuries after one-lung ventilation: a comparison between double-lumen tube and endobronchial blocker: a randomized, prospective, controlled trial. *Anesthesiology*. 2006 Sep;105(3):471-7.

Learning points: Video-thoracic sympathectomy may be performed with the I-gel and the EZ BB, which is a technique that has not been reported so far. Patients who are afraid of suffering laryngeal damage secondary to endotracheal intubation may benefit from the use of supraglottic devices and BB instead of double lumen tubes, depending on the surgery and the clinical situation.

07AP02-3**Effects of intraoperative esmolol administration on systemic perioperative inflammatory response in an experimental model of lung resection surgery**

Fernandez A.¹, Garutti I.¹, Abubakra S.¹, Galve A.¹, Simon C.², Vara E.³

¹Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Hospital General Universitario Gregorio Marañón, Thoracic Surgery, Madrid, Spain, ³Universidad Complutense de Madrid, Biochemistry, Madrid, Spain

Background and Goal of Study: Surgical trauma elicits inflammatory responses, including the secretion of cytokines. The activation of beta-adrenergic receptors stimulates increased secretion of pro- and anti-inflammatory cytokines. Several studies suggest that treatment with beta-blockers inhibited the inflammatory responses induced by trauma, sepsis or surgery. The aim of this study was to analyse the effects of esmolol on the inflammatory response in an experimental model of lung resection surgery (LRS) with periods of one-lung ventilation (OLV).

Materials and Methods: 21 mini-pigs were randomly assigned to 3 different groups: CONTROL (C), ESMOLOL group (E), or SHAM (S). E group received an intravenous esmolol bolus (0.5mg/kg) after induction, and then a continuous perfusion of 0.05 mg/kg/min during whole procedure. Sham group underwent a left thoracotomy, without being exposed to LRS or OLV. At the end of LRS the animals were awakened and after 24 hours they received another general anesthesia to obtain liver biopsies. Blood samples and liver biopsies were analysed to measure different biomarkers of inflammation, and glycocalyx damage. Data are expressed as mean ± standard deviation. Mann-Whitney test was used to compare C vs E groups. Values of $p < 0.05$ were considered significant.

Results and Discussion: Results are shown in:

	Group	BASELINE	One-Lung ventilation 120 min	2 Lung ventilation 60 min	24H Post-operative
TNF	CONTROL	1.4±0.2	4.2±0.9 (p=0.009)	5.3±0.8 (p=0.009)	8.7±1.4 (p=0.009)
	ESMOLOL	1.3±0.3	1.3±0.3	1.6±0.3	3.3±0.4
IL-1	CONTROL	7.7±1.1	9.3±0.6	9.8±0.8	13.3±1.7 (p=0.009)
	ESMOLOL	8.1±0.5	8.8±1.6	9.2±0.5	10.2±0.4
Nitric Oxide	CONTROL	41.6±6.2	35.0±3.4	28.1±9.4	23.4±7.9 (p=0.004)
	ESMOLOL	40.9±1.1	36.1±2.6	32.5±1.0	37.5±1.5
Syndecan	CONTROL	0.101±0.02	0.18±0.01	0.503±0.12	0.916±0.31 (p=0.04)
	ESMOLOL	0.105±0.01	0.113±0.06	0.406±0.13	0.506±0.19

[Blood biomarkers]

	Control Group	Esmolol Group	p value
TNF (arbitrary units)	3.62±0.57	1.33±0.12	0.002
MCP (arbitrary units)	2.61±1.16	1.93±0.57	0.142
iNOS (arbitrary units)	3.47±0.87	2.33±0.39	0.018
IL1 (arbitrary units)	0.89±0.16	0.78±0.08	0.18
IL10 (arbitrary units)	0.87±0.09	1.05±0.11	0.009
NF-KB (arbitrary units)	2.89±0.37	2.08±0.12	0.004

[Liver biopsies]

Conclusion(s): Our results suggest that, E has an important role to decrease inflammatory response in the intra and postoperative period in animals undergo LRS. Also E has protective effects on glycocalyx damage initiated by activation of proinflammatory NF-KB pathways.

07AP02-4**Driving pressure and postoperative pulmonary complications in adult cardiac surgery**

Bignami E.¹, Pelosi P.², Saglietti F.¹, Guarnieri M.¹, de Simone G.¹, Zangrillo A.¹

¹San Raffaele Scientific Institute, University Vita Salute San Raffaele, Anesthesia and Intensive Care Unit, Milan, Italy, ²IRCCS AOU San Martino IST, University of Genova, Department of Surgical Sciences and Integrated Diagnostics, Genova, Italy

Background and Goal of Study: Driving Pressure (DP) is the difference between the plateau pressure (P_{plateau}) and the Positive End-Expiratory Pressure (PEEP), and estimates the lung strain. In general surgery DP >13 cmH₂O has been associated with an increased incidence of Postoperative Pulmonary Complications (PPCs)¹. The aim of this study is to evaluate the predictive power of DP for clinical outcome in adult cardiac surgery.

Materials and Methods: This is a prospective observational study. After the Ethics Committee's approval, 150 patients were continuously enrolled from December 2015 to November 2016. We collected data provided by the anaesthesia machine: tidal volume, PEEP, FiO₂, peak and P_{plateau}, lung compliance and DP. DP was measured after anaesthesia induction and at the end of surgery. Chi-square test was used for dichotomous variables, z-test/t-test or the Mann-Whitney U-test for continuous variables, as appropriate. Statistical significance if p <0.05.

Results and Discussion: The median DP after induction and at end of surgery were 12 (10-15) cmH₂O and 13 cmH₂O (10-16) cmH₂O, respectively. A total of 58 patients (38.7%) had DP >13 at anaesthesia induction, 59 (39.3%) at the end of surgery. DP >13 cmH₂O compared to DP ≤13 cmH₂O at anaesthesia induction yielded lower PaO₂/FiO₂ ratio at ICU discharge (273.01 ± 113.9 vs 315.85 ± 122.54 mmHg, respectively; p=0.038), higher need of Non Invasive Mechanical Ventilation (NIMV) (43.10% vs 22.83%, respectively; χ^2 6.88; p=0.009) and a longer hospital stay (Median 6 vs 5 days, respectively; Z_w = -2.041; p=0.041). DP >13 at the end of surgery yielded lower PaO₂/FiO₂ ratio at ICU discharge (272.47 ± 116.79 vs 316.67 ± 120.65 mmHg, respectively; p=0.0139) and higher incidence of PaO₂/FiO₂ ratio <300 (71.19% vs 52.75%, respectively; χ^2 5.07; p=0.024). In the DP >13 cmH₂O group, the rate of PPCs (81.36% vs 67.03%, p=0.055) and the need of NIMV (45.76% vs 20.88%; p=0.001) were higher and the hospital stay longer (Median 6 vs 5 days; Z_w = -2.325; p=0.0201).

Conclusion(s): Monitoring DP during anaesthesia in cardiac surgery could help to identify those patients at increased risk of PPCs and optimise PEEP setting within the protective ventilation strategies.

References: 1. Neto et al. Association between driving pressure and development of postoperative pulmonary complications in patients undergoing mechanical ventilation for general anaesthesia: a meta-analysis of individual patient data. *Lancet Respir Med* 2016. 4.4: 272-280.

07AP02-5**Diaphragmatic dysfunction after pulmonary resection surgery: an ultrasonographic pilot study**

Spadaro S., Dalla Corte F., Ragazzi R., De Camillis E., Verri M., Volta C.A.

University of Ferrara, Dept of Anaesthesiology & Intensive Care, Ferrara, Italy

Background and Goal of Study: An impaired diaphragmatic function is an adverse sequela after thoracic surgery that may have a negative impact on postoperative (PO) course. However little is known on diaphragmatic motion after lung resection surgery both after thoracoscopy (TS) and thoracotomy (TT). Diaphragmatic ultrasound (US) is a non-invasive bedside tool that has been recently used in cardiothoracic and abdominal surgery to detect PO diaphragmatic dysfunction. The aim of this study was to investigate diaphragmatic displacement (DD) in a population of patients undergoing TS or TT surgery in the early postoperative period.

Materials and Methods: Patients undergoing pulmonary resection were enrolled prospectively over a 1 year study period. Exclusion criteria were: age <18 yrs, ASA 4, a history of neuromuscular disease or emergency surgery admission. If indicated, an epidural catheter was positioned (T₅-T₉ interspinous space) before induction of general anesthesia. Anesthesia was maintained with a continuous intravenous infusion of propofol, remifentanyl and cisatracurium.

Postoperative analgesia was provided either through the epidural catheter or a balloon pump infuser. DD of the operated side was measured by M-mode US during quiet breathing before surgery and on postoperative days (POD) 1 and 2 with the patient laying in the semi-recumbent position. Data are reported as mean ± SD. Repeated measures ANOVA followed by Bonferroni post hoc test was used to compare means of DD at 3 different times; unpaired samples T-test was used to compare means between groups. p <0.05 was considered significant.

Results and Discussion: 35 patients, 13 undergoing TT and 22 TS surgery, were enrolled. DD was significantly decreased on POD1 in both groups, however the impact of surgery was more evident in the TT group (DD_{TT} 86 ± 56 mm vs DD_{TS} 114 ± 53 mm, p=0.040). On POD2 in both groups there was a further decrease in DD (DD_{TT} 66 ± 28 mm vs DD_{TS} 99 ± 37 mm, p <0.0001), again greater in the TT group (ANOVA p <0.0001). Postoperative pain was comparable (POD1: NRS_{TT} 2.5 ± 1.5 vs NRS_{TS} 1.4 ± 1.3, p=0.345; POD2: NRS_{TT} 2.5 ± 1.5 vs NRS_{TS} 3.0 ± 1.2, p=0.279).

Conclusion(s): M-mode US is a feasible bedside method to detect postoperative diaphragmatic dysfunction after lung resection surgery. The operated side hemidiaphragm function seems to be heavily impaired after TT rather than after TS, however further study are needed to assess diaphragmatic recovery after thoracic surgery.

07AP02-6**Effects of dexmedetomidine infusion on inflammatory responses during one-lung ventilation in thoracoscopic surgery: a randomised controlled trial**

Lu Y.-F.¹, Wang M.-L.¹, Chen J.-S.², Hsu Y.-C.¹, Cheng Y.-J.¹, Wu C.-Y.¹

¹National Taiwan University Hospital, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China, ²National Taiwan University Hospital, Dept of Surgery, Taipei, Taiwan, Republic of China

Background and Goal of Study: Dexmedetomidine (DEX), an alpha-2 selective agonist, alleviates reperfusion injury in both experimental and clinical studies. However, its effects during one-lung ventilation (OLV) remain unclear.

Materials and Methods: After obtaining approval from an institutional ethics board and consent from each patient, 60 adult patients undergoing video-assisted thoracoscopic surgery (VATS) were randomly divided into two equal groups—DEX (receiving 0.5 µg/kg/h DEX infusion throughout surgery; N = 30) and control (receiving saline infusion; N = 30). During surgery, anaesthesia depth was maintained with the bispectral index level between 40 and 60 and patients in both groups underwent treatment protocols with the same ventilator settings (tidal volume: 8 mL/kg for two-lung ventilation and 5 mL/kg for OLV) and haemodynamic control. Serum levels of proinflammatory biomarkers, including high mobility group box 1 protein (HMGB1), interleukin-6 (IL-6), and monocyte chemoattractant protein-1 (MCP-1), were measured and compared between the two groups at the baseline (T₀), 1 h after resumption of two-lung ventilation from OLV (T₂), and postoperative day 1 (T₃).

Results and Discussion: The patients in both groups exhibited similar intraoperative profiles. The DEX group patients tended to have a lower incidence (16.7% vs. 33.3%, p = 0.2326) and shorter length (0.2 ± 0.6 vs. 0.8 ± 1.7 day, p = 0.1152) of intensive care unit stay. Attenuated serum inflammatory responses were observed among the DEX group patients: (1) The DEX group exhibited a significant decrease in HMGB1 levels between T₁ and T₂ (51.7 ± 58.1 and 33.9 ± 45.0 ng/mL, respectively; p = 0.0051). (2) The DEX group had lower IL-6 levels at T₃ (DEX vs. control: 78.5 ± 58.5 vs. 118.8 ± 68.8 pg/mL; p = 0.0255). (3) MCP-1 levels increased between T₁ and T₂ in the control group (151.8 ± 130.4 and 235.2 ± 135.9 pg/mL, respectively; p = 0.0427) but not in the DEX group. HMGB1 is present in the nuclei of the majority of mammalian cells; on its release in serum, HMGB1 acts as a damage-associated molecular pattern molecule and initiates potent innate immune responses by upregulating the expression of cytokines, including IL-6 and MCP-1. These inflammatory responses are strongly associated with lung injury development. Thus, DEX infusion has protective effects during OLV in thoracoscopic surgery.

Conclusion: DEX infusion during VATS effectively alleviates OLV-induced inflammatory responses.

07AP02-7**Expiratory flow limitation in adult cardiac surgery**

Saglietti F.¹, Guarnieri M.¹, de Simone G.¹, Di Tomasso N.¹, Volta C.A.², Bignami E.¹

¹San Raffaele Scientific Institute, University Vita Salute San Raffaele, Anesthesia and Intensive Care Unit, Milan, Italy, ²S. Anna Hospital, University of Ferrara, Department of Surgical, Anaesthesiological and Radiological Science, Section of Anaesthesia and Intensive Care, Ferrara, Italy

Background and Goal of Study: Expiratory flow limitation (EFL), a functional condition in which expiratory flow cannot increase, is associated with increased incidence of Postoperative Pulmonary Complications (PPCs) during anaesthesia¹. EFL can be detected by a PEEP test. This test consists of a sudden subtraction of 3 cmH₂O of PEEP: if expiratory flow doesn't increase the patient is considered flow-limited. The aim of this study is to investigate the incidence and risk factors of EFL during adult cardiac surgery.

Materials and Methods: After the Ethics Committee's approval, we conducted a prospective observational trial. Hundred and fifty patients were continuously enrolled from December 2015 to November 2016. We collected data by the anaesthesia machine: tidal volume, PEEP, FiO₂, peak and plateau pressure, lung compliance and EFL. We analysed 150 patients; Chi-square test was used for dichotomous variables, z-test/t-test or the Mann-Whitney U-test for continuous variables, as appropriate. Statistical significance if p<0.05.

Results and Discussion: Our sample was composed mostly by males (98; 65.3%), with a mean age of 61.29 (±14.55) years and a BMI of 26.23 (±4.25) Kg. The number of redo was 20 (13.3%), and the most performed surgery was valvular surgery (90; 60%). 26 pts (17.3 %) presented EFL immediately after anaesthesia induction. At the end of surgery 49 pts (32.7 %) showed EFL; at least on EFL at throughout the surgery, 63 pts (42%) had EFL. Patients with a BMI >30 had an higher incidence of EFL at the beginning of surgery (χ² 10; p=0.004).

Those who presented EFL at the beginning had an incidence of PaO₂/FiO₂ ratio < 200 at ICU discharge (χ² 6.5; p=0.01) and PPCs (χ² 6.07; p=0.014), significantly higher.

Being flow-limited during any time of surgery resulted in a lower PaO₂/FiO₂ ratio at ICU discharge (272.7±123.9 vs 318.5±115.23; p=0.0033); incidence of PaO₂/FiO₂ ratio < 200 (χ² 12.4; p=0.000) was higher, as well as PPCs (χ² 4.14; p=0.042) and need of NIMV (χ² 4.15; p=0.042).

Conclusion(s): Assessing EFL during general anaesthesia is easy and feasible. EFL monitoring could be used to identify patients at risk of PPCs and allow the implementation of protective ventilation strategies.

References: 1. Spadaro et al. Expiratory Flow Limitation as a Risk Factor for Pulmonary Complications After Major Abdominal Surgery. *Anesth Analg.* 2016 Aug 17

07AP02-8**Prediction of hypoxemia during one-lung ventilation for surgical lung biopsy in patients with interstitial pneumonia**

Anzai A.¹, Yamamoto N.¹, Takaki S.², Gamo M.¹, Goto T.³

¹Kanagawa Cardiovascular and Respiratory Center, Dept of Anaesthesiology, Yokohama, Japan, ²Yokohama City University, Dept of Intensive Care, Yokohama, Japan, ³Yokohama City University Medical Centre, Dept of Anaesthesiology, Yokohama, Japan

Background and Goal of Study: Surgical lung biopsy plays an important role for diagnosis of interstitial pneumonia (IP) but usually requires one-lung ventilation (OLV). The aim of this study was to determine risk factors of hypoxemia during OLV in patients with IP.

Materials and Methods: We retrospectively collected the data of those patients with IP who underwent surgical lung biopsy under combined general and epidural anesthesia at Kanagawa Cardiovascular and Respiratory Center from April 2013 to September 2016. We defined the hypoxemic group as those who couldn't keep SpO₂ ≥94% during OLV despite FiO₂ ≥0.8, and the remaining patients were served as the control group. We also defined a novel factor ΔSpO₂ as the difference in SpO₂ when the patients were lying in the supine versus lateral decubitus position, i.e. before and during the placement of the

epidural catheter. Data were compared by Mann-Whitney U and χ² tests, and multivariate logistic regression analysis was also performed. Furthermore, we separately analyzed only those patients who underwent right lung biopsy because left-sided OLV carries a higher risk of hypoxemia.

Results and Discussion: 145 patients were enrolled in the study and 39 patients classified into the hypoxemic group. In the univariate analysis, BMI (25.4 [24.7-27.9] vs.22.9 [20.7-25.8] kg/m², p<0.001), right lung surgery (92.3%vs.44.8%, p<0.001) and ΔSpO₂>3% (28.2%vs.8.3%, p<0.001) were significantly different between the hypoxemic and control groups. In the multivariate analysis, BMI

(OR 1.31 (1.03-1.43), p=0.024) and right lung surgery (OR 12.3 (3.01-50.30), p<0.001) remained as predictive factors of hypoxemia.

Among 79 patients who underwent right lung biopsy, 36 were hypoxemic group. Several factors were significantly different between two groups, BMI (25.3 [23.8-27.5] vs 22.5 [20.7-25.0] kg/m², p<0.001), DLCO% (67.6 [57.4-84.0] vs 86.1 [66.6-101.8], p=0.007), ΔSpO₂>3% (30.6% vs 4.7%, p=0.002) and Hugh-Jones grade (2 [2-2] vs 2 [1-2], p=0.027). Multivariate analysis revealed BMI (OR 1.29 (1.11-29.50), p=0.004) and ΔSpO₂>3% (OR 5.73 (1.08-1.55), p=0.04) were significant factors of hypoxemia.

Conclusion: Right lung surgery, high BMI and oxygen desaturation in the lateral decubitus position may be predictors of hypoxemia during OLV in patients with IP

07AP02-9**Anesthetic management of a patient with a non-functioning right lung who underwent left lung resection**

Kawagoe I., Hayashida M., Satoh D., Inada E.

Juntendo University, Dept of Anaesthesiology & Pain Medicine, Tokyo, Japan

Background: Some long-term survivors after lung cancer surgery may require additional lung surgery for recurrence. In the second surgery, special precautions are required regarding function and anatomical changes of residual lungs. We experienced repeated episodes of sudden hypotension associated with brief apneic periods during left lung resection in a patient with a non-functioning right lung.

Case report: A 58-year-old woman was scheduled for a left superior segmentectomy for lung cancer. She had undergone a right upper lobectomy and superior segmentectomy 11 years before. Function of the residual right lung was abolished due to radiotherapy-induced pulmonary fibrosis. The mediastinal structures were located completely in the right thoracic cavity. Her major respiratory function were TVC=1.65L (60.5%), FEV1=1.38L, PaCO₂=44mmHg, and PaO₂=67mmHg. She was free from PH. Anesthesia was maintained with combined general and epidural anesthesia. After failure in an attempt to place an endobronchial tube in the left main bronchus under fiberoptic guidance for protection of the fragile right lung, we placed a wire-reinforced tracheal tube above the carina. Fortunately, the fibrotic right lung did not re-expand nor receive barotrauma due to positive pressure ventilation (PPV). Repeated cycles of apnea for 3-5 min and intermittent PPV were used to facilitate the segmentectomy. While brief apneic periods were repeated, sudden decreases in blood pressure, cardiac output, and SpO₂ occurred repeatedly, which resolved with resumption of PPV. The segmentectomy could be completed without extreme hypercapnia or hypoxemia. She was extubated 10 min after surgery.

Discussion and learning point: Repeated hypotension during apneic periods probably resulted from hypoxic pulmonary vasoconstriction, although SpO₂ decreased only to 80%-90%. Her right ventricle might not be able to eject a sufficient stroke volume against vasoconstricted pulmonary arterioles probably because of easy collapsibility of her left lung and also because of remarkable anatomical deformity of the heart system, including the heart engaged in a narrow space in the right thoracic cavity, kinking and stenosis of major systemic veins, and an increased distance from the bifurcation of the pulmonary artery to left pulmonary arterioles. Anesthesiologists should note anatomical changes of not only respiratory but also cardiovascular systems in patients scheduled for lung surgery following previous lung surgery.

07AP02-10**Usefulness of combining clinical and biochemical parameters for prediction of postoperative pulmonary complications after lung resection surgery**

Garutti I.¹, De la Gala F.², Piñero P.¹, Reyes A.¹, Arranz R.¹, Suarez D.C.¹

¹Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Hospital Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: The goal of our study was evaluate the usefulness of cytokines (blood and lung) monitoring during lung resection surgery (LRS) to predict postoperative pulmonary complications (PPC).

Materials and Methods: Substudy RCT (NCT 02168751). We classified patients in two group: PPC and Non-PPC. PPCs were defined as in ARISCAT study. We did three logistic regression models:

Model 1: Only clinical (pre and intraoperative) variables.

Model 2: Intra and early postoperative biomarkers and

Model 3: Combined model 1 and 2.

Comparisons between models were based on the receiver operating characteristics (ROC) and tests of integrated discrimination improvement. Significance was set at $p < 0.05$.

Results and Discussion: 37/174 (21.3%) patients had PPCs. Patients PPC group had poor pulmonary function before surgery, they were older and surgery was longer. Lung and systemic inflammatory response was higher in patients of PPCs group.

GROUP	Post-operative Pulmonary complications	NONDEPENDENT LUNG				DEPENDENT LUNG			
		Baseline Median (25-75)	PPC vs Non_PPC p value	END OF OLV Median (25-75)	PPC vs Non_PPC p value	Baseline Median (25-75)	PPC vs Non_PPC p value	END OF OLV Median (25-75)	PPC vs Non_PPC p value
IL4 (pg ml-1)	YES	0.41 (0.39-0.44)	0.592	0.91 (0.72-0.97)	0.023	0.41 (0.39-0.46)	0.482	0.88 (0.74-0.97)	0.152
	NO	0.41 (0.38-0.44)		0.82 (0.72-0.91)		0.41 (0.39-0.44)		0.81 (0.73-0.93)	
IL6 (pg ml-1)	YES	6.46 (5.98-7.02)	0.106	7.73 (6.99-8.33)	0.013	6.41 (5.77-6.79)	0.726	7.6 (6.94-8.03)	0.153
	NO	6.28 (5.82-6.82)		7.27 (6.88-7.85)		6.34 (5.87-6.87)		7.2 (6.88-7.78)	
IL8 (pg ml-1)	YES	2.63 (2.28-2.97)	0.745	53.3 (29.8-56.9)	0.039	2.70 (2.58-2.85)	0.369	47.7 (27.6-58.5)	0.102
	NO	2.72 (2.5-2.95)		32.01 (26.3-53.5)		2.78 (2.54-3.05)		33.5 (24.9-57.2)	
IL10 (pg ml-1)	YES	40.9 (39.5-42.2)	0.173	41.1 (39.6-43)	0.013	41.3 (40.2-41.9)	0.505	40.4 (38.6-45)	0.1
	NO	41.4 (40.2-42.9)		42.7 (40.2-44.9)		41.5 (39.9-42.6)		42.6 (40-45.4)	

[Table 1. Bronchoalveolar lavage]

CYTOKINE	PPC	BASELINE		OLV-30min		OLV-END		Postoperative 6 hours	
		Median (IQ25-75)	PPC vs Non_PPC p value	Median (IQ25-75)	PPC vs Non_PPC p value	Median (IQ25-75)	PPC vs Non_PPC p value	Median (IQ25-75)	PPC vs Non_PPC p value
IL6 (pg ml-1)	YES	3.09 (2.87-3.21)	0.067	3.75 (3.02-4.01)	0.922	4.09 (3.55-5.06)	0.651	4.88 (3.19-5.14)	0.006
	NO	2.96 (2.83-3.11)		3.65 (3.27-4)		3.92 (3.55-5.07)		3.47 (2.96-4.9)	
IL8 (pg ml-1)	YES	0.96 (0.78-1.26)	0.452	2.73 (1.93-3.54)	0.069	42.7 (26.5-56.5)	0.009	22.4 (9.2-29.6)	<.001
	NO	0.93 (0.68-1.13)		2.95 (2.51-3.35)		29.3 (22.9-43.4)		9.56 (6.87-21.5)	
IL10 (pg ml-1)	YES	0.084 (0.08-0.09)	0.294	0.092 (0.08-0.11)	0.156	0.092 (0.09-0.1)	0.365	0.092 (0.09-0.1)	0.705
	NO	0.087 (0.08-0.09)		0.098 (0.09-0.12)		0.097 (0.09-0.11)		0.091 (0.08-0.1)	
IL8/IL10 RATIO	YES	11.5 (8.7-14.6)	0.279	27.8 (22.7-34.4)	0.435	476 (271-634)	0.01	241 (120-321)	<.001
	NO	10.4 (8.2-14)		29.8 (22.7-36.4)		322 (209-473)		110 (75-233)	

[Table 2. Blood biomarkers]

The area under the ROC curve of the model 1,2,and 3 for prediction of PPC was 0.79 (95%CI, 0.71-0.87) 0.80 (95%CI, 0.72-0.88),and 0.93 (95%CI, 0.88-0.97) respectively. Model 3 compare with model 1 had an integrated discrimination improvement of 0.29 ($p < 0.001$) and a net reclassification index of 0.28 ($p = 0.007$).

Conclusion(s): Combining systemic and pulmonary biomarkers increases the ability of models based only on clinical data to identify PPCs early and could prove useful when deciding which hospital resources will be used after LRS.

07AP03-1**Preoperative 3D right ventricular function correlates with patient outcome after cardiac surgery**

Magunia H.¹, Alabbasi H.¹, Matar Ahmed W.¹, Schlensak C.², Rosenberger P.¹, Nowak-Machen M.¹

¹Eberhard-Karls-University Tübingen, Dept of Anaesthesiology & Intensive Care, Tübingen, Germany, ²Eberhard-Karls-University Tübingen, Department of Thoracic, Cardiac and Cardiovascular Surgery, Tübingen, Germany

Background and Goal of Study: Reduced right ventricular function (RVF) is correlated with unfavorable outcome in multiple settings (1, 2). 3D echocardiography allows global evaluation of RVF and has been successfully validated against cardiac MRI. In this study we hypothesized that 3D TEE derived parameters of RVF correlate with unfavorable outcomes after cardiac surgery.

Materials and Methods: After approval by the IRB a retrospective analysis in the institutional echo database was performed. 126 patients undergoing cardiac surgery with cardiopulmonary bypass between November 2013 and June 2016 at the University Hospital Tübingen, Germany were identified to have complete preoperative 3D datasets. 17 patients were excluded due to low frame rate or right sided cardiac surgery. A 4D model of the right heart was generated using the Tomtec 4D RV Function® Software (Ver.2, TomTec Imaging Systems GmbH, Unterschleissheim, Germany). Enddiastolic (RVEDVI) and endsystolic (RVESVI) volume and ejection fraction (RVEF) were calculated. TAPSE and global longitudinal strain of the freewall (GLSfw) was obtained from the full volume 4D dataset. Patient demographics, surgical procedures and laboratory parameters were collected from theclinical records. Unfavorable outcome was defined as an ICU stay greater than 48 hours, acute renal failure (AKIN stage 1 or higher) or death during the hospital stay.

Results and Discussion: 109 patients [male = 78 (71,6%), female = 31 (28,4%), age: median 64 ± 15,7SD, BSA 1,93±0,25 SD] were included in the analysis. Procedures included CABG (28,4%), AVR or MVR (35,8%), combination CABG and valve surgery (15,6%), LVAD implantation 15,6%) or thoracic aortic surgery (4,6%). 66 patients (60,6%) had a unfavorable outcome. They had a significantly elevated preoperative RVEDVI (79,01±27,65SD vs. 62,56±17,53SD, $p < 0,05$) or significantly reduced preoperative RVEF (32,68%±9,5SD vs. 37,53%±7,07SD, $p < 0,05$) or GLSfw (-12,76%±6,64SD vs. -16,16%±6,33SD), $p < 0,05$). Whereas the TAPSE was not significantly different in both groups (11,73±5,45SD vs. 13,17±5,94SD, $p = 0,37$).

Conclusions: 3D TEE derived parameters of RVF and size seem to correlate with patient outcome in a heterogenous group of cardiac surgery procedures. 3D echocardiography might help to identify patients at risk for unfavorable outcome after cardiac surgery in the future.

References:

1. Meyer P et.al. Circulation 2010; 121:252-258
2. Maslow A et.al. Anesth Analg 2012; 150:7-18

07AP03-2

Hemodynamic monitoring during cardiac surgery in France: a multicentric prospective study

Bonnet V, D'Orlando R., Dechanet F, Gerard J.-L., Fischer M.-O., ARCOTHOVA
 University Hospital Caen, Dept of Anaesthesiology & Intensive Care, Caen, France

Background and Goal of Study: New monitoring systems and inotropic drugs, developed in the past decade, have modified the hemodynamic management in cardiac surgery. However, only sparse data are available to reflect these changes. This study aimed at giving an up-to-date overview of advanced hemodynamic monitoring in cardiac surgery in France.

Material and methods: This national inquiry was proposed to every cardiac surgery center in France. Patient medical history, monitoring characteristics, type and outcomes of surgery were prospectively recorded during 7 weeks for every patients who underwent cardiac surgery in the participating centers. Primary objective was the description of advanced monitoring. Secondary outcome was to assess the influence of monitoring on post-operative outcomes.

Results and Discussion: During the inclusion period, 3100 patients underwent cardiac surgery in 37 centers. Among them, 1656 (53.4%) benefited from advanced hemodynamic monitoring. Cardiac output was monitored by transesophageal echocardiogram (1139, 36.8%), thermodilution (370, 11.9%), pulse contour analysis (32, 1.0%), esophageal Doppler (14, 0.5%) or thoracic impedanceometry (3, 0.1%). Metabolic balance was monitored by ScvO₂ (485, 15.7%) or SVO₂ (206, 6.6%).

Advanced monitoring was more often used on patients who presented Left-Ventricular Ejection Fraction impairment, pre-operative kidney failure, anemia, and who underwent combined (valvular and coronary) surgery, or in emergency situations. The mean Euroscore II was higher for the monitored patients (4.7 +/- 7.5 vs 3.3 +/- 5.2, p<0.001).

New inotropic drugs were rarely used (Levosimendan: 8 (0.3%), Milrinone: 22 (0.7%)) compared to dobutamine (422 (13.6%)).

Finally, monitored patients presented more post-operative complications than the others (467 (49.6%) vs 722 (33.5%), p<0.001) and a higher mortality (57 (5.1%) vs 83 (2.3%), p<0.001) as expected by pre-operative Euroscore II. However, in the elderly population (over 80 years old), though monitored patients had more serious preoperative condition (Euroscore II 7.5 +/- 11.8 vs 5.0 +/- 6.1, p<0.001), they did not present more post-operative complications (37 (55.2%) vs 171 (48.6%), p=0.388) nor mortality (5 (6.1%) vs 24 (4.4%), p=0.782).

Conclusions: These findings support the hypothesis that specific subgroups of patients, such as elderly patients, may benefit more from advanced monitoring than others.

07AP03-3

Cerebral oximetry during cardiopulmonary bypass surgery: effect of diabetes mellitus

Südy R.¹, Schranc Á.¹, Nagy J.¹, Peták F.², Babik B.¹
¹University of Szeged, Hungary, Department of Anaesthesiology and Intensive Therapy, Szeged, Hungary, ²University of Szeged, Hungary, Department of Medical Physics and Informatics, Szeged, Hungary

Background and Goal of Study: The cerebral tissue oxygen-saturation (ScO₂) is approximately 10% lower than the central venous oxygen-saturation (SvO₂) due to the notably high oxygen extraction of the brain. This difference (SvO₂-ScO₂) could increase in patients with heart and/or vascular diseases as a consequence of low cardiac output and/or the diminished cerebral reserve capacity. Our aim was to measure the SvO₂-ScO₂ gap in patients with diabetes mellitus during cardiac surgery requiring cardiopulmonary bypass (CPB).

Materials and Methods: Patients without peripheral vascular disease and smoking (control group, CTRL, n=20) and patients with type 2 diabetes mellitus (diabetic group, DM, n=16) were studied in a prospective consecutive descriptive manner. The ScO₂ was evaluated by near infrared spectroscopy (INVOS™). Mean arterial pressure (MAP) was measured, arterial pH, oxygen content (CtAO₂) and SvO₂ were assessed from blood gas samples. During the CPB pH-stat acid-base management was applied, and standard blood flow rate was calculated for the patient's body surface area throughout the study.

Measurements were performed at the beginning of the CPB (Stage 1), and before weaning the patient from the CPB (Stage 2).

Results and Discussion: The CtAO₂ and arterial pH levels were not statistically different between the 2 stages (12.83 vol%±0.38[sem] vs. 12.62±0.42; 7.436±0.01 vs. 7.449±0.01, p>0.05), whereas the MAP was lower and SvO₂ was higher at Stage 1 after cardioplegia and cooling to core temperature to 32°C (52.40±18.13 vs. 58.15±2.77 mmHg p=0.002; and 83.34±0.89 vs 78.42±1.26 mmHg, p<0.001, respectively). In the DM group ScO₂ was lower in both stages compared to those in the CTRL group (51.05±3.28 and 53.71±2.60 vs. 66.50±1.29 and 67.79±1.45, p<0.001), while the SvO₂-ScO₂ was higher (26.13±3.28 and 28.33±3.00 vs. 12.88±1.94 and 15.68±1.28, p<0.001).

Conclusion(s): In diabetes mellitus SvO₂-ScO₂ gap is widened especially at low blood pressures due to the deteriorated cerebral autoregulation, in spite of standard oxygen supply. Monitoring the ScO₂ is strongly recommended to estimate cerebral tissue oxygenation because, the SvO₂ is not able to represent local cerebral hypoxia in patient with diabetes mellitus and peripheral vascular disease.

Acknowledgements: OTKA-NKFI 115253

07AP03-4

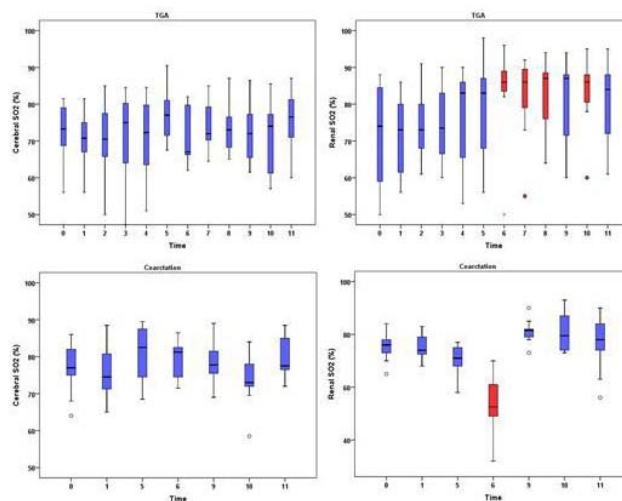
Assessment of perioperative critical cerebral and splanchnic desaturation periods during neonatal heart surgery

Van Ooteghem M.¹, Moerman A.¹, De Hert S.¹, François K.², Vandekerckhove K.³, Peperstraete H.⁴

¹Ghent University Hospital, Dept of Anaesthesiology, Gent, Belgium, ²Ghent University Hospital, Dept of Surgery, Gent, Belgium, ³Ghent University Hospital, Paediatrics, Gent, Belgium, ⁴Ghent University Hospital, Dept of Intensive Care, Gent, Belgium

Background and Goal of study: Despite an increased survival rate, neonatal heart surgery still entails considerable morbidity. The aim of the study was to identify critical cerebral and splanchnic desaturation periods during congenital heart surgery with and without the use of cardiopulmonary bypass, in order to propose tailored treatment guidelines.

Materials and Methods: Neonates with transposition of the great arteries (TGA) or aortic coarctation were eligible for this prospective observational study. Cerebral and splanchnic saturation was measured with near-infrared spectroscopy (Nonin Equanox™ 7600). Eleven potential jeopardizing events were evaluated. Differences between the two surgical groups were evaluated with the independent samples t-test. Changes over time were assessed with a linear mixed model.



[Figure boxplot]

Results and Discussion: Twelve neonates undergoing arterial switch repair (7±4 days, 3.1±0.4 kg) and 11 coarctation patients (12±6 days, 3.1±0.7 kg) were studied. Two patients (9%) had an absolute decrease in cerebral saturation below 50%. Eight patients (35%) showed a relative decrease of >20% from baseline (T0). In the TGA group the main risk periods for cerebral desaturation were arterial (T2) and venous (T3) cannulation and start of cardiopul-

monary bypass (T4). Risk moments in both groups were transfer to intensive care (T10) and extubation (T11). The two groups were only significantly different during aortic cross-clamping (T6) (Cerebral saturation: $72 \pm 8\%$ vs $80 \pm 5\%$, $p=0.012$, and renal saturation: $84 \pm 12\%$ vs $54 \pm 11\%$, $p<0.001$, for TGA and coarctation, respectively). Changes over time are presented in the figure (Red boxes: significantly different from baseline).

Perioperative desaturations were short-lasting and in response to specific events. This might suggest a high standard of perioperative care.

Conclusion: Cerebral and splanchnic desaturations were linked to specific, predictable perioperative events. Preventative measures and a tailored treatment algorithm might diminish the risk for perioperative desaturation.

07AP03-5

Prediction of the size of annuloplasty ring for mitral valve repair using by three-dimensional transesophageal echocardiography

Fujii T., Yoshitani K., Onishi Y.

National Cerebral and Cardiovascular Center, Osaka, Japan, Dept of Anaesthesiology, Osaka, Japan

Background and Goal of Study: During mitral valve (MV) repair for degenerative mitral regurgitation (MR), optimal annuloplasty ring is associated with better clinical outcomes. The size of annuloplasty ring is generally determined by sizer in the cardioplegic arrested heart. Three-dimensional transesophageal echocardiography (3D-TEE), which can measure the mitral annulus under beating heart, can help to select the annuloplasty ring. 3D-TEE has revealed the difference in the mitral annular geometry and dynamics between normal and MV disease, such as myxomatous or ischemic MR. Mitral valve dynamics could affect to determine the annuloplasty ring size. Therefore, we compared the measurements of MV between 3D-TEE and sizer and assessed whether the size of mitral annuloplasty ring can be predicted by 3D-TEE.

Materials and Methods: This study enrolled retrospectively 133 cases underwent MV repair for moderate to severe degenerative MR between January 2015 and December 2016 in our institution. By using an iE33 ultrasound system and an X7-2t TEE matrix-array transducer (Philips Medical System, Andover, MA), the 3D zoom of MV was collected under general anaesthesia. The 3D image at mid-systole frame was selected for analysis, and we measured the commissure-commissure (CC) diameter and the anterior-posterior (AP) diameter of the middle anterior leaflet (A2). The size of annuloplasty ring its self was determined using by sizer, which measured the mitral annulus under cardioplegic cardiac arrest and direct vision. Correlation between the size of annuloplasty ring and predicted size by 3D-TEE was analyzed with multiple regression analysis.

Results: Using 3D-TEE, the CC diameter was 30.6 ± 2.2 cm, the AP (A2) diameter was 20.6 ± 2.2 cm. The size of annuloplasty ring was 30.2 ± 2.1 cm. With the multiple regression analysis, (annuloplasty ring (cm)) = $4.768 + 0.770 \times (\text{CC diameter (cm)}) + 0.092 \times (\text{AP (A2) diameter (cm)})$. The contribution rate (R^2) was 0.76 ($p<0.001$) (Figure1). The standardized partial regression coefficient was 0.819 ($p<0.001$) for the CC diameter and 0.100 ($p=0.044$) for the AP (A2) diameter.

Conclusion: There was a strong correlation between using sizer and using 3D-TEE for measuring the mitral annulus. In particular, CC diameter of MV is effective for determining the size of annuloplasty ring. In the future, we are going to evaluate whether the discrepancy between 3D-TEE and the size of annuloplasty ring affect long-term clinical outcomes.

07AP03-6

Does heparin dosage calculated with ideal body weight reduce blood product use in open heart surgery?

Kara D.¹, Sarikas C.M.¹, Demir A.², Kaygin M.A.³, Ertekin U.Ü.⁴

¹Erzurum Regional Training and Research Hospital, Dept of Anaesthesiology & Intensive Care, Erzurum, Turkey, ²Turkey Yuksek Ihtisas Training and Research Hospital, Dept of Anaesthesiology & Intensive Care, Ankara, Turkey, ³Erzurum Regional Training and Research Hospital, Dept of Surgery, Erzurum, Turkey, ⁴Turkey Yuksek Ihtisas Training and Research Hospital, Dept of Surgery, Ankara, Turkey

Background and Goal of Study: Heparin is used for its anticoagulant effects and requires neutralization after cardiopulmonary bypass. Anticoagulant efficacy in open heart surgery (OHS) is established with heparin dosages calculated based on patient weight. When heparin is administered based on ideal body weight (IBW) rather than actual weight in OHS, changes are observed in activated clotting time (ACT) sufficiency, protamine neutralization dosage and blood/transfusion.

Materials and Methods: After ethical committee approval, 100 adults requiring OHS were included. Patients were divided into two equal groups. The amount of heparin planned for use before entering the pump was calculated from 350 IU/kg based on total body weight in Group 1 and IBW in Group 2. ACT was measured after 5 min, and an additional heparin dose was given if $\text{ACT}<400$ before entering the pump. Demographic characteristics, intraoperative data, transfusion and heparin-protamine levels were compared between the two groups. Drainage at postoperative hours 6 and 24, blood transfusion, reoperation, complications, time in intensive care and mortality were also compared.

Results and Discussion: Mean ages were 59.3 ± 11.36 in Group 1 and 59.78 ± 10.34 in Group 2. Heparin doses before entering the pump were lower in Group 2 ($p<0.001$). Erythrocyte and fresh frozen plasma levels used in the intra- and postoperatively were higher in Group 1 ($p<0.001$). Post-pump protamine dosage was lower in Group 2 ($p<0.001$). Bleeding levels and length of intensive care stay at postoperative hours 6 and 24 were higher in Group 1 ($p<0.001$). Greater use of heparin in OHS can lead to greater postoperative blood and blood product use and increased side-effects.

Conclusion(s): In many cases less heparin usage provides enough ACT levels. In our study, less heparin and protamine were used when administered in line with IBW, and complication levels and transfusion requirements were also lower.

07AP03-9

Management of pacing after elective cardiac surgery in the cardiac Overnight Intensive Recovery (OIR) at St Thomas' Hospital. An audit of current practice

Lucas N., Sarridou D., Chawla A.

Guy's and St Thomas Hospitals, Department of Cardiac Anaesthesia, London, United Kingdom

Background: Pacing wires are commonly inserted at the end of cardiac surgery. Usually their use is straightforward and safe, although rarely complications can occur¹. These can be reduced through safe use, understanding and communication.

This survey was implemented to establish current practice, in order to identify potential pitfalls and minimise risk.

Method: A survey was jointly constructed by the team caring for post-op patients and completed over a 1 month period. 61 questionnaires were completed anonymously. This included information about modes of pacing, box and monitoring settings, together with handover on admission and relevant documentation.

Results and Discussion: Fifty seven patients had pacing wires in situ. Of these, 11(19.3%) were transvenous, 45 (78.9%) epicardial and one patient had both. Out of the 57, 47 (82.5%) were connected to a pacing box, 21 of which were turned 'on' (44.7%). Sensitivity settings were variable with 3 patients having a sensitivity setting $>2\text{mV}$. Pacing settings were not recorded in 67% patients and not handed over on admission in 26.3% of all patients. In 2 patients with active pacing, the pacing detector on the monitor was turned 'off'. The pacing threshold was not recorded in 66% patients.

These results demonstrate the variability that exists in current practice and potential sources of error. Patients with reduced sensitivity settings could lead to under-sensing and subsequent 'R on T' phenomenon². The lack of documentation of the stimulation threshold is concerning, with failure to pace as this increases post-operatively. It is surprising that in 2 of 21 patients with active pacing did not have the appropriate monitor settings turned 'on'. This can make it impossible to distinguish between an ectopic beat and an on demand paced beat.

Conclusion: Poor management of post-operative pacing can cause significant harm. This simple survey highlights the need for further education among medical and nursing staff with a need to improve and standardize practice by improving handover and documentation of pacemaker settings, thus avoiding potential catastrophic complications.

References:

1. Diego Chemello et al, 'Cardiac Arrest caused by undersensing of a temporary epicardial pacemaker.' Canadian Journal of Cardiology 2010 Jan;26 (1) e13-14
2. Reade M.C. , 'Temporary Epicardial pacing after Cardiac Surgery: a practical review'. Anaesthesia 2007, 62 264-271

Acknowledgements: OIR nursing staff for their involvement.

07AP03-10

The correlation between cerebral oxygenation and cognitive decline in transcatheter aortic valve replacement

Yağar S., Süer Kaya G., Koçulu R., Bindal M.

Türkiye Yüksek İhtisas Training and Research Hospital, Dept of Anaesthesiology, Ankara, Turkey

Background and Goal of Study: TAVR is a relatively new procedure, where an aortic valve stent is placed with a catheter technique. Aortic stenosis patients, with severe co-morbidities are candidates for TAVR. In the large series TAVR was associated with 40% cognitive function improvement and almost 13% cognitive decline. The factors causing cognitive decline must be revealed. In this prospective observational study we aimed to evaluate the correlation of cerebral oxygenation and postoperative cognitive decline.

Methods: After obtaining IRB approval, 24 consecutive transfemoral CoreValve TAVR patients are enrolled to the study so far and study is continuing. TAVR was performed in moderate sedation using midazolam and fentanyl boluses. To ensure optimal condition during valvuloplasty and implantation sedation level was deepened if need. Apart from standard monitoring invasive arterial blood pressure and cerebral oxymetry were applied. Blood pressure, heart rate, SpO₂, ET-CO₂, temperature, applied crystalloids and colloids and NIRS-R, NIRS-L are recorded at 5 min intervals. We defined hypoxemia; SpO₂ < 92%. We defined cerebral desaturation as more than 15% decrease in NIRS compare to baseline level at any time. The care giver tried to keep NIRS level in the safe area. Mini mental test was applied the day before procedure and post procedure short term. We will be gathering long term follow up.

Results and Discussion: The mean age \pm SD was 76 \pm 5.5, mean procedure time \pm SD was 70.4 \pm 27.5 min, mean ICU duration time \pm SD was 4.3 \pm 2.9 day, mean length of stay \pm SD was 7.2 \pm 6.3 day. We saw cerebral desaturation in 40% and cerebral oxygenation improvement in 41.6% of patients. 22.2% of patients had post-procedural short term cognitive deterioration. We did not find relation between NIRS levels and post-procedural cognitive decline. TAVR can be managed using sedation or general anesthesia. In our center we prefer moderate sedation technique recently. There is still lack of consensus about the anesthesia technique for TAVR procedure. The results of this pilot study show that cerebral desaturation has no effect on cognitive decline and there is no relation between oxygenation improvement and improved cognitive function. The major limitation of this study is the small sample size.

07AP03-11

Colloids affect coagulation but not perioperative blood loss in patients undergoing off-pump coronary artery bypass

Kusumoto G., Tominaga K., Toyama E., Kumano H., Toda S., Yamaura K.

Fukuoka University School of Medicine, Dept of Anaesthesiology, Fukuoka, Japan

Background and Goal of Study: Colloid administration is considered to possibly influence coagulation. Here we examined the impact of crystalloids and colloids on the blood coagulation test and blood loss during off-pump coronary artery bypass (OPCAB).

Materials and Methods: This retrospective study was approved by the institutional ethics committee/review board (IRB No. 15-10-14). We analysed clinical data from the anaesthetic and medical records of 45 consecutive patients undergoing primary OPCAB from a single surgeon at a single institution between 1 January 2014 and 31 March 2016. Data was collected on the volume of crystalloids and colloids administered from anaesthetic induction to before CABG anastomosis; coagulation test, including data on platelets, fibrinogen, prothrombin time (PT), activated partial thromboplastin time (APTT), activated clotting time (ACT), and EXTEM and FIBTEM tests using rotational thromboelastometry (ROTEM® Pentapharm CO, Munich Germany), including data on maximum clot firmness (MCF) at the time and blood loss during operation and 6 h postoperatively.

Data values were expressed as mean \pm SD or number. Pearson's correlation coefficient was used to test the associations among intra- and postoperative blood loss, laboratory haemostatic variables and ROTEM parameters based on the data distribution. Two-sided P value of <0.05 was regarded as statistically significant.

Results and Discussion: We included data from 40 patients after excluding patients converted to cardiopulmonary bypass (n = 5) and those on whom perioperative data was missing (n = 2). MCF of EXTEM/FIBTEM, platelets and fibrinogen were significantly and dose dependently decreased, whereas PT was prolonged by colloids. However, there was no difference in crystalloid administration. APTT and ACT were not correlated with colloid or crystalloid administration. Blood loss was not correlated with fluids. Haematocrit was significantly decreased after colloid, but not crystalloid, administration. These results suggest that colloid-induced haemodilution affected the coagulation test. However, these effects may not clinically affect perioperative bleeding.

Conclusion(s): Colloids interfered with blood coagulation, but they did not affect perioperative blood loss in patients undergoing OPCAB.

07AP04-1

Factors related to the severity of early post-operative infection after heart transplantation in patients surviving prolonged mechanical support periods: experience from a single university center

Abe R., Shibata S.C., Uchiyama A., Fujino Y.

Osaka University, Dept of Anaesthesiology & Intensive Care, Suita, Japan

Background: The bridging of end stage heart failure patients with continuous flow ventricular assist devices (CF-VADs) has improved the survival of these patients and has enabled longer waiting periods prior to heart transplantation (HTx). However, many patients suffer from VAD-related infections and prolonged support periods over 2 years has been suggested to affect early morbidity.

We investigated the impact of prolonged waiting periods and other possible risk factors on the severity of post-operative infections after HTx.

Methods: After Institutional Review Board approval (#16353), all HTx adult recipients from 2010 to 2016 were enrolled and retrospectively reviewed. Our primary outcome was the severity of 30-day acute post-operative infections. We categorized the severity of infections into 4 groups according to the following grading; None, Minor: infections resolving in <14 d, Major: infections resolving in >14 d, and Severe: septic shock. Values were compared using the Wilcoxon rank-sum test. A logistic-regression model for ordinal responses was used in our multivariable analysis. Age, sex, BMI, length of CF-VAD support, active VAD-specific infections and moderate to severe primary graft dysfunction (PGD) were included as possible risk factors. A p-value of <0.05 was considered statistically significant.

Results: Fifty-two patients were included in our study. The median support period for recipients with CF-VADs was 964 d (interquartile range: IQR 571 - 1135). Infections occurred in 20 (38.5%) with the following severity: None 32 (61.5%), Minor 8 (15.4%), Major 8 (15.4%), and Severe 4 (7.7%). Active VAD specific-infections and moderate to severe PGD was present in 38.5% and 25% of the recipients, respectively. The length of ICU stay was significantly longer for patients with severe infections (median 18 d, IQR 10-13) when compared to all other groups (median 18d IQR (13 - 108) $p < 0.01$). In our multivariable analysis, active VAD-specific infections (odds ratio: OR 5.3, 95% confidence interval: CI 2.6 - 13.0, $p < 0.01$) and moderate to severe PGD (OR 2.5, 95%CI 1.2 - 5.6, $p = 0.02$) were independent risk factors for the increased severity of 30-day acute post-operative infections. The length of VAD support was not significant ($p = 0.92$). Conclusions Active VAD-specific infections and moderate to severe PGD increases the severity of 30-day acute post-operative infections after HTx. The length of CF-VAD support does not impact early morbidity.

07AP04-2

Important risk factors for acute kidney injury requiring dialysis after cardiac surgery in an Asian population

Yong D.W.W.¹, Goh J.Y.², Lee W.S.¹, Liu W.L.³, Chew S.T.H.⁴, Ti L.K.⁵
¹National University of Singapore, Yong Loo Lin School of Medicine, Singapore, Singapore, ²Singapore General Hospital, Department of Anaesthesia, Singapore, Singapore, ³National University Health System, Department of Anaesthesia, Singapore, Singapore, ⁴National University of Singapore, Yong Loo Lin School of Medicine; Singapore General Hospital, Department of Anaesthesia and Surgical Intensive Care, Singapore, and Singapore General Hospital, Singapore Department of Cardiovascular and Metabolic Disorders, Department of Anaesthesiology, Singapore, Singapore, ⁵National University of Singapore, Yong Loo Lin School of Medicine and National University Health System, Department of Anaesthesia, Singapore, Singapore

Background and Goal of Study: AKI requiring new need for dialysis (AKI-D) after cardiac surgery is associated with significant mortality as high as 60% and greater utilization of healthcare resources¹. The incidence of AKI-D ranges from 1.1%-3.0% which have been reported mainly in Caucasian populations. Non-white ethnicity is a risk factor for AKI-D. Given the multi-ethnic local population, we aimed to identify if the incidence of AKI-D differs in the local population and the associated risk factors.

Materials and Methods: With IRB approval, data from 2780 patients, who had undergone cardiac surgery between August 2008 and July 2012, were obtained prospectively. The primary outcome was AKI with new need for dialysis. Binary logistic regression was used to determine significant predictors of new need for dialysis in patients who underwent cardiac surgery.

Results and Discussion: The incidence of new need for dialysis locally was 3.1%. Preoperative anaemia, acute haemodilution, blood transfusion, Malay population, EUROSCORE LOG and eGFR factors independently increase the risk for dialysis postoperatively. Diabetes was found to not increase the risk for new need dialysis despite a greater percentage of diabetic patients requiring dialysis.

C.I. Factors	P-value	Odds Ratio	95%	
			Lower	Upper
Malay Ethnicity	0.046	1.71	0.344	0.991
Preoperative Anaemia	<0.001	3.01	0.182	0.604
Diabetes	0.122	1.46	0.426	1.106
Blood Transfusion	0.002	2.22	1.342	3.685
Acute Hemodilution	<0.001	4.05	0.144	0.533
EUROSCORE LOG	<0.001	1.05	0.930	0.974
eGFR	<0.001	4.22	0.126	0.446

[Table 1: Backward Wald Binary Logistic Regression]

Patients with new need for dialysis had double the length of hospitalisation stay ($P = 0.001$), 5.6 times the length of ICU stay ($P < 0.001$) and increase in ICU mortality to 25% ($P < 0.001$).

Conclusion(s): The incidence of AKI-D is much higher in the local multi-ethnic population compared to the Western population. Malays have a higher incidence compared to the other races, suggesting a genetic predisposition. The high prevalence of DM and pre-DM in this population is probably the reason why DM did not feature as an independent risk factor for AKI-D. Modifiable risk factors of preoperative anaemia, blood transfusion and acute haemodilution should be treated aggressively to reduce the incidence of AKI-D.

References: 1. Thakar, C. V., Worley, S., Arrigain, S., Yared, J. P., & Paganini, E. P. (2005). Influence of renal dysfunction on mortality after cardiac surgery: modifying effect of preoperative renal function. *Kidney international*, 67(3), 1112-1119.

07AP04-3

Lung protective ventilation improves oxygenation and shortens ICU stay in patients undergoing minimally invasive cardiac surgery

Lin H.-Y., Lu C.-W., Lin T.-Y.

Far Eastern Memorial Hospital, Dept of Anaesthesiology, New Taipei, Taiwan, Republic of China

Background and Goal of Study: Lung-protective ventilation with low tidal volumes, high positive end-expiratory pressure, and lung recruitment has been demonstrated to improve patients' outcome in various kinds of surgery. However, its role in minimally invasive cardiac surgery has never been investigated. The aim of this study was to determine the impact of lung-protective ventilation on patients' outcome in minimally invasive cardiac surgery.

Materials and Methods: Lung protective ventilation was implemented strictly since June 1, 2016 in our institution. Therefore, we retrospectively examined the clinical records of patients receiving minimally invasive cardiac surgery from April to July 2016. The intraoperative $\text{PaO}_2/\text{FiO}_2$ ratio (baseline, immediately after the weaning of cardiopulmonary bypass, and at the end of surgery) and postoperative parameters including extubation time, length of ICU stay, length of hospital stay, and postoperative lactate level were compared between the group receiving lung-protective ventilation since June ($n = 17$) and the group before June ($n = 14$).

Statistical analysis was performed using SPSS v.22 (IBM Corp., USA). The Kolmogorov-Smirnov with Lilliefors correction test was performed for variable normality and Levene's test was used for homogeneity of variances. When the homogeneity hypothesis was not rejected, the paired t test or one-way ANOVA was applied where appropriate.

Results and Discussion: In both groups $\text{PaO}_2/\text{FiO}_2$ ratio decreased immediately after the weaning of cardiopulmonary bypass compared to the baseline. $\text{PaO}_2/\text{FiO}_2$ ratio was higher at the end of surgery in the group receiving lung-protective ventilation with recruitment ($P < 0.01$). In addition, the length of ICU stay was significantly lower in patients receiving lung protective ventilation (3.4 ± 0.9 days vs 4.5 ± 2.0 days, $P = 0.03$). No significant differences in extubation time, lactate level, and the length of hospital stay were found in both groups.

Conclusion(s): Our results suggest lung protective ventilation with recruitment maneuver may improve oxygenation and reduce the length of ICU stay in patients receiving minimally invasive cardiac surgery.

07AP04-4

Continuous thoracic paravertebral block reduces the risk of supraventricular arrhythmias after minimally invasive mitral valve repair

Taenaka H., Shibata S.C., Fujino Y.

Osaka University, Dept of Anaesthesiology & Intensive Care, Suita-shi, Japan

Background and Goal of Study: Thoracic paravertebral block (TPVB) has been shown to provide excellent postoperative analgesia after minimally invasive cardiac surgery with lateral thoracotomy. Supraventricular arrhythmias (SVAs), including atrial fibrillation are a common complication after cardiac surgery and are associated with increased morbidity and mortality. Both postoperative pain and sympathetic nerve hyperactivity contribute to the development of SVAs. We hypothesized that continuous TPVB could reduce the occurrence of postoperative SVAs by inhibiting of both components.

We evaluated the effect of continuous TPVB and other possible risk factors on the occurrence of postoperative SVAs in patients undergoing minimally invasive mitral valve repair at our institution.

Materials and Methods: After institutional review board approval, we performed a retrospective record based review of all patients who underwent minimally invasive mitral valve repair at our center between March 2011 and October 2016. Supraventricular arrhythmia was defined as at least 1 hour-duration of either atrial fibrillation, junctional rhythm, or atrial premature complex. We investigated the relationship between the incidence of SVAs with continuous TPVB, age, sex, and duration of aortic cross clamp time. A multivariate analysis was performed to identify independent risk factors.

Results and Discussion: We included a total of 73 patients. A TPVB catheter was placed under ultrasonic guidance prior to surgery and a continuous dose of levobupivacaine (6.7 mg/h) was administered post operatively (54 cases). Fourty-two patients were diagnosed with SVA (57.5%) and commonly occurred on the first postoperative day. Catecholamines were either discontinued or maintained at very low doses in all cases. In the multivariate analysis, the risk of SVAs was decreased with continuous TPVB (odds ratio [OR] 0.24, $p=0.03$). Duration of aortic cross clamp time (OR per min 1.02, $p<0.01$), and female gender (OR 4.64, $p<0.01$) were independent risk factors of SVAs. Increased age was not a significant factor.

Conclusion: The use of continuous TPVB was significantly related with a decreased incidence of postoperative SVAs. Duration of aortic cross clamp time and female gender were also significant risk factors. In addition to excellent postoperative pain control, continuous TPVB reduces the risk of SVAs in patients undergoing minimally invasive mitral valve repair.

07AP04-5

Association of interhemispheric oxygenation difference during cardiopulmonary bypass with postoperative delirium incidence in elderly cardiac surgery

Ito H.

Shinmatsudo Central General Hospital, Dept of Anaesthesiology, Matsudo, Japan

Objective: We investigated whether cerebral interhemispheric difference in prefrontal tissue oxygenation (IHSD) during cardiopulmonary bypass (CPB) are associated with the postoperative delirium (POD) incidence in elderly cardiac surgery.

Materials and Methods: In total, 34 elderly patients (70-years-old or more, 20 males/14 females) who underwent elective cardiac surgery with CPB (including underwent either deep hypothermic cardiac arrest (HCA) and/or selective cerebral perfusion (SCP)) were enrolled in this retrospective study. The bilateral cerebral tissue oxygenation index (cTOI) were measured simultaneously by near-infrared spectroscopy (NIRS, NIRO-200; Hamamatsu Photonics KK; Japan). The absolute value of an IHSDcpb [(the average of right cTOI during CPB) - (the average of left cTOI during CPB)] was calculated in each patient. Delirium was assessed with the Confusion Assessment Method (CAM) for ICU. The differences between groups (patients with POD and patients without POD) were checked by Fisher's exact test for categorical variables or by Mann-Whitney's U test for continuous variables. A difference was considered significant if the P value was less than 0.05.

Results and Discussion: POD was present in 13 of 34 (38.2%) patients. The average of IHSDcpb in all eligible elderly patients was 4.5%. The patients with an IHSDcpb 4.5% or more was present in 9 of 13 (69.2%) patients with POD. Compared with patients with an IHSDcpb <4.5%, patients with an IHSDcpb of 4.5% or more was found to be higher prevalence of POD.

Patients with POD were significantly lower BMI ($P=0.0365$), IHSDcpb 4.5% or more ($P=0.0337$) and higher IHSDcpb ($P=0.0244$) when compared with patients without POD.

Conclusion: An IHSDcpb of 4.5% or more and lower BMI were significantly correlated with the POD incidence in elderly cardiac surgery with CPB. Detection of an IHSD during CPB may provide one of the useful methods of detecting elderly patients at increased risk of POD.

07AP04-6

Preventing lung injury after cardiac surgery - a quality improvement project

Dooley N.¹, Harky A.¹, Wicks P¹, Griffiths M.¹, Wong J.²

¹Barts Heart Centre, St. Bartholomew's Hospital, Dept of Anaesthesiology & Intensive Care, London, United Kingdom, ²Barts Heart Centre, St. Bartholomew's Hospital, Barts Health NHS Trust, Department of Perioperative Medicine, London, United Kingdom

Background and Goal of Study: Despite an improved management of ARDS, no disease-modifying therapy has been identified that can improve the outcome. Management remains supportive, focusing on reducing iatrogenic contributory factors. High tidal volume ventilation in the peri-operative period is a risk factor for developing ARDS subsequently. The lung injury prediction score (LIPS) identifies patients at risk of developing ARDS. A score of greater than 4 has good sensitivity and specificity for predicting ARDS. By identifying patients at risk and implementing preventative measures, we may reduce the incidence and improve the outcomes of patients with ARDS.

Materials and Methods: We recruited all admissions to the cardiac intensive care units (CICU) in Barts Heart Centre over a one week period in August 2016. A LIPS was performed on all new admissions. Ideal body weights (IBW), tidal volumes, peak airway pressures, blood products and fluid balances were collected daily until discharge. Over the following 8 weeks, we presented our findings to the CICU nursing teams and educational leads to highlight the ideal treatment protocols and recommended documenting IBW and tidal volume on daily observation charts. We re-audited our practice in November 2016.

Results and Discussion: During the first audit, there were 34 new admissions to CICU over one week. The predicted incidence of ARDS from the LIPS (mean 5.794 +/- 1.839, $n=34$) was 15%. We in fact had an incidence of 17.6%. This included 3 cases of ARDS and 3 deaths. On day one, the mean tidal volumes were 8.173 +/- 1.217, $n=32$ (ml/kg IBW), and on day two were 8.356 +/- 1.627, $n=6$ (ml/kg IBW). During our re-audit, there were 42 new admissions to CICU. The mean LIPS was 6.571 +/- 1.796, $n=42$ and the incidence of ARDS was 7.1%. There were 3 cases of ARDS and 1 death. The mean tidal volumes on day one were 7.555 +/- 1.229, $n=41$ (ml/kg IBW) and on day two were 8.337 +/- 2.023, $n=6$ (ml/kg IBW).

Conclusion(s): The routine patients admitted to our CICU are at high risk of developing ARDS. Through education and documentation of ideal body weights and tidal volumes, we reduced our ventilating tidal volumes on day one post op. However on day two post op we continue to ventilate patients at higher tidal volumes. We feel this may be the result of our patients breathing spontaneously prior to extubation. We need to continue to educate the CICU staff on the importance of ideal tidal volumes to reduce incidence of ARDS.

07AP04-7

Primary metastatic atrial sarcoma: a case report

Carramiñana Domínguez A.¹, Escudero Teixidó A.¹, Ibáñez Esteve C.¹, Cámara Rosell M.², Teis Soley A.³, Canet Capeta J.¹

¹Hospital Univesitari Germans Trias i Pujol, Dept of Anaesthesiology & Intensive Care, Badalona, Spain, ²Hospital Univesitari Germans Trias i Pujol, Department of Cardiac Surgery, Badalona, Spain, ³Hospital Univesitari Germans Trias i Pujol, Department of Cardiology, Badalona, Spain

Background: Prevalence of primary cardiac tumours is 0.02 to 0.3%. Around 75% are benign while 25% are malignant, being sarcomas the most common subtype^(1,2). Symptoms can be obstructive, embolic, constitutional or caused by local invasion⁽²⁾. Diagnose includes Echocardiography (EC), Computed Tomography (CT), Magnetic Resonance (MR) and anatomical pathology. Treatment for cardiac sarcoma is under discussion. The role of Chemotherapy (QT), Radiation Therapy (RT) and transplantation remains controversial, with consensus about surgical resection improving prognosis⁽²⁾.

Case report: A 55-year-old lady without previous medical history was admitted reporting 4-month back pain with loss of strength and sensibility in her lower limbs. X-ray and MR showed D6 fracture with vertebral collapse and medullary compression. EC showed 63x50mm left atrial mass infiltrating pulmonary veins plus mitral stenosis (ME) due to tumour protrusion, conditioning acute heart failure with severe dyspnea. Fluid and QT administration was lim-

ited because of 2 episodes of pulmonary edema. She underwent medullary decompression with D6 resection and posterior RT. After discussion, partially tumour resection was performed during cardiac surgery (see image below). The patient was extubated in ICU 9 hours after surgery and discharged home after 17 days without relevant complications. Histology confirmed undifferentiated sarcoma with bone metastasis.

Four months after the operation she is alive receiving adjuvant QT. Control EC shows no auricular invasion nor ME.

Discussion and Learning Points:

Cardiac sarcomas are uncommon diseases. Up to 80% of patients have evidence of metastasis at the time of diagnosis. Surgical excision is the only therapy that has been proved effective for symptoms and outcome, but mean survival is less than a year.

The most common cause of death is heart failure or mass recurrence (3). In our patient, palliative resection was performed with significant symptomatic improvement. More evidence is required to identify the best therapeutic approaches for those difficult diseases.

References:

1. Amano. Clinical classification of cardiovascular tumors and tumor like-lesions, and its incidences. *Gen Thorac Cardiovasc Surg* (2013) 61: 435-47
2. Burnside N. Malignant primary cardiac tumours. *Interact Cardio Thorac Surg* (2012) Dec; 15(6): 1004-6
3. Devbhandari M. Primary cardiac sarcoma: reports of 2 cases and a review of current literature. *J of Cardiothor Surg* (2007) 24 (2): 34

07AP04-8

Occurrence of massive brain infarction just before emergency surgery for re-Bentall. Dilemma in decision heart or brain?

Sigdel S.¹, Sakamoto H.², Nozumi Y.², Masuda K.², Miyagi M.², Hideyuki O.³

¹Ohnishi Neurological Center, Dept of Anaesthesiology, Akashi, Eigashima, Japan, ²Akashi Medical Center, Dept of Anaesthesiology, Okubocho Yagi, Akashi, Japan, ³Ohnishi Neurological Center, Dept of Neurosurgery, Akashi, Japan

Background: Infection of a vascular prosthesis is the most serious complication that occur after implantation affecting the patient's morbidity and mortality and requires an emergency management. Neurological complications after cardiac surgery are frequently encountered problem. It is very difficult to decide for brain or heart surgery to perform first to avoid serious complications.

Case report: We report 48 years old right handed male with history of Takayasu's arteritis under steroid since childhood. He had past history of Bentall procedure for aortic regurgitation with composite graft replacement of aortic valve aortic root and ascending aorta 10 years ago. His ADL was good since then. He had fever (39-40 °C) for 1 week followed by dyspnea as soon as antibiotics was started. Radiographic findings were suggestive of aortic graft infections with mediastinitis. Emergency debridement and re-Bentall surgery was planned. While the patient was heading to the surgery, nystagmus and decreased consciousness level was noticed. Induction was performed immediately. Intraoperatively, lot of pus from ascending aorta to the proximal arch was collected and removed. Valve and vessel was intact. Omental filling and chest closure was done. Surgery was uneventful. On the first post-operative day his motor movement partially recovered but he couldn't move his left upper and lower limbs. Postoperative head CT showed massive infarction of right MCA territory. Edoxaban was started immediately.

Discussion: In this case, we suspect cerebral infarction occurred just before the surgery. In acute (cardio) embolic stroke, treatment with intravenous rt-PA within 6 hours after symptom onset can lead to the better clinical outcome. Our patient had right side MCA territory infarction helped our decision to proceed for debridement and re surgery with better outcome. It could have been different if it was on the left. There are many recommendations to reduce brain injury during cardiac surgery. However, the priority of treatment (Heart or Brain) in patients having neurological complications just before re-cardiac surgery remains controversial.

References:

1. Seker et al: *Turk* 2014Dec;42(8)
2. Hogue CW et al: *Anesth Analg* 2006Jul;103(1)

Learning points: This case is a reminder that anesthetists ought to keep a high index of suspicion of neurological complications with post cardiac surgery. Neurological exam checklist in case of suspicion with brain infarction could make a huge difference in better outcome.

07AP04-9

Does Edmonton Frailty Score (EFS) predict postoperative delirium in patients undergoing cardiac surgery?

Schubert M., Watremez C., Kahn D., Matta A., Momeni M.
Université Catholique de Louvain; Cliniques Universitaires Saint Luc, Dept of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Age is a major risk factor of Postoperative Delirium (PD).¹ Otherwise frailty assessment is used to characterize the ability to face (perioperative) stress and PD might be a manifestation of this stress. We hypothesized that frail old patients would be at higher risk of PD.

Materials and Methods: This is a subanalysis of a prospective observational trial (NCT02006212) evaluating the neurologic outcome of adult patients undergoing cardiac surgery. EFS² was performed in patients ≥ 75 years. Patients were considered non frail if the EFS ≤ 5 . A baseline Mini Mental Scale Examination was performed in all patients. Subjects were evaluated for signs and symptoms of hypoactive, hyperactive and mixed PD during the entire hospital stay. No standard screening tests were used. Binary regression analysis was performed to predict PD. MMSE and EFS were used as independent variables. Mann Whitney test compared continuous data. Data are expressed as median (P25-P75).

Results and Discussion: Fig 1 shows the study flowchart.



[Flowchart of the study]

Table 1 shows the preoperative and postoperative characteristics of the patients with or without PD.

	PD (N=107)	No PD (N=213)	P
Age(Y)	81 (78-83)	80 (77-83)	0,836
MMSE (max 30)	27 (24-28)	28 (26-29)	0,008
EFS (max 17)	5 (3-6)	4 (2-6)	0,045
Hospital stay (days)	11 (8-16)	9 (7-11)	<0,001

[Patients' characteristics]

The number of patients showing PD was not different between frail and non frail patients (P=0,3). Table 2 illustrates the regression analysis for PD.

	β	Odds Ratio (95%CI)	P
Frail	0,089	1,093 (0,588-2,033)	0,779
MMSE	-1,112	0,894 (0,815-0,981)	0,017

[Regression analysis predicting PD]

Hosmer-Lemeshow test was valid (P=0,635).

Conclusion(s): Our preliminary results are in contrast with previous studies showing that frailty predicts PD.³ In contrast baseline MMSE seems to be a useful test to detect patients at high risk of PD. Future trials should investigate whether other frailty scores than the EFS can be useful in detecting and classifying patients at high risk of PD.

References:

1. *Perioper Med* 2016; 26:5;
2. *Age Aging* 2006;35:526-9.
3. *Anesth Analg* 2016;123:430-5.

07AP04-11**A case report of electrical storm during aortic valve replacement and cardiac artery bypass requiring 16 attempts at electrical cardioversion**

Mori T., Kodaka M., Nihei W., Okamura K., Nishiyama K., Komori M.
Tokyo Women's Medical University Medical Center East, Dept of Anaesthesiology, Tokyo, Japan

Background: Nifekalant, a K⁺ channel blocker available in Japan, is used as often as amiodarone for suppressing electrical storm¹ (ES) signs such as ventricular fibrillation and tachycardia (Vf and VT). In our department, nifekalant is a first-choice drug in such situations. It has no inotropic effect and a short half-life. Here, we report a case in which we failed to suppress ES with nifekalant, but succeeded with amiodarone and 16 attempts at electrical cardioversion (EC) after cardiopulmonary bypass (CPB) in cardiac surgery.

Case report: A 65-year-old male, diagnosed with aortic valve stenosis (AS) and angina pectoris, underwent a planned aortic valve replacement (AVR) and cardiac artery bypass. After starting CPB, cardiac arrest was induced immediately after cardioplegia infusion and maintained with 500 - 700 ml infusion every 30 min. LITA-LAD and SVG-RCA anastomosis, and AVR were performed. When the aorta was unclamped, Vf occurred. Several attempts at EC and four administrations of nifekalant (15 mg) were not effective. Subsequently, we administered three doses of amiodarone (150 mg). This seemed to be effective to stop the ES, which sustained for 80 min. During this period, normothermia was maintained with no electrolyte imbalance, the bypass graft flow was satisfactory, and echocardiography showed only diffuse hypokinesia, which gradually improved toward the weaning of CPB. After ICU admission, no Vf or VT occurred with continuous infusion of amiodarone, and the patient was discharged on the third postoperative day without complication.

Discussion: Nifekalant is an antiarrhythmic agent approved in Japan¹. Though some studies show that nifekalant is not at all inferior to amiodarone in managing patients with fatal ventricular arrhythmias^{2,3}, there is no large-scale study comparing the efficacy of the two drugs. We experienced a case in which nifekalant was not effective but amiodarone was. The reason is unknown, but an underlying character of nifekalant, a pure K⁺ channel blocker, could have been less effective than amiodarone in this case.

References:

1. Guidelines for Drug Treatment of Arrhythmias (JCS 2009)
2. J Anesth 28: 587-592
3. J Cardiovasc Pharmacol 66: 600-609

Learning points:

1. In Japan, nifekalant is used as often as amiodarone in managing patients with fatal ventricular arrhythmias, but there is no comparative study for effectiveness.
2. We experienced a case in which nifekalant was less effective than amiodarone for ES.

07AP05-1**Exposure to plasma from helium breathing volunteers reduces hypoxia induced cell damage in human endothelial cells**

Smit K.¹, Oei G.T.¹, Hollmann M.W.¹, Preckel B.¹, Patel H.H.², Weber N.C.¹

¹Academic Medical Center, University of Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands, ²University of San Diego, Dept of Anaesthesiology, San Diego, United States

Background: Remote ischemic preconditioning (RIPC), induced by short repetitive ischemic stimuli in one organ, can protect another organ against prolonged ischemia/reperfusion. Previously we demonstrated that plasma taken from volunteers that underwent 4x5 minutes of forearm ischemia protected endothelial cells in vitro against hypoxia-induced damage¹. In healthy volunteers, preconditioning with helium protected against post-ischemic endothelial dysfunction². The mechanism behind helium preconditioning is not yet clear. Here we investigate whether plasma from helium treated volunteers in vivo can protect human umbilical vein endothelial cells (HUVEC) remotely against hypoxia.

Methods: After ethical approval, 20 healthy male volunteers inhaled heliox (79%helium, 21%oxygen) or air for 30 minutes, in a crossover design with two weeks between experiments. Plasma was collected at baseline (T0), directly after inhalation (T1), 6h (T3) and 24h (T4) after start of the experiment. HUVEC

were incubated with either 5 or 10% of the plasma for 1-2 hours after which they were subjected to enzymatically induced hypoxia for 24 hours. Cell damage was measured by LDH content. Caveolin-1, HIF1a, ERK 1/2 and STAT 3 were determined by Western Blot analysis, caveolin-1 and eNOS levels were measured by ELISA.

Results: Prolonged pre-hypoxic exposure to 10% plasma obtained 6 hours after helium inhalation significantly decreased hypoxia induced cell damage in HUVEC compared to baseline, (mean (95%CI) 0.86 (0.77;0.95) T0=1 p<0.05. No significant increases of caveolin-1 levels in the plasma were observed. However, increased levels of caveolin-1 were observed at the cellular level after hypoxia with concomitant decreased levels in the supernatant after treatment with helium plasma (30 min and 24 h after helium inhalation). Activated STAT3 levels were elevated after exposure to plasma obtained 24 hours after helium inhalation.

Conclusion: Plasma of healthy volunteers who inhaled helium protects HUVEC against hypoxic cell damage by remote preconditioning, and this is possibly dynamically mediated by caveolin-1.

References: 1. Weber et al, BRIC 2015, Smit et al, Anesthesiology 2013

07AP05-3**New antiarrhythmic in intramyocardial arteries' remodelling in heart structural disease**

Martín-Oropesa R.¹, Pazó-Sayós L.¹, Delgado-Martos M.J.², Muñoz D.³, Delgado-Baeza E.², Quintana-Villamandos B.¹

¹Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology, Madrid, Spain, ²Instituto de Investigación Sanitaria Gregorio Marañón, IISGM, Madrid, Spain, ³Universidad Autónoma de Madrid, Facultad de Medicina, Madrid, Spain

Background and Goal of Study: Dronedaronone is a multichannel blocker used to treat atrial fibrillation (AF). Left hypertrophy is widely known as AF substrate. The aim of our study was to show the effects of dronedaronone on intramyocardial arteries structure in an experimental model of arterial hypertension and compensated left hypertrophy.

Materials and Methods: Adult male spontaneously hypertensive (SHR) rats were randomly divided into therapy group (SHR-D, n=7) and placebo group (SHR, n=7). Kyoto rats were used as normotensive controls (WKY, n=7). After 14 days of treatment, histological sections were prepared by staining with orcein to study intramyocardial branch of obtuse marginal artery (circumflex branch). The following variables were studied: external diameter (ED), wall width (WW) cross sectional area (CSA) and collagen volume density (CV). Comparisons among groups were made by ANOVA test of one factor with Bonferroni's correction. All data were expressed as mean ±SEM. P<0.05 was considered significant. All procedures were approved by the Ethics Committee of Hospital General Universitario Gregorio Marañón, Madrid, Spain.

Results and Discussion: SHR group showed a greater WW and CSA than WKY group (p<0.001). Dronedaronone produced a decrease in WW and CSA (p<0.001), and ED (p<0.05) compared to SHR. Wall width was similar between WKY and SHR-D. SHR rats showed a greater CV than WKY (p<0.001) but no statistical differences were observed between SHR-D and WKY.

Conclusion(s): 14 days of treatment with dronedaronone produced a regression in intramyocardial arteries structural remodelling of spontaneously hypertensive rats.

Acknowledgements: This work was supported by a grant from FIS 13/01261 and Fondos FEDER, Spain

07AP05-4**Protector effect of esmolol on thoracic aorta remodeling by ADMA pathway in arterial hypertension**

Martín-Oropesa R., Gómez B., Ávalos E., Ramos E., García-Reza A., Quintana-Villamandos B.
Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Our group previously demonstrated that short-term treatment (48 h) with esmolol reduces left ventricular hypertrophy by increasing the bioavailability of nitric oxide (1), although the impact of short-term treatment with this beta-blocker on remodeling in large arteries has not yet been studied. We hypothesized that even a short (48 h) course of esmolol might alter remodeling of the aorta in the spontaneously hypertensive rat (SHR).

Materials and Methods: Fourteen-month-old male SHRs were treated intravenously with vehicle (SHR, n=8) or esmolol (SHR-E, n=8). Age-matched, vehicle-treated male Wistar-Kyoto rats (WKY, n=8) served as controls. After 48 h, we studied the structure, volume density of elastic fibers, and passive mechanical properties of the aorta (B parameter, wall stiffness). Determination of asymmetrical dimethylarginine (ADMA) concentrations in the aorta was analyzed. The results were expressed as mean \pm S.E.M. The parameters were compared using single-factor (rat) analysis of variance. A post hoc Bonferroni correction was applied. Non-regression analysis with an exponential equation was used to estimate mechanical parameters (B parameter). *P*-values < 0.05 were considered statistically significant. All procedures were approved by the Ethics Committee of Hospital General Universitario Gregorio Marañón, Madrid, Spain.

Results and Discussion: Esmolol significantly attenuated abnormal aortic wall thickness, cross-sectional area, wall-to-lumen ratio, volume density of elastic fibers, and wall stiffness of the aorta. The protective effect of esmolol could be related to a decrease in ADMA levels.

Conclusion: Esmolol is now widely used to treat patients with arterial hypertension. These findings could play a key role in the selection of antihypertensive therapy in patients with hypertension and aortic remodeling.

References: Quintana-Villamandos et al. Early regression of left ventricular hypertrophy after treatment with esmolol in an experimental rat model of primary hypertension. *Hypertens Res* 2013;36:408-413.

Acknowledgements: This study was supported by a grant FIS 13/01261 and Fondos Feder, Spain.

07AP05-5**Regression of myocardial remodeling with a multichannel antiarrhythmic: positron emission tomography (PET) and echocardiography study**

Frade-Mochales M.¹, Gómez de Diego J.J.², Fernández D.¹, Delgado-Martos M.J.³, Delgado-Baeza E.³, Quintana-Villamandos B.¹

¹*Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*, ²*Hospital General Universitario Gregorio Marañón, Cardiology, Madrid, Spain*, ³*Hospital General Universitario Gregorio Marañón, Research and Development Department, Madrid, Spain*

Background and Goal of Study: Left ventricular hypertrophy (LVH) is a strong and independent predictor of cardiovascular morbidity and mortality in patients with hypertension. It is also a potentially reversible condition. Dronedaron is an antiarrhythmic agent that was recently approved for the treatment of atrial fibrillation. However, its effect on early regression of LVH has not been reported. We tested the hypothesis that short-term administration of dronedaron induces early regression of LVH in spontaneously hypertensive rats (SHR).

Materials and Methods: Ten-month-old male SHR were treated with vehicle (SHR) or dronedaron (SHR-D). Age-matched, vehicle-treated male Wistar-Kyoto (WKY) rats served as controls. After 14 days, left ventricular morphology and function were assessed using M-mode echocardiography (left ventricular mass index [LVMI], ejection fraction [%EF]) and transmitral Doppler (early-to-atrial filling velocity ratio [E/A]). Uptake of 2-deoxy-2[18F] fluoro-D-glucose (¹⁸F-FDG) by the heart was evaluated using positron emis-

sion tomography and based on the standardized uptake value (SUV). The parameters were compared using single-factor analysis of variance. *P*-values <0.05 were considered statistically significant. All procedures were approved by the Ethics Committee of Hospital General Universitario Gregorio Marañón, Madrid, Spain

Results and Discussion: The LVMI was lower in SHR-D than in SHR. There were no significant differences in %EF or E/A ratio between SHR-D and SHR. PET acquisitions in SHR-D showed lower uptake of ¹⁸F-FDG than SHR. Interestingly, there were no significant differences in LVMI or SUV between SHR-D and WKY.

Conclusion(s): Dronedaron produces early regression of LVH in the SHR model of compensated ventricular hypertrophy.

Acknowledgements: This study was supported by a grant FIS 13/01261 and Fondos Feder, Spain.

07AP05-6**Ventilation protocol in a new experimental ex vivo single-lung perfusion model for transplantation**

Ramos S.¹, Garutti I.¹, Fernandez-Peña A.¹, Puig A.¹, Simon C.², Vara E.³

¹*Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*, ²*Gregorio Marañón General Hospital, Dept of Thoracic Surgery, Madrid, Spain*, ³*Universidad Complutense de Madrid, Dept of Biochemistry and Molecular Biology, Madrid, Spain*

Background and Goal of Study: Nowadays, only about 15% of donated lungs are used for transplantation while up to 20% of patients die while waiting for a lung transplant. Ex vivo lung perfusion (EVLP) has been shown to be a useful technique for preservation, assessment and reconditioning of donor lungs. Clinical and experimental research is needed to address many unanswered questions about EVLP.

To assess the viability of a new porcine single lung EVLP model for assessment/reconditioning of non heart-beating donor lungs. The detailed technique for ex vivo lung ventilation is described.

Materials and Methods: 15 pigs were submitted to a left lung transplant. Donor lungs were harvested after electrical cardiac arrest and a 30-minute period of warm ischemia. The left lung was then submitted to a three-hour period of cold preservation. In SHAM group (n=5), left lung was then implanted and reperfusion was maintained for two hours. In EVLP group (n=10) donor lungs were assessed/reconditioned for 60 minutes in a normothermic EVLP circuit using an acellular perfusate and leaving the left atrium open. Perfusate flow and temperature were increased to 16% of the calculated cardiac output and 37°C respectively. Ventilation was started after 20-25 minutes, when temperature of perfusate reached 32°C. Ventilatory parameters: rate up to 14/min; tidal volume up to 4 mL/kg (donor body weight); PEEP= 5 cm H₂O; FiO₂=40%; I:E ratio=1:2; maximum airway pressure=20 cm H₂O. Airway resistance and pressure, lung compliance and perfusate gases were measured 30 and 60 minutes after the beginning of perfusion. Lung was then recooled, implanted and reperused for two hours. In both groups, left pulmonary venous gases were measured 60 and 120 minutes after the beginning of reperfusion.

Results and Discussion: Lung airway resistance decreased significantly during EVLP (*P*<0.05) while lung compliance increased (*P*<0.05). The oxygenation capacity of the lung improved during EVLP (PaFIO₂ 75 \pm 37 vs 335 \pm 89) at 30min and 60min respectively (*p*<0.01). The oxygenation capacity of the implanted lungs after two hours of reperfusion was significantly better in the EVLP group than in the SHAM group (*P*< 0.05). In EVLP group, pulmonary vein gases of transplanted lungs after reperfusion did not significantly differ from arterial gases from donor pigs.

Conclusion(s): The present experimental model has proven to be feasible and suitable to investigate reconditioning strategies for damaged donor lungs.

07AP05-7**Relationship between the level of preoperative leukocytes and the level of leukocytes after 24 and 48 hours and postoperative arginase 1 activity. A new index for inflammation in cardiac surgery?**

Sánchez Conde M.P., Rodríguez-Lopez J.M., Iglesias Gonzalez J.L., Palomero-Rodríguez M.A., García-Navas R., Poveda-Marina J.L.
University Hospital of Salamanca, Dept of Anaesthesiology, Salamanca, Spain

Background and Goal of Study: Cardiac surgery with extracorporeal circulation (ECC) is associated with the perioperative development of systemic inflammatory response syndrome (SIRS). A diagnosis of SIRS is normally reached if at least two of the following criteria are met in the perioperative period: HR >90 bpm, respiratory rate >20 breaths per minute or PaCO₂ <32 mmHg, body temperature <36°C or >38°C and leukocyte level <4000/mm³ or >12000/mm³. Also, the activity of the enzyme arginase 1 (ARG) after ischemia-reperfusion syndrome (IR) is the subject of research in many experimental models. Our study analyzes whether the level of preoperative leukocytes related to the levels of leukocytes after 24 and 48 hours and to ARG activity 24 hours after cardiac surgery with ECC may represent a new predictive index for perioperative SIRS development.

Materials and Methods: 50 patients who underwent cardiac surgery with ECC were included. We measured the leukocytes levels prior to the operation and 24 and 48 hours after the operation, as well as ARG activity 24 hours after the operation. We designed two leukocyte indexes which were defined as follows: Leukocyte Index #1 (IL₁) is the ratio between leukocytes 24 hours after operation (L₂₄) and preoperative leukocytes (L_p). Leukocyte Index #2 (IL₂) is the ratio between leukocytes 48 hours after operation (L₄₈) and L_p. Data were analyzed with non-parametric Mann-Whitney U test and a linear regression model.

Results and Discussion: 24 patients (48%) met at least two criteria for SIRS diagnosis. In all patients (50) a significant association was found between L_p and L₂₄. In patients who developed SIRS we registered IL₁ and IL₂ <1 or >2; and in patients who did not develop SIRS, IL₁ and IL₂ were between 1 and 2. We also observed that in patients who developed SIRS the IL₂/IL₁ ratio was <1 or >2, and this was associated, independently from L₂₄ and L₄₈, with L_p <7000/mm³. Regarding ARG activity after 24 hours, we observed that SIRS was associated with increased activity of the enzyme.

Conclusions:

1. In this study we have designed two indexes which may be useful to predict the development of postoperative SIRS in patients who undergo cardiac surgery with ECC and who are associated with an increased ARG activity 24 hours after the operation.
2. We have also observed that this event is more likely in patients with L_p <700/mm³.

07AP05-9**The utility of prothrombin complex concentrate in order to treat the dilutional coagulopathy due to the use of cell saver**

Rubio M.D.P., Mata Francisco N.C., Rodríguez López J.M., Sánchez Conde M.P., Sánchez Crespo J.A., Díaz Álvarez A.
Hospital Clínico Universitario Salamanca, Dept of Anaesthesiology & Intensive Care, Salamanca, Spain

Background and Goal of Study: The cell saver (CS) is an intraoperative blood conservation method. This device collected autologous blood and removal plasma from the red blood cells (RBC). There are a lot of discrepancies about the use of CS: it may reduce homologous RBC transfusion but it also can increase the postoperative bleeding and the transfusion of fresh frozen plasma (FFP) and platelet (PLT).

Materials and Methods: The aim of this study was to evaluate if the retransfusion of blood processed by CS could increase postoperative blood loss and transfusion requirements. We also want to evaluate if the prophylactic administration of complex concentrate prothrombin (CCP) avoid this complications. This is a retrospective study in which the medical records of all patients who underwent cardiac surgery were reviewed. It was carried out in the period between January of 2014 and February of 2015 at the University Hospital of Salamanca. It was registered: patient's demographics dates, volume of autologous blood transfusion, volume of chest tube drainage in 24 hours, trans-

fusion requirements and the in-hospital morbidities. Statistical analysis was performed using SPSS version 21.0 software. P values less than 0.05 were considered statistically significant.

Results and Discussion: A total of 197 patients with a mean age of 71 years were included. Males constituted 57% of our study. The most common procedure was valvular surgery (63%). Patients received 518 ml of autologous blood transfusion from CS. The postoperative blood loss were 1318 ml. As we can see in the graphic, patients in the valvular surgery group received higher volume of CS and postoperative blood loss were lower than in coronary artery graft surgery (CAGB) group. Patients in the CAGB group received significantly more FFP and PLT transfusion. Could be that due to the prophylactic administration of CCP? It seems logical to administrate CCP in order to treat the dilutional coagulopathy secondary to the use of CS. The optimal dose of CCP is 15 UI/kg. Complications occurred in 52 patients; the most frequent are bleeding (29), acute renal failure (17) and ischemia (6). In disagreement with other authors, we found that the use of CCP is not associated with acute renal failure.

Conclusion(s): We conclude that the use of CS in cardiac surgery is associated with more postoperative blood loss. In order to reduce the blood loss we recommend to administrate prophylactic CCP if CS volume retransfused is more than 14% of the total blood volume.

07AP05-10**Can the degree of cardiac I/R damage determined in animal models be translated to the damage in humans with myocardial infarction or cardiac surgery?**

Posthuma L.M.¹, O'Brien P.², Zuurbier C.J.¹, Preckel B.¹

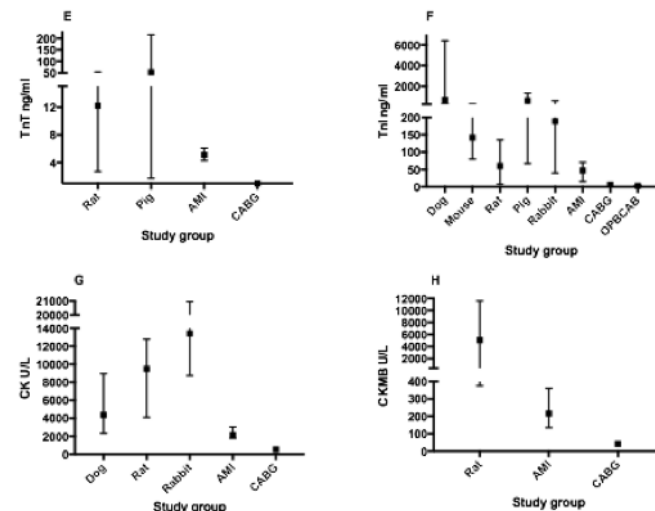
¹AMC, Dept of Anaesthesiology, Amsterdam, Netherlands, ²UCD, Dept of Anaesthesiology, Dublin, Ireland

Background: A wealth of preclinical knowledge about cardioprotective agents has been gained over the past decades. However, the translation of the laboratory data of ischemia-reperfusion (I/R) injury experiments into clinical application has been largely unsuccessful (1,2).

In this literature review we compared the degree of I/R damage in animal studies to the degree of I/R damage in patients with acute myocardial infarction (AMI) and patients subjected to coronary artery bypass grafting (CABG) surgery.

Methods: Peak blood concentration values of commonly used biomarkers in the diagnosis of ischemic heart injury (Troponin T (TnT), Troponin I (TnI), creatine kinase (CK) and MB isoenzymes of creatine kinase (CK-MB)) were extracted from animal I/R studies and human AMI and CABG studies. The preferred animals in I/R injury studies were used, namely dogs, rabbits, mice, rats and pigs. PubMed database was screened until January 2016 by two authors.

Results and Discussion: 243 animal studies and 151 human studies were included. Only groups with >5 studies per cardiac marker were included for further analysis.



[Figure 1 mean value of TnT (A), TnI (B), CK (C) a]

Figure 1 shows the average value per cardiac marker per animal / human group. The values found in the animal group are higher than the values found in the human group.

Conclusion: The degree of cardiac I/R damage examined in animal models is not comparable and more severe than cardiac I/R damage occurring in human conditions of CABG and AML.

References:

1. Vander Heide RS, Steenbergen C. Cardioprotection and Myocardial Reperfusion: Pitfalls to Clinical Application. *Circ Res.* 2013;113:464-77.2.
2. Cabrera-Fuentes HA, Aragones J, Bernhagen J, Boening A, Boisvert WA, Bötter HE, Bulluck H, Cook S, Di Lisa F, Engel FB, Engelmann B, Ferrazzi F, Ferdinandy P, Fong A, Fleming I, Gnaiger E, Hernández-Reséndiz S, Kalkhoran SB, Kim MH, Lecour S, Liehn EA, Marber MS, Mayr M, Miura T, Ong SB, Peter K, Sedding D, Singh MK, Suleiman MS, Schnittler HJ, Schulz R, Shim W, Tello D, Vogel CW, Walker M, Li QO, Yellon DM, Hausenloy DJ, Preissner KT. From basic mechanisms to clinical applications in heart protection, new players in cardiovascular diseases and cardiac therapeutics: meeting report from the third international symposium on "New frontiers in cardiovascular research". *Basic Res Cardiol.* 2016 Nov;111:69

07AP05-11

Protective effect of anthocyanin on lung ischemia-reperfusion injury

Yu S., Wenling Z., Jing L., Bin L.

West China Hospital of Sichuan University, Dept of Anaesthesiology, Chengdu, China

Background and Goal of Study: Cyanidin-3-O-b-glucoside (C3G) has been reported to protect the heart and many other organs from ischemia/reperfusion (I/R)-induced inflammatory and apoptosis[1]. However, unclear is the potential effect of C3G on Lung ischemia-reperfusion injury (LIRI). Thus, we hypothesized that C3G treatment may play a vital role in relieving LIRI.

Materials and Methods: Thirty C57BL/6J adult male wild-type mice (n = 10/group, 22-25g), were randomly and evenly divided to I/R+C3G (I/R+C) group, I/R group, and sham group. LIRI mouse model was built via one-hour occlusion of the left pulmonary hilum and two-hour reperfusion. C3G(40mg/kg) and same dose of 0.9% sterile saline were administered to I/R+C group and other groups in advance, respectively. Blood and lung tissues of all mice were harvested after lung I/R for subsequent analysis. Arterial blood gas (ABG) analysis, Lung Wet/dry (w/d) weight ratio analysis, and Histological analysis were performed. The levels of inflammatory cytokines, including tumor necrosis factor- α (TNF- α), interleukin-6 (IL-6) and nuclear factor- κ B 65 (NF- κ B 65) activation in the serum and lung tissue, were measured by ELISA, Western blot (WB) and Quantitative polymerase chain reaction (qPCR), respectively. Also, toll-like receptor 3 (TLR3) levels were measured by the same methods. The apoptosis assays, including cleaved caspase-3 and TUNEL, were assessed.

Results and Discussion: The results exhibited significantly increased lung injury scores based on the outcomes of ABG, w/d weight ratio and lung Histological analysis after I/R. Moreover, the results of ELISA, WB and PCR showed the cytokine production including TNF- α , IL-6 and NF- κ B 65 activation, and TLR3 levels were substantially raised in I/R group. Pulmonary apoptosis after I/R was elevated as reflected in TUNEL staining and activated caspase-3. C3G treatment, in contrast, markedly reduced the expressions of the same inflammatory cytokines in both lung tissue and serum, and pulmonary apoptosis in I/R+C group. In addition, pulmonary and circulating TLR3 levels in I/R+C group decreased significantly compared with I/R group.

Conclusion(s): Injection of C3G during preoperative period relieved LIRI. The potential mechanism was related to the decrease of TLR3 level and the inhibition of inflammation and apoptosis.

References: 1. Amorini, A.M, et al, C3G Protects Myocardium and Erythrocytes from Oxygen Radical-mediated Damages. *Free Radical Research.*

07AP06-1

Perioperative copeptin concentrations in patients undergoing vascular surgery

Kamber F.¹, Mauermann E.¹, Seeberger E.¹, Bolliger D.¹, Müller C.², Lurati Buse G.¹

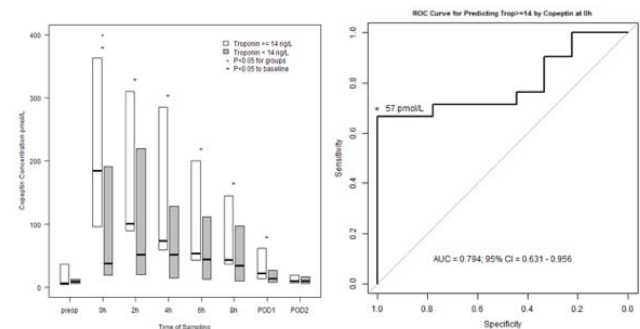
¹University Hospital Basel, Dept of Anaesthesiology, Basel, Switzerland, ²University Hospital Basel, Dept of Cardiology, Basel, Switzerland

Background and Goal of Study: In troponin negative patients presenting to the emergency room, copeptin has been shown to reliably rule out myocardial infarction with a suspected ACS.¹ Because of this early, albeit unspecific rise in copeptin, a dual biomarker strategy to rule out myocardial infarction has been endorsed in the emergency room setting.²

In contrast, little is known about copeptin after major noncardiac surgery: both with regard to time course in uneventful cases, as well as with regard to its potential association with myocardial ischemic complications.

Methods: This is a prospective cohort study in a pilot phase examining 30 patients undergoing vascular surgery. We measured Copeptin and troponin immediately prior to induction of anesthesia, upon arrival on the ICU (0h), 2h, 4h, 6h, and 8h after arrival, as well as on the 1st and 2nd postoperative day.

Results and Discussion: Copeptin was highest immediately after surgery (median: 64.7 pmol/L; IQR 29.6 to 258.7 pmol/L) and remained significantly higher than preoperative up to the 1st postoperative day. Patients who developed increased hs TNT by the 2nd postoperative day demonstrated significantly higher copeptin concentration (Fig. 1). This resulted in an area under the ROC curve of copeptin for the prediction of increased hsTNT (≥ 14 ng/L) of 0.749 [95% CI 0.631 - 0.956] (Fig. 2).



[Fig. 1: Copeptin Time Course, Fig. 2: ROC Curve]

Conclusion: These preliminary results suggest that copeptin concentrations greatly increase immediately following surgery and return to preoperative concentrations by the 2nd postoperative day. Further, very early after surgery, copeptin seemed to flag patients that went on to develop elevated hs TNT by postoperative day 2 after major noncardiac surgery.

References:

1. Khan SQ et al. C-terminal proavopressin as a novel and prognostic marker in acute myocardial infarction: Leicester Acute Myocardial Infarction Peptide (LAMP) study. *Circulation* 2007;115:2103-10
2. Roffi M et al. ESC Guidelines for the management of ACS in patients presenting without persistent ST-segment elevation: Task Force for the Management of ACS in Patients Presenting without Persistent ST-Segment Elevation of the ESC. *Eur heart j* 2015

07AP06-2**Primary cardiac pheochromocytoma**

Serrano Zueras C.¹, Simic Silva D.¹, Gonzalez A.I.¹, Garcia Fernandez J.¹, Gomez Bueno M.², Forteza A.³

¹Hospital Puerta de Hierro Majadahonda, Dept of Anaesthesiology & Intensive Care, Majadahonda, Spain, ²Hospital Puerta de Hierro Majadahonda, Cardiology, Majadahonda, Spain, ³Hospital Puerta de Hierro Majadahonda, Dept of Surgery, Majadahonda, Spain

Background: Pheochromocytoma is a usually benign catecholamine-producing tumor and a rare cause of hypertension. 90% of them occur in the adrenal gland and less than 2% occur in the thorax, being the intrapericardial location extremely uncommon.

Case report: We report a case of a 35-year-old man with a 5-year history of hypertension in whom a pheochromocytoma in the atrio-ventricular sulcus, that involved the right coronary artery, was found. The patient referred headache, insomnia and atypical chest pain along with the hypertension. High metanephrines levels in urine and a FDopaPET (which detected a pathological catchment by a mass in the anterior mediastinum between the right atrial and the right ventricle) established the diagnosis.

Alpha-adrenergic and beta blockade were started and maintained during two months before surgery. A Stent was implanted in the right coronary artery in order to embolize capillaries and arteries that irrigated the tumor prior to its resection.

The pheochromocytoma was successfully removed using cardiopulmonary bypass. Monitoring at the operating room included ASA standards plus radial artery and internal right jugular vein canalization, BIS and transesophageal echocardiography. Anesthetic induction and intubation occurred without incidents. Medium-high inotropic doses were required during surgery and up to 48-72 hours after surgery because of hypotension (due to the alpha-adrenergic blockade). Patient left to ICU intubated with medium doses of vasoactive drugs.

Extubation was made in the first DAS and vasopressor support was withdrawn in the third DAS. Patient was discharged from the ICU on the third DAS stable, with no antihypertensive treatment.

Discussion: Primary cardiac pheochromocytomas are extremely rare. There are less than 50 reported cases worldwide. We have not found any published case where the cardiac pheochromocytoma had this location.

These neuroendocrine catecholamine-producing tumors constitute a challenging anesthetic management due to the hemodynamic lability they create.

References: Challis BG et Al. Is there an optimal preoperative management strategy for pheochromocytoma/paraganglioma? Clin Endocrinol (Oxf).2016 Oct.10.1111/13252.

Learning Points: Anesthesia management in this surgery should include close communication with the surgeon to anticipate events likely to cause hemodynamic instability.

07AP06-3**Predictors of neurologic deficit after thoracoabdominal aortic aneurysm repair: a retrospective study**

Hino M.¹, Kajitani M.², Takayama W.², Mihara T.³

¹Itabashi Chuo Medical Center, Dept of Anaesthesiology, Tokyo, Japan, ²Kawasaki Saiwai Hospital, Dept of Anaesthesiology, Kawasaki, Japan, ³Kanagawa Children's Medical Center, Dept of Anaesthesiology, Yokohama, Japan

Background and Goal of Study: Neurologic deficit is a devastating complication of thoracoabdominal aortic aneurysm repair (TAAAR) and is associated with a significant increase in both, morbidity and mortality. The purpose of this study was to identify predictors of neurologic deficit after TAAAR.

Materials and Methods: The subjects for this study comprised 449 consecutive patients who underwent TAAAR between June 2003 and November 2015. Data were collected retrospectively through electronic medical records. Age, Crawford classification, acute dissection occurrence, whether surgery was elective or emergency, medical history (preoperative renal insufficiency, diabetic mellitus, cerebral infarction), aortic cross clamp time, presence of open distal anastomosis, whether intercostal arteries were reattached, and whether preoperative cerebrospinal fluid was drained were evaluated. The logistic regression with Akaike information criterion stepwise selection was performed to identify predictors of neurologic deficit.

Results and Discussion: Of the 449 patients, 56 (12.5%) developed neurologic deficit. Neurologic deficit included paraplegia in 30 patients (6.6%) and paraparesis in 26 patients (5.8%). The logistic regression analysis with stepwise model selection revealed multiple significant factors for the development of neurologic deficit, including preoperative renal insufficiency (odds ratio [OR] 1.24, 95% confidence interval [CI] 1.06 - 1.44; p = 0.006), open distal anastomosis (OR 2.79, 95% CI 1.52 - 5.12; p = 0.001), and absence of intercostal artery reattachment (OR 0.47, 95% CI 0.23 - 0.96; p = 0.039).

Conclusion(s): The predictors of postoperative neurologic deficit in our hospital were preoperative renal insufficiency, open distal anastomosis, and absence of intercostal artery reattachment.

07AP06-4**Carotid revascularization. Can we improve our efficiency?**

Aliaño M., González Cibrián C.C., Paz D., Pintado C., Arastey S. Complejo Hospitalario de Toledo, Dept of Anaesthesiology & Intensive Care, Toledo, Spain

Background and Goal of Study: Different papers have described great outcomes in patients undergoing ambulatory carotid revascularization reducing costs and increasing patient comfort. The goal of this study is to determine the incidence of complications after carotid revascularization (stenting /endarterectomy) during the first 24h in our intensive care unit and to identify risk factors which could help us to select patients for ambulatory procedures.

Materials and Methods: Observational retrospective research. Postsurgical patients undergoing carotid artery revascularization from 2012 to November 2016 were included in the study. The data was analysed using a descriptive statistics and the Chi-square test.

P values less than 0.05 were considered statistically significant. All statistical analysis was conducted using SPSS 20.0 for Windows.

Results and Discussion: 160 patients were included in the study (128 men, 32 women, mean age 71±9.5 years, range 45-87 years), treated for symptomatic (n=99, 62%) or asymptomatic (n=61, 38%), endarterectomy (n=40, 25%), stenting (n=120, 75%), urgent surgery (n=6, 3.8%), local anaesthesia (n= 83, 51.9%), general anaesthesia (n=77, 48.1%). 47 patient (29.3%) had a total of 57 complications : 30 (18,8%) episodes of arterial hypertension, 2 (1,2%) episodes of hypotension, 8 (5%) strokes, 7 (4,4%) bleeding, 7 (4,4%) periods of confusion, 1 (0,6%) myocardial infarction, 1 (0,6%) cerebral vasospasm, 1 (0,6%) intracerebral hemorrhage. Comparing complications with surgical technique, endarterectomy showed a higher incidence of complications (47,5% vs 23,3% stent) P 0,04. Statistical significance was also obtained comparing complications between local (19,27%) vs general anaesthesia (40%), p 0,04.

Conclusion(s): This study shows a low incidence of fatal events. The most common complication was hypertension. However, only 2 patients with hypertension developed a fatal outcome (1 stroke, 1 intracerebral hemorrhage). Our patients undergoing carotid artery stenting may be safely discharged on the same day of surgery. Nevertheless, patients presenting hypertension or hypotension after the procedure should remain in the hospital due to the potential complications. Our patient sample is not enough to determine whether the outpatient performance of endarterectomy is also a safe practice. In our study it showed twice as complications compared to the stenting.

07AP06-5**Thromboelastometry as guidance for blood products management in vascular aortic surgery**

Spinoni A., Martins K., Alonso A., Sarrajs C., Beltrao R., Aguilar C. Hospital Clinico San Carlos, Dept of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Thromboelastometry (ROTEM®) is a viscoelastometric method that tests coagulation in a global way analysing a whole blood sample. The aim of this study was to assess the results of using thromboelastometry as guidance for blood products management in abdominal aortic and thoracoabdominal aneurysms repair.

Materials and Methods: It is a quasi-experimental, analytical and interventional study, comparative but with a non-probabilistic sampling, based on a prospective cohort with a retrospective control group.

68 patients undergoing abdominal aortic and thoracoabdominal aneurysms repair were included. In 31 patients intraoperative blood products transfusion

followed classic clinical guidelines (Group A), in the other 37, thromboelastometric based transfusion algorithms were used (Group B).

Our main variables were fresh frozen plasma (FFP) administration, fibrinogen supply and platelet transfusion. Secondary variables were: ICU stay, hospital discharge and postoperative adverse events.

Results and Discussion: We analyzed 68 patients (31 group A and 37 group B), with an homogeneous distribution between both groups except for smoking (higher in group B). Confounding factors were pre-surgical hematocrit and type of aneurysm.

For data analysis, Student's T and Man Whitney U tests were used for the quantitative variables. For main variables analysis we categorized the data and applied the Chi square test.

There was a decremental transfusion of FFP in group B respect group A ($p = 0.024$), with 29% and 8.1% patients transfused, respectively. Fibrinogen use in group B was increased ($p=0.002$), used almost 10 times more. There was a decrease in packed red blood cells transfusion during surgery with a mean transfusion rate of 3.9 units in group A compared to 2.64 in group B. No differences were found in platelets nor prothrombin complex administration, although there is a tendency towards greater use of platelets in group B, 29.7% before 22.6% in group A.

Regarding postoperative complications, ICU and hospital stay, no statistically significant differences were found.

Conclusion(s): Based on our experience, the use of a viscoelastic tests, led to a substantial change in the use of blood products, with a decrease in the use of FFP and increase in the administration of fibrinogen. Regarding packed red blood cells transfusion and ICU and hospital stay, it seems that enlarging our sample could probably yield to statistically significant results.

07AP06-6

Intraoperative transcranial ultrasound monitoring of cerebral middle cerebral arteries blood flow and neurocognitive function in patients after carotid endarterectomy

Medvedeva L.¹, Zagorulko O.¹, Belov Y.², Drakina O.³, Shevtsova G.⁴

¹Petrovsky National Research Centre for Surgery, Dept of

Anaesthesiology & Pain Medicine, Moscow, Russian Federation,

²Petrovsky National Research Centre for Surgery, Dept of Surgery,

Moscow, Russian Federation, ³I.M. Sechenov First Moscow State

Medical University, Dept of Surgery, Moscow, Russian Federation,

⁴I.M. Sechenov First Moscow State Medical University, Dept of

Anaesthesiology & Pain Medicine, Moscow, Russian Federation

Background and Goal of Study: This study was conducted to identify the correlation between neurocognitive function (NCF) changes and intraoperative transcranial ultrasound monitoring (TUM) in 50 patients after carotid endarterectomy (CEA) for asymptomatic internal carotid artery stenosis in 2014-2016.

Materials and Methods: Pre- and intraoperatively and before discharge from the hospital duplex assessment, including TUM of cerebral blood flow by middle cerebral arteries was performed. Intraoperative transcranial TUM helps to determine qualitative microemboli characteristics and differentiate gas (frequency >800 Hz, duration 15-100ms), material (frequency <600 Hz, duration 20-40ms) and artifact high-intensity transient signals. NCF was assessed preoperatively, 24 hours, 7 days and 3, 6 months postoperatively using the Mini Mental State Examination, Information-Memory-Concentration Test, Frontal assessment battery, Wechsler Adult Intelligence Scale (WAIS), Clock Drawing Test and Schulte's test (ST), Hospital Anxiety and Depression Scale and Covi Anxiety Scale. Linear regression models were used to assess the correlation between the changes in the microemboli existence and the results of NCF tests [1-3].

Results and Discussion: 15 subjects (30%) showed microembolism during TUM. All of them showed gas microemboli. Besides, three of them (6%) showed both gas and material microemboli. 2 cases of material microembolism occurred in patients with unstable or ulcerated plaques and in 1 patient while using intravascular shunt. Material microemboli during surgery correlates with cognitive decline in the postoperative period ($p<0.01$), what makes it important for the further prognosis. Patients showed different degrees of cognitive decline in total scale, immediate memory, language, psychomotor reaction rate, attention and emotional state preoperatively. 24 hours after surgery results of all cognitive tests were significantly decreased. A week after CEA total score had returned to the preoperative level, except for the ST and WAIS. 3 and 6 months after CEA psychomotor reaction rate increased ($p<0.05$).

Conclusion(s): In conclusion, our results represent beneficial effect of CEA on NCF. Material microembolism during CEA results in neurocognitive decline, which requires special treatment. Gas microembolism doesn't affect NCF.

References:

- Aleksic M. J Vasc Surg 2006; 31:616-621.
- Belov Y. J Anaesth 2016; 33(54):308-309.
- Zagorulko O. Eur Neurol 2012;19(1):545.

07AP06-7

Postoperative sustained hypotension after carotid endarterectomy: risk factors and perioperative outcome

Latorre M.¹, Mases A.¹, Sabaté S.², Díaz C.³, Vallés J.¹, Soler E.¹

¹Hospital del Mar, Dept of Anaesthesiology, Barcelona, Spain,

²Fundació Puigvert (IUNA), Dept of Anaesthesiology, Barcelona,

Spain, ³Hospital del Mar, Dept of Vascular Surgery, Barcelona, Spain

Background and Goal of Study: Haemodynamic instability after carotid endarterectomy (CEA) has been correlated to worst outcome. Our aim was to analyze the incidence of sustained hypotension (hypoT) after CEA, to identify risk factors and to evaluate an association with perioperative morbidity.

Materials and Methods: We reviewed retrospectively 201 cases of CEA under general anaesthesia in our institution were retrospectively reviewed. We collected demographic data, comorbidities, chronic treatments, degree of stenosis, symptomatology, surgical and anaesthesia details and postoperative evolution data up to 30 days. We defined sustained hypoT as the need for postoperative continuous infusion of noradrenaline. Data was obtained from medical records. Mann-Whitney U and Chi square tests were used to compare means or percentages respectively.

Results and Discussion: The incidence of hypoT was 13.4%. When comparing both groups (hypoT vs no hypoT) we did not find significant differences in demographics, surgical site, stenosis degree, symptomatic stenosis, contralateral carotid disease, previous contralateral surgery and duration of surgery. With respect to comorbidities, we only found estimated glomerular filtration rate (GFR) <45 mL/min/1.73m² to be associated with an increased incidence of hypoT (Table 1). Chronic antihypertensive drugs did not correlate to hypoT. Sustained hypoT prolonged ICU stay [median days (IQR): 22 (21-24) vs 24 (23-45); $p<0.001$] but did not have any impact in length of hospital stay [5 (4-6) vs 5 (4-7); $p=0.978$]. Perioperative complications are shown in Table 2.

	No hypoT	HypoT	p
Hypertension, n(%)	141 (81)	24 (88.9)	0,425
Coronary artery disease, n(%)	48 (27.6)	9 (33.3)	0,923
Diabetes mellitus, n(%)	54 (31)	13 (48.1)	0,085
Chronic heart failure, n(%)	6 (3.4)	2 (7.4)	0,293
GFR (CKD-EPI) < 45 mL/min/1,73m ² , n (%)	16 (9.2)	7 (25.9)	0,015

[Table 1. Preoperative variables]

	No HypoT	HypoT	p
Any complications, n (%)	31 (18.9)	8 (29.6)	0,205
Exitus, n(%)	1 (0.6)	2 (7.4)	0,052
SDRA, n(%)	0 (0)	2 (7.4)	0,019
Atelectasia, n(%)	1 (0.6)	2 (7.4)	0,052
Severe infection, n(%)	1 (0.6)	1 (3.7)	0,265
MACCE, n(%)	18 (10.3)	4 (14.8)	0,507

[Table 2. Complications]

Conclusion(s): According to our results, sustained hypoT after CEA is difficult to predict. We could not find an association of sustained hypoT with worst outcome.

07AP06-8**Is it important to control the efficacy of antiplatelet therapy in patients with drug-eluting stents presenting for surgery?**

Coupez C., Watremez C., Momeni M.

Université Catholique de Louvain, Cliniques Universitaires Saint Luc, Dept of Anaesthesiology, Brussels, Belgium

Background: The European guidelines recommend ticagrelor and prasugrel as the treatment of choice for Acute Coronary Syndrome (ACS) because of their superior platelet inhibition action when compared with clopidogrel.¹ They are therefore often used when Drug-Eluting Stents (DES) are inserted. A meta-analysis comparing ticagrelor and prasugrel suggested that ticagrelor allows a higher platelet reactivity inhibition as compared with prasugrel.² Resistance to the newer antiplatelet drugs, although theoretically possible, has not yet been reported.

Case report: A DES was inserted in a 59-year-old diabetic patient after an ACS. The patient was put on dual antiplatelet therapy aspirin 80 mg/day and ticagrelor 90 mg 2x/day. She presented intrastent thrombosis 6 months post DES insertion despite perfect medication compliance and was successfully treated with 2 other DES. A Multiplate electrode aggregometry realized by Multiplate® Analyzer showed no ADP-induced platelet aggregation. Ticagrelor was stopped and prasugrel 160 mg was started. The patient presented 4 months later for an elective peripheral vascular surgery. A Multiplate® test was realized to confirm efficient dual antiplatelet therapy (aspirin-prasugrel). Table 1 illustrates the results of the Multiplate® test under ticagrelor (at the moment of stent thrombosis) and subsequently prasugrel therapy.

	Normal range	Ticagrelor and aspirin therapy	Prasugrel and aspirin therapy
ADP test	607-963	684	397
ASPI test	505-1086	365	205
TRAP test	868-1473	1066	1067

[Results of Multiplate]

Discussion: The etiology of increased platelet activation in diabetic patients is multifactorial.³ Resistance to aspirin and/or clopidogrel is well known and especially described in diabetic patients resulting in an increased cardiologic use of newer antiplatelet drugs. We describe a first case of biological and clinical resistance to ticagrelor. Patients on dual antiplatelet therapy for DES and presenting for elective or emergency surgery should systematically be tested for efficacy of their antiplatelet treatment in order to adapt the perioperative management.

References:

1. Eur Heart J 2012;33:2569-619;
2. J Thromb Haemost 2015;13:931-42;
3. Curr Cardiovasc Risk Rep 2015;9:4

Learning points:

1. This case illustrates that resistance to newer antiplatelet medications can occur.
2. Point-of-Care functional platelet tests are easy to perform and can rapidly confirm the efficacy of antiplatelet therapy in patients with DES.

07AP06-9**Anesthetic management for thoracoabdominal aneurysm repair performed by left heart bypass with renal and abdominal viscera selective perfusion**

Vázquez Antas M., Santiago Paniagua P., Arcas Bellas J.J.,

Martín Piñeiro B., Stanciu O., Muñoz Alameda L.E.

Hospital Fundación Jiménez Díaz, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Open surgery for repair of thoracoabdominal aortic aneurysms is considered among the most complicated surgeries nowadays, with high mobility and mortality. Hemodynamic changes, one lung ventilation, adequate perfusion of abdominal viscera, as well as the risk of spinal cord ischemia and high transfusion rate, are among the possible difficulties.

Case report: 55-years-old woman, hypertensive and HIV with an incidental type II thoracoabdominal aortic aneurysmal dilatation discovered during anesthetic assessment for knee arthroplasty.

The surgery is planned to be performed under left heart bypass with renal and abdominal viscera selective perfusion.

Discussion: The procedure is performed under balanced general anesthesia with left-side double lumen endotracheal tube, invasive monitoring (left radial artery, swan-ganz catheter and 4 lumen right jugular vein catheter), as well as CSF drainage catheter are placed.

A left thoracotomy approach is performed. For the left heart bypass two cannulas are placed, the proximal one in the aortic arch distal to subclavian artery and the distal one in the left femoral artery. The prothesis is placed between the aortic arch and the iliac bifurcation.

Postoperative evolution in ICU and ward was eventless and renal and neurological functions (both sensitive and motor) were preserved at all times. 60 days after hospital admission was discharged from the hospital.

Prevention of ischemia both at the abdominal and spinal levels is essential during the repair of type II thoracoabdominal aortic aneurysms. To achieve it, retrograde distal aortic perfusion was performed by the left heart bypass with selective renal and abdominal viscera perfusion; also CSF was drained to maintain pressures below 10 mmHg during the entire procedure.

Learning Points: Type II thoracoabdominal aortic aneurysms repair performed by left heart bypass allows to maintain perfusion of the lower half of the body though a retrograde distal aortic perfusion, decreasing ischemic injuries and improving prognosis.

07AP06-10**Stellate ganglion radiofrequency - beyond chronic pain management**Veiga M.¹, Trejo Velasco B.², Valls Serral A.², Asensio-Samper J.³, de Andrés J.³*¹Hospital Central do Funchal, Dept of Anaesthesiology, Funchal, Portugal, ²Hospital General Universitario de Valencia, Cardiology, Valencia, Spain, ³Hospital General Universitario de Valencia, Dept of Anaesthesiology & Pain Medicine, Valencia, Spain*

Background: The stellate ganglion is a neuronal structure formed by the fusion of the inferior cervical ganglion and the first thoracic ganglion. It is a structure with sympathetic functions.

The Electrical Storm (ES) is a life-threatening syndrome, characterized by recurrent ventricular fibrillation (VF) and ventricular tachycardia (VT). Many times unresponsive to antiarrhythmic drugs, it presents a major clinical challenge.

Case report: A 70-year-old male, with history of myocardial infarction with elevated ST in 2003, 2014 and 2015, with a depressed myocardial function and an Implantable Cardioverter Defibrillator (ICD) since July 2015, admitted to the Coronary Unit with an ES in June 2016. This episode was managed with lidocaine perfusion and phenytoin.

On 24th August the patient was readmitted with another ES. Perfusions of lidocaine and esmolol were used to control the ES. Ablation treatment was performed by Cardiology without success. On the 8th October the patient returned to the ES, with various ICD discharges.

On the 11th October a Pulsated Radiofrequency (PLR) of the left stellate ganglion was performed.

The patient was positioned in dorsal decubitus, the stellate ganglion identified with ecographic control and PLR was performed. The procedure was uneventful.

The patient had one episode of VF in the day after the procedure, successfully treated with the ICD and a lidocaine. Three days after the procedure the patient was discharged to the cardiology ward. The follow-up remain uneventful.

Discussion: The use of ultrasound in critical care suffered a huge technical advance in recent years. Since we do not have to transport the patient and we have a direct view of the structures safety is improved.

Ventricular arrhythmias management requires a multimodal approach. Sympathetic cardiac neural modulation is one of the treatments used in this situations.

Management of ES with PRF has been previously reported.¹

To our knowledge, this is the first case report of an ultrasound guided technique.

References: Hayase J, et al. Comparative efficacy of stellate ganglion block with bupivacaine vs pulsed radiofrequency in a patient with refractory ventricular arrhythmias. Journal of Clinical Anesthesia 2016; 31: 162-165

Learning points: Ultrasound guided approach of the left stellate ganglion to perform PRF appears to be a safe and efficiency technique in the ES management.

07AP07-1**Variation of pulmonary shunt at different levels of positive end-expiratory pressure in patients undergoing one-lung ventilation**

Savino S.¹, Fogagnolo A.¹, Fanni A.¹, Karbing D.S.², Rees S.E.², Volta C.A.¹

¹University of Ferrara, Dept of Anaesthesiology & Intensive Care, Ferrara, Italy, ²Aalborg University, Dept of Intensive Care, Aalborg, Denmark

Background and Goal of Study: Ventilation/perfusion mismatch during one-lung ventilation (OLV) in lateral decubitus impairs oxygenation and increases pulmonary shunt. The shunt fraction in OLV, however, is partially attributed to atelectasis in the dependent lung and, therefore, can improve with adequate ventilation strategies. Titration of PEEP is usually performed to improve lung recruitment and decrease shunt. How to optimize PEEP levels in OLV, however, remains unclear. The aim of this study was to investigate the effect of different levels of PEEP on pulmonary shunt in OLV.

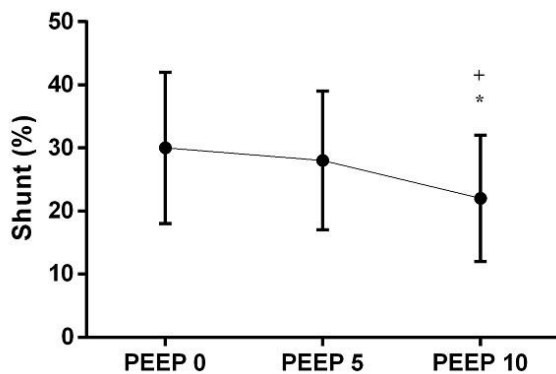
Materials and Methods: This is a prospective-observational study conducted at Sant'Anna Hospital, Ferrara. All patients >18 years undergoing scheduled thoracoscopic lobectomy or thoracoscopic wedge resection were enrolled. We collected clinical and laboratory data for each patient. PEEP was set at three levels in each patient (0, 5 and 10 cmH₂O) in random order, and pulmonary shunt was measured non-invasively using the ALPE system (Mermaid Care A/S, Nørresundby, Denmark). Differences in pulmonary shunt at each level of PEEP were analyzed with paired sample t-tests.

Results and Discussion: Thirty-one patients were enrolled Table 1.

Variable	Patients n=31
Age	68.5 [60 - 74]
BMI	26.3 ± 4.5
ASA	3 [2 - 3]
Type of surgery	
Lobectomy	20
Wedge resection	11
Lung function	
MRC scale	2 [1.5 - 3]
FEV 1 (%)	93.7 [79 - 109.5]
FEV1/FVC	73.3 [68.3 - 78.5]

[Table 1]

Pulmonary shunt significantly decreased from 30%±12% at PEEP 0 to 22%±10% at PEEP 10 ($p<0,001$), see Figure 1, with an improvement in oxygenation from 75 [69-90] to 84 [71-106] mmHg ($p<0,001$), and an increase in static compliance from 24±6 mL/cmH₂O to 30±4 mL/cmH₂O ($p<0,001$). Driving pressure was decreased from 16,5±3 cmH₂O at PEEP 0 to 11,5±3 cmH₂O at PEEP 10 ($p<0,001$), while no significant differences were detected between PEEP 0 and PEEP 5.



[Figure 1. + $p<0,001$ vs PEEP 5; * $p<0,001$ vs PEEP 0]

Conclusion(s): A PEEP level of 10 cmH₂O significantly improved shunt and static compliance compared to PEEP 0 and PEEP 5 in patients undergoing thoracoscopic surgery.

References: Loshier, Anesth Analg 2015

07AP07-2**Role of thoracic epidural anaesthesia in patients with low functional respiratory reserve during surgery for pneumothorax in the postoperative rehabilitation**

Gritsan A.¹, Mitsukov D.², Ishutin V.², Novokreshchennykh V.², Schnaider V.², Nosova L.³

¹Krasnoyarsk Regional Clinical Hospital, Krasnoyarsk State Medical University, Dept of Anaesthesiology & Intensive Care, Krasnoyarsk, Russian Federation, ²Krasnoyarsk Regional Clinical Hospital, Dept of Anaesthesiology & Intensive Care, Krasnoyarsk, Russian Federation, ³Krasnoyarsk State Medical University, Research and Development Department, Krasnoyarsk, Russian Federation

Background and Goal of Study: Atypical lung resection is a method of choice in the treatment of pneumothorax in patients with COPD, which is characterized by a decrease in external respiratory function and a high risk of pulmonary complications. Benefits of thoracic epidural anesthesia (TEA) for the postoperative course in patients undergoing thoracic surgery was proved. **Objective:** To find out the benefits of TEA in the postoperative rehabilitation of patients with severe COPD, surgically operated for pneumothorax.

Materials and Methods: A course of early postoperative period (up to 3 days) was analysed in 15 patients operated under anesthesia with sevoflurane and fentanyl combined with TEA with 0.2% ropivacaine. FEV1 dynamics and a pain intensity in points on the VAS after extubation, and in 12, 24, 48 and 72 hours after the surgery as well as duration of extubation evaluated.

Results and Discussion: In all the patients, the initial value of FEV1 made 48.6±8.4% of the proper one, and being at the lower tolerance limit of the operation it confirmed the presence of severe COPD. After 27.5±6.7 minutes after the operation 12 out of 15 patients were extubated on the table. Their FEV1 amounted 46.4±6.5%, which was not significantly different from the initial level. 3 patients needed APV because of the cardiac disease.

The characteristic value according to the VAS made 2.2±0.6 points, which was evidence of adequate anesthesia. FEV1 indicators after 12, 24, 48 and 72 hours after the operation appeared to be 52.7±8.8%, 56.2±7.5%, 59.5±9.7% and 64.6±8.3%, and corresponding values for pain assessment on the VAS made 2.0±0.4, 1.8±0.5, 2.6±0.4 and 2.5±0.7 points.

These data show the significant improvement of external respiration parameters, that, on the one hand, can be associated with a positive effect of the operation, and, on the other hand, it can be a consequence of improving drainage function together with adequate anesthesia.

Conclusion: Inclusion in the scheme of TEA anesthesia contributes to the favorable course of the postoperative period and full functional rehabilitation of patients with initial low functional respiratory reserve due to COPD during surgery for pneumothorax.

Acknowledgements: No conflict of interest.

07AP07-3**Role of cytokine release during lung resection surgery and postoperative complications**

Casanova Barea J., González M F., De la Gala F., Garutti I., Blas M., Sastre I.

Gregorio Marañón General Hospital, Dept of Anaesthesiology, Madrid, Spain

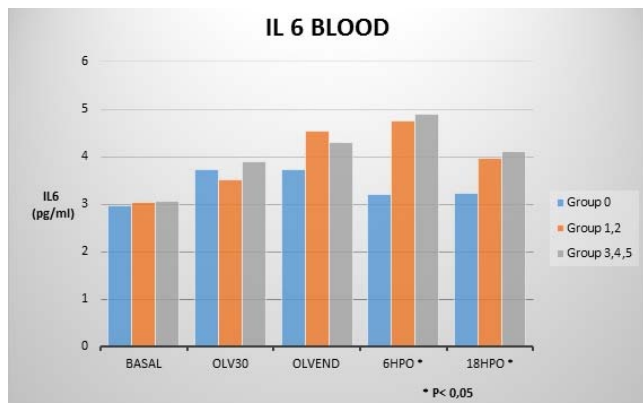
Background and Goal of Study: During lung resection surgery (LRS) with periods of one-lung ventilation (OLV), inflammatory response is mandatory and multifactorial. Several authors have demonstrated that perioperative inflammatory response could lead to postoperative surgical complications. In the last decade, has been proposed the Clavien-Dindo classification to evaluate the impact of postoperative complications on postoperative outcome. The aim of the study was to analyse the impact of intra and early postoperative local and systemic inflammatory response on the incidence of postoperative complications after LRS evaluated by Clavien-Dindo classification.

Materials and Methods: Follow-up of 174 patients undergoing pulmonary resection surgery. 84 segmentectomies, 79 lobectomies and 11 pneumonectomies or bilobectomies. Patients were divided into three groups according to Clavien Dindo classification:

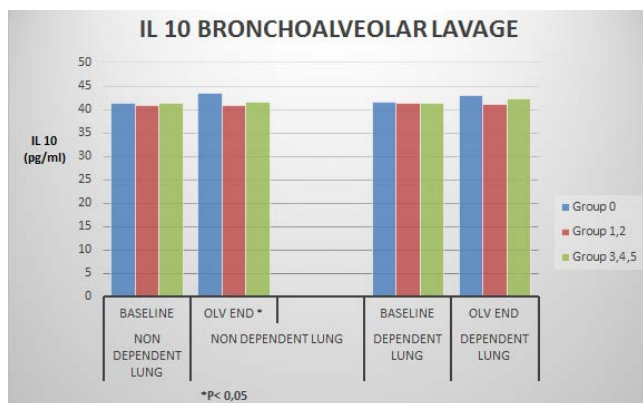
Group 0 (0) in which there were no complications. A second group (1 and 2) encompassing grades I and II of Clavien Dindo and a third group (3, 4

and 5) encompassing Clavien Dindo classes III, IV and V. Blood samples and bronchoalveolar lavage were performed in different moments for biochemical analysis.

Results and Discussion:



[IL 6 Blood sample]



[IL 10 Bronchoalveolar lavage]

Figures 1 and 2, show the more relevant results. Patients with less perioperative inflammatory response (lower IL 6, MMP 2, IL 7 levels and higher IL 10 levels) showed better postoperative outcome. In major surgery we recommend taking inflammation biomarkers measurements, to detect high-risk patients in developing postoperative complications. It'll allow the early instauration of clinical measures to improve the outcome.

Conclusion: Proinflammatory cytokines release and anti-inflammatory decrease, determine the appearance of postoperative complications and their severity.

References:

- Dindo D, et al. Ann Surg. 2004.
- Wong VW, et al. Biomed Res Int. 2013

07AP07-5

Factors associated with postoperative oxygenation impairment after surgical lung biopsy in patients with interstitial pneumonia: a single center retrospective case control study

Yamamoto N.¹, Anzai A.¹, Takaki S.², Gamo M.¹, Goto T.³

¹Kanagawa Cardiovascular and Respiratory Center, Dept of Anaesthesiology, Yokohama, Japan, ²Yokohama City University, Dept of Anaesthesiology & Intensive Care, Yokohama, Japan, ³Yokohama City University Medical Center, Dept of Anaesthesiology, Yokohama, Japan

Background: Surgical lung biopsy is a common procedure to make definitive diagnosis for interstitial lung disease. However, lung surgery for these patients sometimes worsen their oxygenation after the surgery.¹ This study is aimed to investigate the clinical factors associated with short-term postoperative oxygenation impairment in these patients.

Method: We performed a single center, retrospective case-control study. Adult patients with interstitial pneumonia (IP) admitted to ICU after surgical lung biopsy under general anesthesia with or without epidural anesthesia from April 2013 to September 2016 were enrolled this study. All the patients received oxygen administration after the operation, adjusted to keep $SpO_2 \geq 96\%$. We classified the patients as having oxygenation impairment if oxygen administration could not be discontinued in the postoperative day 1. Clinical backgrounds, operative and anesthetic factors were compared between this group and the remaining control group. As secondary outcomes, postoperative factors were also compared. Data are presented as median (interquartile range), and comparison was made by Mann-Whitney *U* test or χ^2 test. Multivariate analysis was also performed to find factors that influence early postoperative oxygenation.

Results and Discussion: 114 patients were enrolled and 46 (40.4%) were classified to oxygenation impairment group. Oxygenation impairment group had significantly higher BMI (26.5 (23.3-28.8) vs 22.0 (20.3-24.7) kg/m^2 , $p < 0.001$) and Brinkman index (400 (50-800) vs 2 (0-500), $p = 0.006$), lower DLCO% predicted (63.8 (50.3-83.5) vs 72.4 (61.7-89.4) %, $p = 0.02$), and contained more male patients (31 of 46 (67.4%) vs 28 of 68 (41.1%), $p = 0.008$) compared to control group. Combined epidural anesthesia was performed less frequently in oxygenation impairment group (28 of 46 (58.7%) vs 58 of 68 (85.3%), $p = 0.002$) and hospital stay was significantly longer (6 (5-72) vs 5 (5-23) days, $p = 0.017$). Multivariate analysis identified BMI (OR 1.22, $p = 0.026$) and epidural anesthesia (OR 0.2, $p = 0.006$) as significant factors.

Conclusion: Male, higher BMI, history of smoking, lower DLCO and lack of epidural anesthesia were factors associated with oxygenation impairment in early postoperative period of surgical lung biopsy for IP

References: 1. Luo, Q. *et al.* The diagnosis efficacy and safety of video-assisted thoracoscopy surgery (VATS) in undefined interstitial lung diseases: a retrospective study. *J. Thorac. Dis.* 5, 283-8 (2013).

07AP07-6

Pulmonary inflammatory response modulation by esmolol in a one-lung ventilation experimental model during lung resection surgery

Ramos S.¹, Garutti I.¹, Chamorro E.¹, Rancan L.², Vara E.², Simón C.³

¹Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Universidad Complutense de Madrid, Biochemistry, Madrid, Spain, ³Hospital General Universitario Gregorio Marañón, Thoracic Surgery, Madrid, Spain

Background and Goal of Study: One-lung ventilation (OLV) is usually needed in lung resection surgery (LRS) and is associated with lung inflammatory response (LIR). Esmolol (E) modulates this response in different clinical settings. The aim of this study was to determine the role of E on the LIR induced by LRS with OLV.

Materials and Methods: 21 mini-pigs were randomly assigned to 3 different groups: CONTROL (C), ESMOLOL group (E), or SHAM (S). E group received an intravenous esmolol bolus (0.5mg/kg) after induction, and then a continuous perfusion of 0.05 mg/kg/min during whole procedure. Sham group underwent a left thoracotomy, without being exposed to LRS or OLV. At the end of LRS the animals were awakened and after 24 hours they received another general anesthesia to obtain lung biopsies. Bronchoalveolar lavages and lung biopsies were analysed to measure different biomarkers of inflammation, apoptosis and glycocalyx damage. Data are expressed as mean \pm standard deviation. ANOVA test was used to determine differences between 3 groups. Mann-Whitney test was used to compare C vs E groups. Values of $p < 0.05$ were considered significant.

Results: Results are shown in table 1 and 2.

		BASELINE Mean (SD)	OLV 2hours Mean (SD)	Two Lung Ventilation Mean (SD)	24 hours postop. Mean (SD)
IL1 (pg/ml)	CONTROL	131 (18)	248 (42) (p<0.001)	312 (40) (p<0.001)	405 (24) (p<0.001)
	ESMOLOL	134 (9)	141 (11)	219 (17)	278 (24)
TNF (pg/ml)	CONTROL	62 (2.6)	192 (45) (p=0.001)	206 (37)	142 (15) (p=0.05)
	ESMOLOL	61 (2.7)	119 (15)	166 (24)	123 (15)
NO (pg/ml)	CONTROL	21.4 (2.8)	13.6 (2.1) (p=0.023)	14.7 (2.5) (p=0.002)	14.9 (1.2) (p<0.001)
	ESMOLOL	21.6 (2.0)	18.1 (2.8)	20.8 (0.8)	20.4 (1.8)
MMP2 (pg/ml)	CONTROL	3.66 (0.26)	11.12 (1.62) (p=0.003)	12.20 (2.53)	21.54 (6.84) (p<0.001)
	ESMOLOL	3.66 (0.40)	8.49 (1.01)	10.25 (0.59)	10.46 (0.70)

[Bronchoalveolar biomarkers (sig p value E vs C)]

	GROUP	BASELINE	ML 24H	LSL 24H
TNF-alpha (pg/ml)	CONTROL	0.157(0.017)	0.405(0.062) p=0.009	0.497(0.04) p=0.009
	ESMOLOL	0.168(0.098)	0.21(0.097)	0.25(0.089)
SYNDECAN (pg/ml)	CONTROL	7.27(0.7)	5.27(0.92)	3.302(0.46) p=0.032
	ESMOLOL	7.09(1.02)	5.14(1.07)	4.32(0.56)
ICAM (pg/ml)	CONTROL	46.93(1.96)	58.92(5.07) p=0.009	86.71(4.47) p=0.009
	ESMOLOL	45.85(2.32)	47.54(0.16)	68.06(0.67)
LUNG EDEMA (wet/dry weight)	CONTROL	70.14(1.6)	87.42(1.5) p=0.006	84.4(0.5) p=0.006
	ESMOLOL	68.35(1.9)	73.08(3)	71.95(1.8)

[Table 2 Lung biopsies]

Conclusions: To our knowledge, no work has previously investigated the effects of E regarding LIR, apoptotic, and glycolix response during LRS. We have shown an attenuation of this response to OLV by the administration of E. Antiinflammatory effects related with antagonism of B1 receptors during LRS could be the responsible of these effects during LRS.

07AP07-8

Choice of ventilation by video-assisted thoracoscopic surgery by thymectomy

Zhikharev V., Malyshev Yu.P., Baykova E.E.

Scientific Research Institute - Krasnodar Regional Hospital named after the Professor S.V. Ochapovsky, Dept of Anaesthesiology, May, Russian Federation

Background and Goal of Study: To compare the noninvasive support ventilation (NIV) with mechanical ventilation and endobronchial intubation by video-assisted thoracoscopic surgery (VATS) by thymectomy.

Materials and Methods: The study included 22 patients who underwent VATS by thymectomy, because of generalized myasthenia gravis. Depending on the method of ventilation, they were divided in 2 groups: "A" - with endobronchial intubation and mechanical ventilation in low-flow sevoflurane anesthesia; "B" - with auxiliary lungs ventilation through the epiglottis (Pressure Support 4-7 cmH₂O) and propofol-based total intravenous anaesthesia (TIVA). All patients received epidural anesthesia with norapin. Intraoperative monitoring done by the Harvard standard. Originally, in 15 minutes after incision, removing of the preparation and finishing of anesthesia PvCO₂, pH, SpO₂, MAP, glycemia was controlled. The results are presented in the form of (M ± σ), * - notation for intergroup differences (p < 0.05).

Results and Discussion: Length of the surgery in group "A" - 76 ± 13.4 minutes and in "B" group - 76 ± 12.2 min (p>0.05). MAP in group "A" in the study stages: 94 ± 7.4; 101 ± 8.4; 74 ± 8.4; 92 ± 8.1 mm Hg; and in the "B" group: 88 ± 9.0; 63 ± 5.1 *; 61 ± 6.1 *; 65 ± 7.2 * mm Hg. PvCO₂ in group "A": 39 ± 3.6; 40 ± 4.1; 39 ± 4.2 and 38 ± 3.6 mmHg and in the group "B" - 37 ± 3.1; 54 ± 6.1 *; 58 ± 3.2 * and 46 ± 3.1 * mmHg. The level of glucose in the group «A»: 5.6 ± 2.1; 6.8 ± 1.34; 7.2 ± 1.22; 6.6 ± 1.21 mmol / l, and in the second group - 5.5 ± 2.22; 6.2 ± 2.13; 5.7 ± 1.6 *; 5.8 ± 0.6 * mmol / l. Blood pH level

in the group «A»: 7.40 ± 0.05; 7.37 ± 0.04; 7.37 ± 0.04; 7.42 ± 0.02, in the "B" group: 7.41 ± 0.03; 7.33 ± 0.03; 7.28 ± 0.01*; 7.35 ± 0.02*. Oxygen saturation of hemoglobin in groups - 94% initially and 99% in the research stage. Indicators of recovery of patients are shown in Table.

Parameters	Group «A»	Group «B»
Period of extubation	44±8,2	2±0,8*
Start moving (min)	467±46,6	69±7,5*
Nosea and vomiting (cases)	2	0
Transport to the Unit (hours)	18±3,1	8±1,4*
Release from hospital (days)	7,4±0,68	5,6±0,81*

[Indicators of recovery of patients with mechanical]

* - P < 0.05 between-group differences (Kruskal-Wallis test).

Conclusion(s): NIV does not break the neuromuscular conduction by myasthenia, provides clinically stable intraoperation period and reduces the time of recovery in patients.

07AP07-9

Tracheal resection in the patient with consequences of severe chest and head trauma - the role of dexmedetomidine

Panafidina V., Kovalev M., Cherniy S., Rusanov A.

First Pavlov State Medical University, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation

Background: Dexmedetomidine is a selective α₂-adrenergic agonist that has sedative and analgesic properties with associated reduction in opioid and anesthetic requirements. We present a case of a man with post-intubation stenosis. The patient had a difficult airway because of posttraumatic ankyloses of temporomandibular joints, moderate tricuspid valve regurgitation and post-traumatic epilepsy. Dexmedetomidine was used during operation time and in postoperative period for sedation.

Case report: A 54-years-old, 73-kg man presented with a 1-year history of increasing difficulty in breathing. He had a car accident 1,5 years before. He had been intubated and mechanical ventilation had been performed for 28 days. He had a difficult airway because of posttraumatic ankyloses of temporomandibular joints, moderate tricuspid valve regurgitation after blunt chest trauma and posttraumatic epilepsy. A computed tomographic image revealed the tracheal stenosis of the 3 to 7-8 cartilage. Stenosis involved the membranous part of the trachea, so due to risk of disruption we refused a rigid bronchoscopy and dilation. We used a prolonged infusion of dexmedetomidine in dose 0.3 mcg/kg/h. After achievement of adequate sedation level, we inserted a laryngeal mask. We inserted the guide wire in the trachea through the flexible fiberoptic bronchoscope and the catheter for jet ventilation. We started infusion of propofol 2 mg/kg/h and used a bolus of fentanyl (0.1 mg 4 times), rocuronium bromide in initial dose 40 mg and 10 mg after that every 30 min. When the trachea was reconstructed, an endotracheal tube 7,0-mm was placed in trachea. Propofol infusion was stopped and inhalation of 2% of sevoflurane was started. When the chin was drowning to the anterior chest wall, the patient was allowed to awaken by discontinued of sevoflurane. Extubation was successful and the patient was comfortable and breathing easily in the semi-sitting position. Hemodynamic was stable during all the operation time. The dexmedetomidine infusion was prolonged in ICU in dose 0.2 mcg/kg/h for postoperative sedation.

Discussion: This is the first case of the the anesthesia with dexmedetomidine for tracheal resection in patient with high-risk of difficult airway and cardiovascular instability.

Learning Points: Dexmedetomidine appeared to be a useful and safe drug for intra- and postoperative management for tracheal resection in high-risk patients.

07AP07-10**The oxygenation during one lung ventilation for patients with previous lung resection is affected by the previous surgical side**

Tomita A., Toyota K., Kosobe K., Yamashita S.
Kurashiki Central Hospital, Dept of Anaesthesiology, Kurashiki, Japan

Background and Goal of Study: One lung ventilation (OLV) is a greater challenge to the anesthesiologist when the ventilated lung has previously been resected. Potential changes after lung resection include decreases in lung diffusion capacity and reserve of vascular bed. However, there are no controlled studies describing OLV management in patients with a history of lung resection. This retrospective study aimed to investigate the oxygenation during OLV in patients who previously underwent lung resection.

Materials and Methods: The data of patients who underwent unilateral lung resection under OLV using double lumen tube between January 2013 and March 2016 in our institution were investigated.

Ninety-three patients with a past history of lung resection were included as a previous lung resection group (Group P). The subjects of Group P were divided into two groups for subgroup analysis, a previous ipsilateral lung resection group and a contralateral lung resection group. A consecutive 93 patients without a past history of lung resection were allocated as the control group (Group C).

The P/F ratio during OLV was collected from the electronic medical record. We excluded cases of data unavailability, rescue CPAP application using oxygen on non-dependent lung and/or interruption of OLV for surgical request.

Statistical analysis was performed using the Mann Whitney U test for comparing Group C and Group P. Kruskal-Wallis one-way analysis of variance and Bonferroni multiple comparison test were performed for subgroup analysis. We defined $p < 0.05$ as statistically significant.

Results: Forty-three cases of Group P and fifty-one cases of Group C were analyzed after exclusion. There was no significant difference in the median values of the P/F ratio in Group P and Group C. Subgroup analysis revealed that the median value of the P/F ratio in the contralateral lung resection group ($N=29$) was significantly lower than that of Group C (119 vs. 189, $p < 0.01$), whereas that of the ipsilateral resection group ($N=14$) was significantly higher than that of Group C (251 vs. 189, $p < 0.01$).

Conclusion(s): These results indicate that a history of contralateral lung resection resulted in depressed oxygenation during OLV. Conversely, a history of ipsilateral lung resection can be an advantage in OLV management. Further investigation in the changes of respiratory mechanics after lung resection is required.

07AP08-1**Is Invasive pressure monitoring more reliable than non-invasive in patients with cardiovascular pathology? A case report**

Fernandes A., Coimbra L., Delgado I., Carvalho J., Bentes C.
Centro Hospitalar de Vila Nova de Gaia/Espinho, Dept of Anaesthesiology, Vila Nova de Gaia, Portugal

Background: Patients undergoing carotid endarterectomy (CEA) require strict arterial blood pressure (BP) control to maintain adequate cerebral perfusion. Invasive blood pressure (IBP) is the gold standard, however artifacts may lead to erroneous readings. We report a case of CEA using IBP monitoring.

Case report: A 64-year-old man, American Society Anaesthesiology (ASA) physical status 3 (diffuse atheromatosis, dyslipidemia and non-medicated hypertension), was presented for an elective right CEA. ASA standard, neuromuscular block monitoring, anesthesia depth and cerebral oximetry were used as monitorization. On preanaesthetic assessment noninvasive BP (NIBP) had no significant difference between right and left arms (180/90mmHg). IBP monitoring was placed in left radial artery after several attempts in both arms. Surgery was performed under balanced general anesthesia (GA). Intraoperatively the patient remained stable (140/86mmHg) however the systolic carotid artery stump pressure (SP) was 210mmHg. This finding was confirmed by measuring NIBP in both legs. At this point NIBP was used to monitor and guide the BP target until the end of the procedure and during postoperative period (PO) in postanesthetic care unit (PACU). Surgery proceeded

uneventfully. After discharge to the ward (48h stay at PACU), a hypertensive crisis lead to cervical neck haematoma which required emergent surgery under GA. Intraoperatively the BP was assessed with NIBP. After a new period of 48h at PACU the patient was discharged to the ward and subsequently from the hospital on the 8th postoperative day, without further complications.

Discussion: BP allow beat-by-beat measures with optimization of BP in order to improve cerebral perfusion during CEA. NIBP may be an alternative, however is not continuous and is expected to be less accurate than the IBP. The high IBP-NIBP difference (>40 mmHg) was clinically relevant and in this patient might be explained by diffuse atheromatosis. NIBP was compatible with carotid SP, indicating that, in this case was a reliable and accurate method of monitoring.

References: 1. Romagnoli S et al. Accuracy of invasive arterial pressure monitoring in cardiovascular patients: an observational study. *Critical Care*. 2014;18:644.

Learning points: IBP can be inaccurate in patients with diffuse atheromatosis. This pathology may have clinical relevance and may demand non-invasive arterial pressure measurement during and after surgery.

07AP08-2**Reliability of haemodynamic monitoring using arterial waveform analysis in major peripheral vascular surgery**

Lauretta M.P., Courtois N., Illingworth J., Gautama S., Sidhu V., Platt M.
Imperial College. St Mary's Hospital, Dept of Anaesthesiology, London, United Kingdom

Background: Recent guidelines from UK health service suggest that haemodynamic monitoring should be used in high risk patients undergoing major surgery to reduce mortality, morbidity and reduce costs. However, in vascular surgery, haemodynamic monitoring is challenging, and the expensive and invasive pulmonary artery catheter (PAC) remains the gold standard for cardiac output (CO) monitoring. Aim of this study is to verify if the less invasive Flo/Trac Vigileo system, based on arterial waveform analysis, and patient's age, sex, height, weight, correlates with the expected physiological changes of arterial clamping/unclamping in vascular surgery.

Materials and Methods: The FloTrac/Vigileo system estimates CO by multiplying the HR by the SV. This stroke volume is averaged and displayed every 20 s. We used version 1.9 of the software.

Six patients undergoing elective femoral-popliteal bypass between October 2016 and December 2016 were enrolled. Exclusion criteria were: spontaneous breathing, atrial fibrillation, moderate or severe valvular disease, intracardiac shunts, ascites.

Cardiac Index (CI), Cardiac Output (CO), Stroke Volume (SV), Stroke Volume Variation (SVV), Stroke Volume Index (SVI), Systemic Vascular Resistance (SVR) and Systemic Vascular Resistance Index (SVRI) were recorded at this timing: at incision, arterial clamping, every 10 min after clamping/unclamping.

Results: The CI, SVI, and SVRI were used for the analysis to eliminate the effect of physical size.

Statistical differences were assessed using a paired T-test. P values < 0.05 were considered statistically significant. In all our cases application of clamping caused a sudden increase in SVRI (15%) and BP, due to the sudden impedance to arterial flow and increased LV afterload ($p < 0.05$). In one case we recorded a significant decrease in CI (14%) and SVI (15%) as a result of myocardial dysfunction.

Removal of arterial clamping resulted in a sudden decrease in SVRI (16%) and BP, due to reperfusion. SVI increased as a result of venodilation and decreased preload (14%), ($p < 0.05$).

Conclusion: This study, even if performed without using PAC for comparison, have shown a good correlation between arterial wave form analysis derived parameters and the expected physiological changes of arterial clamping and unclamping. These semi invasive devices may be promising among high risk patients undergoing peripheral vascular surgery to monitor and optimise CO. This hypothesis is still under investigation.

07AP08-4**Can statin decrease postoperative atrial fibrillation?**Omae T.*Juntendo Shizuoka University Hospital, Dept of Anaesthesiology, Izunokuni, Japan*

The impact of postoperative atrial fibrillation (PAF) on patient outcomes has prompted intense investigation into the optimal methods for prevention and treatment of this complication. Statins feature documented benefits for primary and secondary prevention of cardiovascular disease and are thought to improve perioperative outcomes in patients undergoing surgery.

280 patients underwent CABG in our hospital from 2010 to 2013. Patients were divided into two groups to examine the influence of statins: those with preoperative statin therapy (Statin group, n = 141) and those without it (Non-statin group, n = 139). In addition, patients were divided into two groups to determine the independent predictors for postoperative AF: those with postoperative AF (AF group, n = 61) and those without it (Non-AF group, n = 219). Patient data were collected and analyzed retrospectively.

The overall incidence of postoperative AF was 28%. Postoperative AF was significantly lower in the Statin group compared with the Non-statin group (16% versus 33%, p = 0.005). Multivariate analysis demonstrated that independent predictors of AF development after CABG were preoperative statin therapy (odds ratio [OR] 0.311, 95% confidence interval [CI] 0.116 to 0.911, p = 0.04) and age (OR 1.051, 95% CI 1.017 to 1.121, p = 0.02).

07AP08-5**EEG monitoring during endovascular treatment for carotid obstruction: a case report**Cavalcante S.L.F.¹, Nunes R.R.¹, Lopes C.G.², Fernandes M.B.C.¹, Sales A.J.B.¹, Lima F.B.¹*¹Hospital Geral de Fortaleza, Dept of Anaesthesiology, Fortaleza, Brazil, ²Hospital Sao Carlos, Dept of Anaesthesiology, Fortaleza, Brazil*

Background: Proper brain functioning depends on the balance between neuronal metabolism and cerebral circulation. Carotid obstruction causes the loss of this balance, and cerebral distress. Electroencephalographic monitoring using BIS generates timely information on the depth of anesthesia and the state of cerebral hypoperfusion, quantified as suppression rate (SR). In this case report we describe EEG changes in a patient with carotid obstruction and show the importance of EEG monitoring during endovascular treatment.

Case report: A 59-year-old hypertensive and diabetic man has a history of 5 episodes of transient ischemic attack. Arteriography of the carotids showed 100% obstruction on the left side and 95% on the right side, with indication for endovascular treatment with stenting of the right carotid (RC). Upon admission, the patient was awake, responsive to verbal commands, despite attention deficit. Initial findings: BP=117x78 mmHg, HR=55 bpm, BIS=75, BSR=4%, and slow EEG with low amplitudes, compatible with neuronal distress. Dexmedetomidine i.v (1 µg.kg⁻¹ for 10 min, then 0.5µg.kg⁻¹.h⁻¹) and fentanyl i.v.(100 µg) were infused.



[Pic. 1]

A filter and a stent were placed in RC. Before ballooning, adrenaline (5µg i.v.) was administered and findings were: HR=84 bpm, BP=168x93 mmHg, BIS=75, BSR=4%. After ballooning, BIS=73-74 and BSR=0. The neurological status was satisfactory and the RC was well perfused (BIS=90 and BSR=0). After a few minutes, BSR was again 4% and a new image revealed vasospasm in RC. The filter was removed, resulting in BIS=90 and BSR=0. Upon emergence, the patient was oriented, without neurological deficits.

Discussion: Cerebral monitoring during endovascular treatment for carotid obstruction made it possible to observe electrical changes (burst suppression) due to compromised brain perfusion.

Learning Points: The SR monitoring allows us to verify changes of brain perfusion during treatment for carotid obstruction.

Reference: 1. Li J, Shalabi A, Ji F, Meng L. Monitoring cerebral ischemia during carotid endarterectomy and stenting. J Biomed Res. 2017, 31 (1):00-00 in press

07AP08-6**Anesthetic management of aortic-bicarotid double bypass graft. A case report**Gomez Diago L., Reina-Giménez C., Hernández-Cádiz M.J., Alós-Zaragoza L., Ripoll-Vidal A., De Andrés J.*Consorcio Hospital General Universitario de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain*

Background: The perioperative management of aortic-bicarotid double bypass (ABDB) surgery is a challenge by the limited scientific literature on that subject, the morbidity and mortality associated with the patient's condition and the complexity of the surgery and postoperative management.

Case report: 72-yr-old male, ASA III intervened by AAA stent placement in 2010, followed up by increased size asymptomatic aortic arch aneurysm with hematoma in descending thoracic aorta. During the preoperative echo study highlights left ventricular hypertrophy with normal contractile function overall. Previous neurological exam was within normal. Surgery is planned preferential basis by the placement of an aortic prosthesis bicarotid, so a partial clamping of ascending aorta and bicarotid was required. Basic intraoperative monitoring (ECG, SpO₂, EtCO₂, urine output) with an arterial line placement in left radial artery before anesthetic induction to control arterial pressure and monitoring regional oxygenation saturation of brain with InVivo Metric® system (initial parameters R65/L64). During left carotid clamping monitoring parameters sudden decrease (InVivo Metric® R70/L35) so it alerted to anesthesia-surgical team and cerebral protection measures with 100% oxygen therapy breathing and MAP > 70 mmHg were established obtaining improved parameters (R85/L49). After clamping resolution an improvement in monitoring parameters near to initial values was found. The patient's clinical stability encouraged for early extubation in order to neurological examination (slight paresis in the right arm). At 4 hours, he had a sudden cardiac arrest, which recovered after cardiac massage and administration of adrenaline ev.

(1 mg). Major bleeding is caused through drainage tubes requiring surgical revision. A hematoma on the back part of the ascending aorta and the dissection aortic intima causing false lumen were evidenced this time. The gravity of the situation and the serious complication led to the patient to die.

Discussion: Performing an ABDB is a high-risk procedure in patients with important morbidity and mortality. Complications during surgery are frequent and early treatment should be instituted. Postoperative management requires close monitoring of the patient.

Learning points: Needing regional monitoring oxygen saturation and advanced invasive monitoring. Treating early complications. Waking up early for neurological assessment. Strict control of blood pressure and adequate analgesia.

07AP08-7**Anaesthesia for renal autotransplantation and ex vivo renal artery aneurysm repair - a case report**

Fernandes A., Ferreira E., Carrapatoso I., Oliveira C.
Centro Hospitalar de Vila Nova de Gaia/Espinho, Dept of Anaesthesiology, Vila Nova de Gaia, Portugal

Background: Renal autotransplantation is an alternative for treating rare renal artery aneurysm.¹ We report the challenging anaesthetic management of ex vivo complex Aneurysmorrhaphy with Autotransplantation (AA) after a laparoscopic nephrectomy.

Case report: A 73-year-old woman, American Society of Anaesthesiology (ASA) physical status 3 (hypertension, diabetes mellitus, multinodular goiter, dyslipidemia) was presented for elective ex vivo AA (aneurism with 28 mm of diameter). After premedication with intravenous (IV) midazolam 1mg, low thoracic epidural catheter was placed at T11-T12 for postoperative (PO) analgesia. General anaesthesia was induced with IV fentanyl 150mcg, propofol 70 mg, rocuronium 50 mg and maintained with desflurane, O₂ and air. ASA standard, invasive blood pressure (BP), central venous pressure (CVP), neuromuscular block, depth of anaesthesia and cerebral oximetry monitoring were used. Urine output (UOP) and arterial blood gas were measured hourly. Crystalloids were given to maintain UOP >1ml/Kg/h, high CVP and systolic blood pressure (SBP) > 120 mmHg before nephrectomy.

During the bench surgery a CVP of 6-7 cmH₂O was obtained. After kidney transplantation and before unclamping, mannitol 0.25g/kg and furosemide 100mg were administered. CVP and SBP were increased to 15 cmH₂O and 140mmHg, respectively, with adequate UOP. The surgery lasted 8 hours, with total ischemia time of 3 hours. Analgesia was attained using continuous epidural infusion of ropivacaine 0.2%, epidural bolus of morphine and IV acetaminophen. The patient was hemodynamically stable, without significant metabolic or electrolytic abnormalities and minimal blood loss throughout the intra and PO period. She was discharged on the 8th PO day with well-preserved renal function.

Discussion: Ex-vivo AA demands proper intraoperative management according to the surgery phase with maintenance of adequate UOP. Invasive monitoring is required to achieve this goal. Mannitol and furosemide are given to protect the kidney and improve graft viability. Colloids and drugs that may cause renal lesion should be avoided.

References: 1. Min E-K et al. Renal autotransplantation in open surgical repair of suprarenal abdominal aortic aneurysm. *Ann Surg Treat Res.* 2015; 89(1): 48-50.

Learning Points: Success of the autotransplanted kidney depends on preoperative optimization, intra operative hemodynamic stability and invasive monitoring during perioperative period.

07AP08-8**Regional cerebral oxygen saturation is a useful predictive factor of postoperative cerebral infarction in acute dissection of aorta involving the aortic arch**

Kosobe K., Toyota K., Tomita A., Yamashita S.
Kurashiki Central Hospital, Dept of Anaesthesiology, Kurashiki, Japan

Background and Objectives: Cerebral malperfusion is a serious complication in the anesthetic management of patients with acute type A dissection of aorta (DA). Especially, cerebral perfusion can be restricted if the dissected area involves the aortic arch and the cervical branches.

Although previous studies have reported that operation time and an intraoperative depression of regional cerebral oxygen saturation (rSO₂) can be predictive factors for detecting cerebral malperfusion in patients with DA, the sensitivity and specificity are unclear in subjects with DA involving the aortic arch. In addition, independent risk factors other than rSO₂ for cerebral malperfusion in patients with DA involving the aortic arch are yet to be investigated. We conducted this study to investigate the factors which are correlated with postoperative cerebral infarction (CI) in patients with DA involving the aortic arch.

Materials and Methods: We included 85 patients who underwent urgent aortic surgery involving arch dissection from December 2010 to October 2016. The patients were divided into two groups on the basis of the occurrence of postoperative CI: a CI group and non-CI group.

Data of operation time, cardiopulmonary bypass time, aortic clamping time, selective cerebral perfusion time, circulatory arrest time, amount of bleeding, amount of transfusion, and rSO₂ values were collected from the anesthesia record. The time duration of rSO₂ depression of less than 50% were accumulated for each patient.

Statistical analysis was performed using the non-paired t-test, logistic regression, and receiver operating characteristic curve (ROC) analysis.

A p value of less than 0.05 was considered as significant.

Results: There were 28 and 57 patients allocated to the CI group and non-CI group, respectively.

Through descriptive analysis and logistic regression, independent risk factors for CI were as follows: operation time (OR=1.01, 95%CI 1.00-1.02), and time duration of rSO₂ below 50%(OR=1.01, 95%CI 1.00-1.02).

ROC analysis revealed that an rSO₂ depression below 50% of longer than 39 minutes was a significant independent predictor of postoperative CI (Sensitivity: 75% Specificity: 67%, P=0.0003).

Conclusion: Our results indicate that prolonged depression in rSO₂ and operation time are useful predictors for postoperative CI in patients with DA involving the aortic arch. Early intervention for cerebral perfusion is needed in patients who experience a prolonged rSO₂ depression.

07AP08-9**A case of undiagnosed GI bleed discovered after the endovascular repair of an infrarenal aortic aneurysm**

Teodora N., Roberts P.
OUHSC, Dept of Anaesthesiology & Intensive Care, Oklahoma City, United States

Background: 89 years old trauma patient, which had an infrarenal aortic aneurysm discovered on CT scan, comes in for endovascular repair. The case is done under MAC, during the case the patient experiences desaturations leading to an LMA placement and uneventful surgery. 2units OF PRBC given for a hemoglobin of 7.5gm/dl.

Repeat gas in PACU shows hemoglobin of 7gm/dl. The patient starts having difficulty breathing is intubated and search for occult bleeding started. In ICU the patient has melanic stool and a large ulcer is discovered on endoscopy.

Despite having gone into hemorrhagic shock the patient recovered and was discharged home.

Case report: Undiagnosed GI bleed discovered after an infrarenal endovascular aneurysm repair.

Discussion: There is a proven association between aortic vascular disease and H.pylori positive patients.

References: The association between aneurysm of the abdominal aorta and peptic ...gut.bmj.com/content/11/8/679.full.pdf by AW Jones - 1970 - Cited by 35 - Related article.

Learning points: There is a proven association between H. pylori presence and aortic/carotid disease. High risk patients: male, age over 66, with vascular disease should be tested for H. pylori presence.

07AP08-10**Impact of hemodilution using hydroxyethyl starch 130/0.42 on whole blood viscosity and tissue oxygen delivery**

Kim T.-Y.¹, Kim K.¹, Choi D.-K.², Oh E.³, Yon J.⁴

¹Konkuk University Medical Center, Dept of Anaesthesiology, Seoul, Korea, Republic of, ²Asan Medical Center, College of Medicine, University of Ulsan, Dept of Anaesthesiology, Seoul, Korea, Republic of, ³Seegene Medical Foundation, Research and Development Department, Seoul, Korea, Republic of, ⁴Sanggye Paik Hospital, Dept of Anaesthesiology, Seoul, Korea, Republic of

Background and Goal of Study: Acute normovolemic hemodilution (ANH) has long been employed for reducing allogenic blood transfusion for cardiac surgery, and hydroxyethyl starch (HES) has been used as a replacement fluid for ANH. However, possible impact of ANH employing HES on whole blood viscosity (WBV) and tissue oxygen delivery index (TODI) have not been well investigated in patients undergoing off-pump coronary artery bypass (OPCAB) surgery.

Methods: Anaesthesia was induced and maintained by using propofol-remifentanyl-rocuronium in OPCAB surgery (n=21). ANH was performed by using 5 ml/kg of blood salvage and administering 5 ml/kg of balanced HES 130/0.42 for 15 min during vascular graft harvesting. For the present study, three whole blood samples (3 ml each) were taken from arterial line before (Sample 1) and after ANH (sample 2 and 3) and they were stored in 3 EDTA tubes. Sample 3 (in tube) underwent further 30% in-vitro dilution by adding 1-1.5 ml HES. By using a noble scanning capillary tube viscometer (Hemovister™), WBVs at high and low shear rates (300/s and 5/s, SBV and DBV, respectively) of the three samples were determined. Clotting formation time (CFT) and maximum clot formation (MCF) in EXTEM and amplitude at 10 min (A10) in FIBTEM were also determined by using ROTEM. Tissue oxygen delivery index (TODI) of sample was calculated (=hematocrit/DBV).

Results: SBV and DBV of sample 1, 2 and 3 showed significant differences. TODI, hematocrit, CFT-EXTEM, MCF-EXTEM and A10-FIBTEM of sample 2 and 3 showed significant differences (Table 1). TODI showed significant negative correlation with SBV, DBV and hematocrit ($r=-0.297$, $r=-0.302$, and $r=-0.697$, respectively, all $p<0.05$ in Pearson correlation).

Conclusion(s): ANH 5 ml/kg significantly reduced WBV, but it did not affect TODI nor coagulation profile. In contrast, further 30% dilution significantly increased WBV and TODI and reduced viscoelastic coagulation profiles. Further study to find the degree of ANH, which can increase TODI, reduce WBV and coagulation profiles, is warranted.

References:

1. Yi JE, Youn HJ. Perfusion 2016 Jul 20 [Epub ahead of print]
2. Lee SR, et al. Clin Hemorheol Microcirc 2013;55:85-94.

	Sample 1	Sample 2	Sample 3	P
SBV (cP)	3.9±1.2	3.3±0.5*	2.6±0.4**	<0.001
DBV (cP)	10.9±4.2	9.0±2.7*	5.3±2.0**	<0.001
Hct (%)	36(30-38)	34(31-35)	22(12-25)**	<0.001
TODI (%/cP)	1.5(1.3-1.7)	1.6(1.4-2.1)	2.9(2.1-4.4)**	<0.001
CFT _{EXTEM} (s)	73(63-90)	87(79-101)	197(148-356)**	<0.001
MCF _{EXTEM} (mm)	66±6	65±4	46±10**	<0.001
A10 _{FIBTEM} (mm)	21±18	15±5	5±3**	<0.001

Data are median (IQR) or mean±SD

SBV: WBV at shear rate 300/s, DBV: WBV at shear rate 5/s, TODI: Tissue oxygen delivery index (=hematocrit/DBV), cP: centi Poise.

*: $P<0.05$ vs Sample 1, †: $p<0.05$ vs Sample 2 by RM-ANOVA with Bonferroni t-test or Friedman RM-ANOVA ranks with Turkey test.

[Table 1. Sample analyses]

07AP09-1

Ability of Capstesia™, a new smartphone Pulse Pressure Variation (PPV) and Cardiac Output (CO) application, to predict fluid responsiveness in mechanically ventilated patients

Boudart C.¹, Joosten A.¹, Desebbe O.², Huybrechts I.¹, Barvais L.¹, Van Obbergh L.¹

¹Erasmie ULB Bruxelles, Dept of Anaesthesiology, Bruxelles, Belgium, ²Clinique de la Sauvegarde, Dept of Anaesthesiology & Intensive Care, Lyon, France

Background: In mechanically ventilated patient, fluid responsiveness (FR) can be predicted using PPV and evaluated by monitoring CO. Capstesia™ is a new smartphone application which automatically calculates PPV and CO from a digital picture of the arterial waveform from any monitor.

The primary goal of this study was to compare the ability of PPV obtained with the Capstesia™ application (PPVcap) against pulse contour technology (PulsioFlex™ Monitor, Maquet) (PPVpc) to predict FR.

The secondary goal was to assess the trending ability of CO obtained with the Capstesia™ application (COcap) compared to the gold standard transpulmonary thermodilution method (COtd).

Methods: After ethical approval and written informed consent, mechanically ventilated patients undergoing CABG were included. FR was defined as an increase in COtd greater than 10% following a volume expansion of 5 mL/kg ideal body weight of 3% modified gelatine. COtd measurement, COcap and PPVcap were obtained simultaneously. COtd, COcap, PPVcap and PPVpc were all obtained before and after the fluid loading. A ROC curve analysis

determined the ability of PPVcap and PPVpc to predict FR. The agreement between COcap and COtd was assessed with the Bland-Altman analysis. The ability of COcap to follow the variations of COtd before and after fluid loading was assessed by a four-quadrant plot analysis.

Results: A total of 57 patients were included. There was no difference in the ability of PPVcap and PPVpc to predict FR (AUC 0.736 (CI95%: 0.603-0.844) vs. 0.677 (CI95%: 0.540-0.795, $p=0.3$). PPVcap >7.6% could predict FR with a sensitivity of 85% and a specificity of 58% whereas PPVpc >10.3% could predict FR with a sensitivity of 54% and a specificity of 81%. Mean COcap was 5.2 L/min (range: 4.1-9.6 L/min) and mean COtd was 4.9 L/min (range: 4.0-8.7 L/min). The Bland-Altman analysis showed a mean bias of 0.3 L/min with limits of agreement of -2.8 L/min and +3.3 L/min, the percentage error was 60%. The concordance rate between variations of COtd and COcap was 73% (95%CI: 68-78).

Conclusion: Our findings show that PPVcap and PPVpc can both weakly predict fluid responsiveness. The CO calculated by Capstesia™ application is not in agreement with the gold standard pulmonary thermodilution method and cannot be used to assess the fluid responsiveness.

07AP09-2

Effects of anaesthesia induction on microvascular reactivity monitored by near-infrared spectroscopy: is there a difference between smokers and non-smokers?

Willems H., Lapage K., De Hert S., Moerman A.

Ghent University Hospital, Dept of Anaesthesiology, Ghent, Belgium

Background and Aim of Study: Recent research has indicated that induction of anaesthesia impairs microvascular reactivity. Also smoking is known to affect microcirculation. The aim of the present study is to evaluate if the effect of anaesthesia on microvascular reactivity is more pronounced in smokers than in non-smokers.

Materials and Methods: After approval by the local ethics committee and written informed consent, adult patients scheduled for elective coronary artery bypass grafting surgery were recruited prospectively. Twelve actually smoking patients were included. The control group consisted of 12 case-control matched non-smoking patients. Matched variables were gender, age, weight, haemoglobin and PaO₂. Microvascular reactivity was assessed by the postocclusive reactive hyperaemia (PORH) response, measured with near-infrared spectroscopy (NIRO-200NX). PORH was performed before and 30 minutes after anaesthesia induction. Oxygen consumption (VO₂), recovery times (time from release of cuff to the initial (tR) and to the maximum value (tM)) and rate of recovery (recS₂O₂) were determined. Data were compared using the Wilcoxon and Mann Whitney U test for within and between group differences, respectively.

Results and Discussion: Data are presented in the table as median (min-max). Before induction of anaesthesia, only tR was significantly different between smokers and non-smokers ($p=0.04$). After induction, VO₂ was significantly higher ($p=0.02$) and recovery times were significantly longer ($p=0.01$ and $p=0.05$ for tR and tM, respectively) for smokers compared to non-smokers. RecS₂O₂ decreased significantly in the smoking group after induction of anaesthesia ($p=0.04$).

		Before induction	After induction	P-value within group
VO ₂ (%/min)	Non-smokers	201 (56-1056)	48 (15-750)	0.008
	Smokers	373 (45-594)	94 (41-390)	0.03
P-value between groups		0.6	0.02	
tR (sec)	Non-smokers	9 (4-13)	11 (8-23)	0.02
	Smokers	11 (7-30)	19 (15-96)	0.05
P-value between groups		0.04	0.01	
tM (sec)	Non-smokers	20 (15-66)	32 (24-57)	0.03
	Smokers	27 (18-44)	44 (17-97)	0.04
P-value between groups		0.41	0.05	
RecS ₂ O ₂ (%/min)	Non-smokers	459 (91-1369)	452 (158-840)	0.86
	Smokers	384 (206-1649)	322 (135-433)	0.04
P-value between groups		0.82	0.12	

[PORH values before and after induction in smokers and non-smokers]

Since alterations in microvascular perfusion are known to be associated with impaired tissue oxygenation and organ dysfunction, this finding may have important implications for the anaesthesia management in smoking patients.

Conclusion: Given the higher VO_2 , the longer recovery times and the shortening of the recovery slope in the smoking group after induction of anaesthesia, we demonstrated that the effect of anaesthesia on microvascular reactivity is more pronounced in smokers than in non-smokers.

07AP09-3

Monitoring of perfusion index using pulse co-oximetry technology after off-pump coronary artery bypass grafting

Lenkin P., Smetkin A., Lenkin A., Fot E., Ushakov A., Kirov M.
Northern State Medical University, Dept of Anaesthesiology & Intensive Care, Arkhangelsk, Russian Federation

Background and Goal of Study: Peripheral tissues are sensitive to alterations in circulatory status, thus the monitoring of peripheral oxygenation could be helpful to reveal tissue hypoperfusion. The perfusion index (PI) is the ratio of the pulsatile blood flow to the nonpulsatile flow in peripheral tissue. This parameter provides a noninvasive continuous measurement of peripheral perfusion, can be obtained from a pulse oximeter and requires evaluation in different clinical settings.

The aim of our study was to assess the applicability of PI for the monitoring of tissue perfusion after off-pump coronary surgery.

Materials and Methods: Twenty-seven patients with coronary artery disease undergoing off-pump coronary artery bypass grafting (OPCAB) were enrolled into a prospective observational study. During early postoperative period, PI was measured using a Masimo SET Radical pulse oximeter (Radical-7, Masimo, USA). Cardiac index (CI), mean arterial pressure (MAP) and systemic vascular resistance index (SVRI) were assessed using a PiCCO₂ monitor (Pulsion Medical Systems, Germany). The haemodynamic variables were registered simultaneously with PI values at 8 stages of early postoperative period.

Results and Discussion: After surgery, PI increased significantly from 0.34 (0.30-0.71) after arrival to ICU to 2.9 (1.8-3.3) at 24 hrs of postoperative period. We found a correlation of PI with MAP ($\rho = -0.43, p < 0.005$) and SVRI ($\rho = -0.50, p < 0.005$). There was no association between PI and CI.

Conclusion(s): Perfusion index increases 9-folds during early postoperative period after OPCAB. The improvement of PI after coronary surgery is associated with resolution of systemic vasoconstriction.

07AP09-4

Survey of regional cerebral oximetry in thoracic aortic replacement surgery: comparison of near-infrared cerebral oximeters

Misa K.¹, Masahiro M.¹, Wataru T.¹, Ryoichi O.²
¹Kawasaki Saiwai Hospital, Dept of Anaesthesiology, Kanagawa, Japan, ²Toho University Omori Medical Centre, Dept of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: It is reported that incidences of cerebral infarction during and of neurological deficit following aortic surgeries are 1-3% and 35%, respectively. The risk of cerebral ischemia is high especially in total arch replacement (TAR) with deep hypothermic circulatory arrest (DHCA). Near infrared spectroscopy (NIRS), used in near-infrared cerebral oximeters such as INVOS™-4100 (Medtronic, Boulder, CO) and NIRO™-200X (Hamamatsu Photonics, Hamamatsu City, Japan), can detect some changes in cerebral oxygen saturation, and these machines are in common clinical use for that purpose. However, there are few evaluations of their accuracy or the dynamics of cerebral tissue oxygenation during DHCA. We prospectively observed the efficacy of NIRS of NIRO and INVOS especially during Retrograde Cerebral Perfusion (RCP) during DHCA.

Materials and Methods: With IRB approval, 19 patients who underwent conventional TAR from June to September 2016 were enrolled. After induction of anesthesia, 2 sensors of both INVOS and NIRO were placed over the forehead of the patients. We collected regional cerebral oxygen saturation (rSO_2 %) and tissue oxygen index (TOI%) data from INVOS™ and NIRO™ respectively. Data collected during RCP was used for statistical analysis. Bland-Altman analysis was used to compare the bias \pm precision and polar plot analysis was also

performed for concordance analysis of these devices either on left and right side of the forehead. Linear regression was applied to the Bland-Altman plots. Data were expressed as mean \pm SD.

Results and Discussion: The demographic characteristics of the 19 patients are as follows; age 71 years old (± 9) and BMI 23 (± 4.4). A total of 694 pairs of data were obtained (right 355, left 355). The bias of right was -2.2%, left was -1.8%. Precision of right and left was 6.3% and 9.0%. There is a correlation between the two devices ($r = 0.54$ for right, 0.83 for left, $p < 0.0001$). Concordance rate was 47.2% and 53.3% for right and left.

Conclusion(s): NIRO has a close correlation with INVOS during RCP. Bias of left and right were varied, however. Comparing the bias of the left to the right, right side had smaller bias than the left. Concordance rate was also low between the two. These differences seemed to be created because of the algorithms on which these two oximeters based and nonphysiological hemodynamics during RCP.

07AP09-5

Assessment of changes in lactate measurement with intravascular microdialysis using the trend interchangeability method

Bonnet V.¹, Gouezel C.¹, Lorne E.², Gerard J.-L.¹, Fellahi J.-L.³, Fischer M.-O.¹, French Hemodynamic Team
¹University Hospital Caen, Dept of Anaesthesiology & Intensive Care, Caen, France, ²Amiens University Medical Center, Dept of Anaesthesiology & Intensive Care, Amiens, France, ³Louis Pradel Academic Hospital, Dept of Anaesthesiology & Intensive Care, Lyon, France

Background and Goal of Study: Blood lactate is a strong predictor of mortality, and it is recommended to monitor its clearance over time during surgery in high-risk patients. We studied the interchangeability of venous lactate measurement through intravenous microdialysis incorporated in a central venous catheter with the reference method on arterial blood sample.

Materials and Methods: Blood lactate measurements from microdialysis and central venous blood were simultaneously recorded in 23 high-risk cardiac surgical patients (Trial Registry Number: NCT02296593). For absolute values, correlation was determined by linear regression, and Bland-Altman for repeated measurements was used to compare bias, precision, and limits of agreement. Changes in lactate measurement were evaluated with four-quadrant plot and trend interchangeability methods.

Results and Discussion: For the 22 analysed patients, the central venous catheter was used as usual care without complication. For absolute values ($n = 104$), the correlation coefficient was 0.96 ($P < 0.0001$). The bias, precision and limits of agreement were -0.19, 0.51 and -1.20 to 0.82 mmol l⁻¹, respectively. For changes in lactate measurement assessment ($n = 80$), the concordance rate was 94% with the four-quadrant plot. In contrast, the trend interchangeability method showed that 23 (29) changes of lactate measurements were not interpretable; and among the remaining 57 (71) interpretable changes, 18 (32) were interchangeable, 8 (14) were in the gray zone, and 31 (54) were not interchangeable.

Conclusions: The microdialysis using a central venous catheter is safe, and seems reliable to absolute values of blood lactate. However, only one third of changes in lactate measurements are interchangeable with reference method.

Acknowledgments: Co authors list being restricted to 6 names, the following persons contributed equally to this study: Mrs Fradin Sabine, Dr Saplacan Vladimir, Pr Hanouz Jean-Luc.

07AP09-6

Preoperative cognitive performance, age and the choice of the main anaesthetics influence the Area Under the Curve (AUC) of intra-operative cerebral burst suppression (BS) as measured by the depth-of-anaesthesia monitor NeuroSENSE®

Lemaire G., Watremez C., Van Dyck M., Docquier M.-A., Momeni M. Université Catholique de Louvain, Cliniques Universitaires Saint Luc, Dept of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Studies suggest that intra-operative cerebral BS¹, preoperative cognitive impairment and advanced age are risk factors for postoperative delirium and cognitive decline.² We hypothesized that preoperative cognitive impairment and advanced age increase brain vulnerability to the anaesthetics resulting in an increased BS despite a constant level of anaesthesia and that the choice of anaesthetics influence this vulnerability.

Materials and Methods: This is a subanalysis of a prospective observational trial (NCT02006212). Only subjects undergoing normothermic cardiac surgery were analysed. Depth of anaesthesia was maintained between 40-60 based on NeuroSENSE®. BS is presented as total AUC of EEG suppression ratio >0 seconds (AUC_{>0s}) and expressed in minutes%. AUC_{>0s} of >10 minutes% (dichotomous variable) is defined as abnormal to exclude eventual immediate post-induction BS. Binary regression analysis was performed to predict AUC_{>0s} of >10minutes%. Age, baseline Mini Mental State Examination (MMSE) and the choice of anaesthetic (Sevoflurane vs Propofol) were used as independent variables. Data are expressed as median (P25-P75). Mann-Whitney test compared continuous variables.

Results and Discussion: 925 patients were analysed. AUC_{>0s} of >10minutes% for the right and left hemispheres were respectively present in 717 and 700 subjects.

	Propofol (N=255)	Sevoflurane (N=670)	P
Age	65 (53-74)	69 (60-77)	0,002
AUC>0s Right (min%)	1859 (385-5087)	111 (8-614)	0,000
AUC>0s Left (min%)	1684 (414-4404)	111 (7-600)	0,000
MMSE	28 (26-29)	28 (26-29)	0,99

[Patients' characteristics]

Patients with AUC_{>0s} of >10 minutes% had significantly lower baseline MMSE (P = 0,000). Table 2 shows the regression analysis for AUC_{>0s} of >10 minutes% for the right hemisphere.

	β	Odds Ratio (95%CI)	P
Propofol	1,622	5,061 (2,999-8,542)	0,000
Age	0,029	1,029 (1,017-1,041)	0,000
MMSE	-0,127	0,881 (0,815-0,952)	0,001

[Regression analysis for AUC10min% (Right)]

Hosmer-Lemeshow test was valid (P=0,630).

Conclusion(s): Our results illustrate that patients' intrinsic factors increase the risk of intraoperative BS. This risk increases depending on the choice of anaesthetics and despite an adequate level of anaesthesia. In order to minimize the occurrence of BS, the depth of anaesthesia should be guided by raw EEG and spectral analysis and not by predefined values.

References:

1. Anesth Analg 2016;122:234-42;
2. Anesth Analg 2015;120:649-52

07AP09-7

The analysis the effect site concentration of propofol affecting the left ventricular long-axis systolic performance: mitral annular tissue Doppler study

Kim T.-Y.¹, Bang J.-Y.², Choi B.-M.²

¹Konkuk University Medical Center, Dept of Anaesthesiology, Seoul, Korea, Republic of, ²Asan Medical Center, College of Medicine, University of Ulsan, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background of Study: We evaluated the dose-response effect of target-controlled infusion of propofol on the peak systolic velocity of the mitral annulus (S') in Doppler tissue imaging in patients undergoing cardiac surgery.

Methods: In patients undergoing elective cardiac surgery (n=33) with LV ejection fraction ≥ 50%, anesthesia was induced with target-controlled infusions (TCI) of propofol and remifentanyl. After achieving stable hemodynamics, remifentanyl's plasma concentration was fixed to 20 ng·dl⁻¹ and, then, propofol's effect-site concentration (Ce) was adjusted to achieve and maintain BIS 40-60. After reaching equilibrium between Ce and plasma concentration of propofol, transesophageal echocardiography data were recorded for future off-line analyses for determining S' changes. These recordings were repeated at two incremental dosages, 2 times greater than Ce1 (Ce2) and 3 times greater than Ce1 (Ce3), respectively. Propofol's concentrations with 50% probability of S' changes ≥10% and ≥20% (Ce₅₀-10% and Ce₅₀-20%, respectively) compared to S' at Ce1 were determined by using a program for non-linear mixed effect modeling (NONMEM).

Results: Mean values of Ce1, Ce2 and Ce3 were 0.8, 1.6 and 2.4 μg·ml⁻¹, respectively. Mean S' (95% confidence interval, CI) at Ce1, Ce2, and Ce3 were 9.7(95% CI 9.3-10.2), 8.7(95% CI 8.2-9.1) and 7.5(95% CI 7.0-8.0) cm·s⁻¹, respectively, which showed significant differences (p < 0.001). Mean differences of S' at Ce1 vs. Ce2, Ce2 vs. Ce3, and Ce1 vs. Ce3 were and -1.1(95% CI -1.7--0.4), -1.1(95% CI -1.8 --0.5), and -2.2 (95% CI -2.9--1.6) cm·s⁻¹, respectively. Other variables indicating LV loading condition did not show significant changes between the time points. Ce₅₀-10% and Ce₅₀-20% were 1.4 and 2.1 μg·ml⁻¹, respectively.

Conclusions: Propofol increments dose-dependently reduce S', indicating LV systolic long-axis performance, in cardiac surgery patients with preserved LV function. Future research is needed to determine the clinical relevancy of these does-dependent declines of S' in our study.

References:

1. Yang HS, et al. J Am Soc Echocardiogr. 2013; 26: 727-35.
2. Tabata T, et al. J Am Soc Echocardiogr. 2003; 16: 424-31.

	Ce1	Ce2	Ce3	P-value
phenylephrine (μg kg ⁻¹ min ⁻¹)	0.04 (0.03-0.06)	0.07 (0.05-0.09) [†]	0.11 (0.09-0.13) [†]	<0.001
BIS	50 (49-52)	43 (41-44) [†]	37 (35-39) [†]	<0.001
MBP (mmHg)	77 (73-81)	74 (71-78) [†]	73 (69-77) [†]	0.0041
SVRI (dynes·s·cm ⁻⁵ ·m ⁻²)	1767 (1515-2020)	1753 (1501-2006)	1669 (1416-1921)	0.250
S' (cm·s ⁻¹)	9.7 (9.3-10.2)	8.7 (8.2-9.1) [†]	7.5 (7.1-8.0) [†]	<0.0001
e' (cm·s ⁻¹)	11.7 (10.5-12.9)	11.7 (10.5-12.9)	11.1 (9.9-12.3)	0.2451
a' (cm·s ⁻¹)	10.2 (9.0-11.4)	9.2 (8.0-10.4) [†]	8.4 (7.2-9.6) [†]	0.0016
E/e'	7.0 (6.0-8.0)	7.0 (6.0-8.0)	7.3 (6.3-8.3)	0.693
LVEF (%)	60 (57-62)	58 (55-60) [†]	56 (53-58) [†]	0.001
LVEDV (ml)	120 (111-128)	117 (108-125)	119 (110-128)	0.116
LVESV (ml)	49 (43-55)	50 (44-56)	53(48-59) [†]	0.015
Ea (mmHg/ml)	1.720 (1.560-1.870)	1.740 (1.590-1.900)	1.780 (1.620-1.930)	0.543

Values were as means (95% confidence interval).

[†]: p < 0.05 versus Ce1; [‡]: P < 0.05 versus Ce2.

BIS: bispectral index; MBP: mean blood pressure; SVRI: systemic vascular resistance index; S': peak DTI velocity of lateral mitral annulus during systole; e': peak DTI velocity of lateral mitral annulus during early filling; a': peak DTI velocity of lateral mitral annulus during atrial contraction; E/e': ratio of E to e'; LVEF: left ventricular ejection fraction in modified Simpson's technique; LVEDV: LV end-diastolic volume; LVESV: LV end-systolic volume; Ea: arterial elastance (=systolic BP/SV). Ce1: propofol dosage for BIS 40-60; Ce2: 2-times greater than Ce1; Ce3: 3-times greater than Ce1

[Table 1. Changes during the propofol increments]

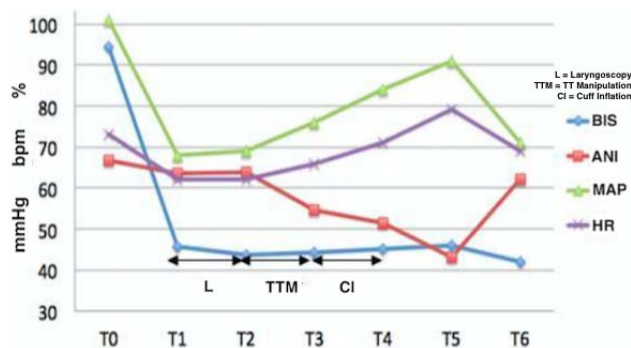
07AP09-8**Hemodynamics and nociception resulting from Oro-tracheal intubation: an observational prospective study**

Bouzit Z., Grati A.H., Cherait C., Abdi W., Houache H., Dhonneur G.F

Centre Hospitalier Universitaire Henri Mondor, Dept of Anaesthesiology & Intensive Care, Créteil, France

Background and Goal of Study: Oro-tracheal Intubation (OTI) is thought to be one of the highest nociceptive stimulation but this dogma has never been clearly proved. We tightly monitored hemodynamics (HD), nociception, and consciousness during OTI with the aim of pragmatically revisiting this dogma.

Materials and Methods: Consenting informed patients scheduled for elective cardiac or vascular surgery were included in this observational prospective study. After admission into the operating room, invasive blood pressure (BP), Bis-spectral (BIS) and Analgesia Nociception Index (ANI) monitoring were installed. The induction procedure of anesthesia with target-controlled infusion was standardized using sufentanil and propofol. Timed OTI maneuver (<30s) truncated in 3 periods (P) of predefined duration was performed after monitored deep neuromuscular blockade (atracurium) was installed. P1 (10-15s) corresponded with direct laryngoscopy, P2 (5-10s) with tracheal tube (TT) manipulation, and P3 (<5s) with TT cuff inflation. Recorded HD, BIS and ANI data were analyzed at 6 predefined time points. T0: baseline values after monitors installation, T1: post induction of anesthesia and just before OTI, T2: end of P1, T3: end of P2, T4: end of P3, T5 and T6, respectively 1 and 5 min after the end of OTI. Recorded parameters evolution was compared using standard statistics.

Results and Discussion:

[Monitored parameters evolution (mean) during OTI]

39 patients were included, but 4 were secondarily excluded because of OTI lasting more than 30s. P1 is characterized by a remarkable stability of all measured parameters. P2 and even more P3, are associated with intense and significant HD and ANI variations. ANI variations are completely superimposed, but opposite, to those of MAP and HR. BIS variations during T1 were negligible.

Conclusions: Our data suggest that laryngoscopy may not be the most intense nociceptive stimulus applied to patients during OTI. Both laryngeal and/or tracheal stimulation resulting from tracheal tube passage and cuff inflation seem to promote very intense nociception. Interestingly, such phenomenon could be erased by either laryngeal mucous topicalization or superior laryngeal nerve block.

07AP09-9**Quality of reporting of fluid responsiveness evaluation studies: a five year systematic review**

Izaute G.¹, Jacquet-Lagrange M.², Fellahi J.-L.¹

¹Hospices Civils de Lyon, Hôpital Louis Pradel., Dept of Anaesthesiology & Intensive Care, Lyon, France, ²Hôpital Louis Pradel, Dept of Anaesthesiology & Intensive Care, Bron, France

Background and Goal of Study: The Standards for the Reporting of Diagnostic Accuracy Studies (STARD) statement was developed in 2003 to improve the quality of reporting of diagnosis studies [1].

It was then updated in 2015. The purpose of the present study was to evaluate the quality of reporting of studies assessing fluid responsiveness by using the STARD criteria.

Materials and Methods: We used MEDLINE via PubMed to search all publication of studies assessing the ability to predict or diagnose fluid responsiveness between 2004 and 2014. We presented herein the last five years (2010-2014). We checked these studies for the whole 25 STARD criteria. The rating methodology of each item was discussed and double checked (GI and MJL). The 2003 and 2015 STARD quality score (SQS) was the integer of the present item. Univariate and multivariate analyses were conducted to find out if some characteristic of the studies were linked with a better SQS. Statistical analysis was performed with R software. $p < 0.05$ was considered statistically significant.

Results and Discussion: After a double screening (GI, MJL) of 430 articles, 97 were selected. Forty-six were excluded because of an IF <2. Fifty-one studies were selected and reviewed. The mean 2003 overall quality score was 11.8 on a scale of 0 to 25, whereas the mean 2015 overall quality score was 15.3 on a scale of 0 to 30. The 2003 SQS remained stable between 2010 and 2014 ($p=0.173$). Some items are inconstantly reported: participant sampling (adequately reported in 19.6% of studies), executing and reading the tests (11.7%), blindness (11.8%). Some items are better reported: methods for calculating or comparing (90.2%), diagnostic accuracy (90.2%). An IF >5 was the only independent factor significantly associated with higher SQS in a multivariate regression model ($p=0.037$). SQS were very low, but assessment of a study depends on quality of reporting. Blindness and participant sampling are the cornerstone to evaluate biases and were scarcely reported.

Conclusion(s): Our study showed that several items remain poorly reported. We recommend systematic use of STARD criteria in the elaboration and reporting of future studies that evaluates the preload dependence.

References: 1. Bossuyt PM. Towards complete and accurate reporting of studies of diagnostic accuracy: The STARD Initiative. *Ann Intern Med.* 2003 ; 7 : 138(1):40-4.

07AP09-10**Masimo SpHb: is it reliable?**

Pedrosa F¹, Luís M.¹, Galveias I.², Conde P¹, Alves A.¹

¹Centro Hospitalar Lisboa Norte - Hospital Santa Maria, Dept of Anaesthesiology, Lisbon, Portugal, ²Instituto Português de Oncologia - Lisboa, Dept of Anaesthesiology, Lisbon, Portugal

Background and Goal of Study: Non-invasive methods of monitoring hemodynamics are becoming a more and more frequent choice intraoperatively. Their accuracy, comparing with gold-standard measurements, is the downside of these new methods. Masimo rainbow[®] is a continuous method that through plethysmography curve analysis, monitors not only a estimated value for pulse pressure variation but also estimates blood hemoglobin (SpHb) and hemoglobin saturation. This study, aims to find a correlation between SpHb variation with the one from gas blood analysis (GHb), our standard method.

Materials and Methods: A protocol of study to compare the values of SpHb and laboratorial hemoglobin measurements was designed. Each patient was monitored on the same arm with a finger sensor of Masimo rainbow and an arterial line. At the beginning of the surgical procedure and every hour, the SpHb value was registered and blood gas analysis was run. Demographic data and variables concerning estimated blood loss, use of vasopressor drugs and transfusional therapy were also registered.

Results and Discussion: Nineteen patients submitted to a vascular procedure under general anesthesia, during october 2016, were enrolled in this study. Eight of these patients were excluded due to unsuitable data. The majority of patients were male (91%) and mean age was 67 years-old. Sixty-four percent of patients were classified as ASA 3. Open aortic aneurism repair was the most performed surgery in this group of patients. The mean estimated blood loss was 814 ml. Four out of 11 patients needed intra-operative vasopressor agents. Each patient had from 3 to 6 collected samples, totalizing 44 samples for comparison. Linear regression and range of determination coefficient were performed to correlate the trend of SpHb with GHb. R^2 ranged between 0,12 to 1. The median value was 0,49, far under 0,8, usually used as an acceptable threshold for correlation.

Conclusion: According to our results, SpHb variation does not correlate with standard method trending analysis. This might compromise decision-making in adverse intra-operative setting, based alone on SpHb interpretation. As limitations of this study, we point out the small sample size, as well as the impossibility to attenuate all the confounding factors to Masimo readings, above all the great prevalence of peripheral arterial disease in this group.

07AP09-11**Microvascular effects of esmolol in postoperative atrial fibrillation: a prospective pilot study in cardiac surgery**

Fornier W., Jacquet Lagrèze M., Colletot T., Portran P., Schweizer R., Fellahi J.L.
University Hospital Louis Pradel, Dept of Anaesthesiology & Intensive Care, Bron, France

Background and Goal of Study: Postoperative atrial fibrillation (POAF) is commonplace after cardiothoracic surgery. Rate control with betablockers is recommended as a first-line therapy in patients macro-hemodynamically stable. Esmolol is a short-acting β_1 -selective betablocker whose microcirculatory effects have not been yet investigated.

We tested the hypothesis that esmolol could improve the POAF-related microvascular dysfunction.

Materials and Methods: After approval of the Ethical Committee, we prospectively included 20 cardiothoracic surgical patients with POAF in the Teaching University Hospital Louis Pradel (Lyon, France). Microcirculation was assessed by near-infrared spectroscopy (NIRS) and a vascular occlusion test (VOT) at successive time points: before esmolol infusion, during incremental doses of esmolol (25, 50, 100, and 200 $\mu\text{g}/\text{kg}/\text{min}$) and after return to sinus rhythm. Esmolol dose regimen was increased every 45 minutes until heart rate reached a targeted value between 60 and 90 beats/min. NIRS parameters included StO_2 , StO_2 min, StO_2 max, ΔStO_2 , and both desaturation and resaturation speeds. Data before and after cardioversion were compared with a paired Student *t* test or a Wilcoxon test. A one-way ANOVA for repeated measurements or a Friedman test were used to compare the effects of incremental doses of esmolol.

Results and Discussion: StO_2 and resaturation speed were significantly improved between POAF and return to sinus rhythm: StO_2 64.5 % \pm 3.9 vs. 67.0 % \pm 5.1, $p=0.047$; and resaturation speed 0.6 %/s (0.45-0.99) vs. 0.7 %/s (0.50-1.03), $p=0.02$. ΔStO_2 was significantly lower after return to sinus rhythm, 8.0 \pm 4.5 vs. 6.0 \pm 4.5, $p=0.026$.

During esmolol infusion, StO_2 and resaturation speeds were not statistically different (Figure 1). Nevertheless, resaturation speed showed a trend toward an improvement. No significant difference was found at any other time point for StO_2 min, StO_2 max, ΔStO_2 and desaturation speed. On the other hand, mean arterial pressure showed a trend toward a decrease ($p = 0.054$) whereas pulse pressure had a significant reduction ($p < 0.001$). Heart rate was lowered as expected ($p = 0.031$).

Conclusion(s): Stable hemodynamic POAF is associated with significant microvascular dysfunction. Rate control with intravenous esmolol showed a not significant trend toward a dose-dependent improvement in POAF-related microvascular dysfunction.

07AP10-1**Desflurane does not decrease the risk of myocardial injury in trans-catheter aortic valve implantation with the trans-femoral approach under general anaesthesia**

Okitsu K., Iritakenishi T., Fujino Y.
Osaka University, Dept of Anaesthesiology & Intensive Care, Suita, Japan

Background and Goal of Study: The cardio-protective effect of volatile anaesthetic agencies is observed in some cardiac surgery settings but is uncertain in patients who undergo transcatheter aortic valve implantation (TAVI). The aim of this study was to determine whether desflurane decreases the risk of postoperative myocardial injury in patients who undergo TAVI under general anaesthesia.

Materials and Methods: This retrospective study was undertaken after institutional review board approval. We collected anaesthetic details and perioperative blood test values from electronic hospital records for patients who underwent TAVI with the femoral approach under general anaesthesia in a single university hospital in 2015. We determined that postoperative myocardial injury was represented by peak creatine kinase myocardial band (CK-MB) and troponin I (TnI) values within 72 hours after operation as was documented in the Valve Academic Research Consortium-2 consensus. We compared the values between patients who received desflurane (group D) and those who received propofol (group P) to maintain general anaesthesia. The Wilcoxon rank sum test was used in the statistical analysis.

Results and Discussion: Ninety-one patients were included in the final analysis. Peak CK-MB (median [range]) was 9.25 ng/mL (1.3-20.3 ng/mL) in Group D ($n=26$) and 8.7 ng/mL (2.6-49.7) in Group P ($n=65$; $P=0.52$). Peak TnI did not show a statistically significant difference between the groups D and P (1.233 ng/mL [0.088-6.347 ng/mL] vs. 1.244 ng/mL [0.036-29.0 ng/mL], $P=0.71$; Figure 1).

None of the patients in both groups had symptomatic acute coronary syndrome or any other episode requiring intervention. Desflurane showed no superiority to propofol with regard to myocardial protection in our study population.

Conclusion(s): Desflurane did not decrease the risk of postoperative myocardial injury in the patients who underwent TAVI with the femoral approach under general anaesthesia. A large-scale randomised controlled trial that includes different settings, other surgical approaches for TAVI, or use of sevoflurane is needed in the future.

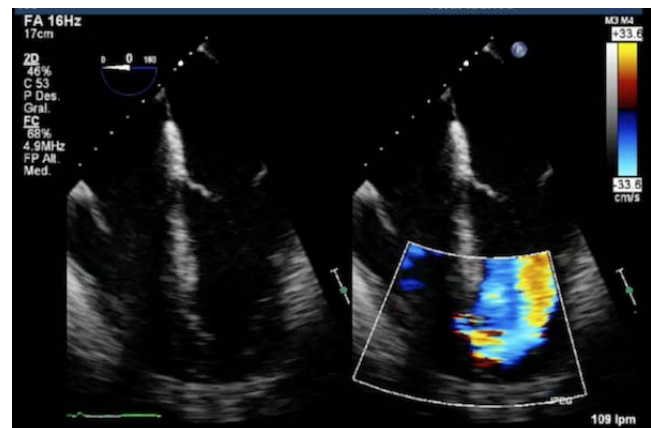
07AP10-2**Ventricular septal defect after damage control resuscitation in penetrating cardiac injury: management pitfalls**

Varela Cabo J.A., Gonzalez Zarco L., Jimenez de la Fuente C., Portas Gonzalez M.T., Piñeiro Otero P.
Gregorio Marañon General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Cardiac injuries are most common after penetrating thoracic trauma. Treatment is immediate thoracotomy, ideally in the operating room. In extremis, thoracotomy in the ED can be life saving. Bypass is reserved for patients who have injury to the valves, chordae tendineae or septum. These injuries become evident over a few hours or days following the injury.

Case report: A 36-year-old male was admitted to the ED in clinically in shock. He received 2 stab wounds to the chest, medial to the left nipple. He suffered 2 cardiac arrest on scene. Patient was taken to theatre, left thoracotomy was performed. A massive haemothorax was diagnosed. Pericardial sac was filled with blood. Pericardiectomy was performed. 2 cms left ventricular wound was closed with simple suture.

The patient had a postoperative course with extreme instability. TTE showed right ventricle severe dysfunction with no residual cardiac tamponade. Cardiac output (CO) measurements were performed using Transpulmonary Thermodilution (TPT). 24 hours later, due to persistence of instability, TEE was performed showing a large post-traumatic VSD in the distal-apical portion of the septum. A left-to-right shunt was clearly shown by colour flow Doppler. He was transferred to theatre and the VSD repaired. Patient suffers neurological impairment for hypoxic encephalopathy.



[Transoesophageal echocardiography]

Discussion: Follow-up echocardiography is suggested in the case of equivocal initial echocardiographic results and a new echocardiographic examination is recommended if the initial results are negative. This protocol is very important, since VSD is the commonest delayed complication of penetrating heart injuries. Use of TPT is controversial in this setting.

Learning points: Cardiac tamponade and VSD are the most frequent complications. Although cardiac tamponade is easily recognised, a post-traumatic VSD may become clinically detectable only at a latter stage and can escape

the initial examination. It is crucial to plan follow up because of the occurrence of delayed complications such as VSD. Hemodynamic monitoring in the ICU is essential in these cases, as pitfalls may occur with invasive and non-invasive monitoring.

07AP10-3

Effect of rapid ventricular pacing on cerebral oxygenation in transcatheter aortic valve implantation (TAVI): role of routine near-infrared spectroscopy monitoring

Karaaslan P.¹, Darcin K.², Ozyuksel A.³, Kutlu E.¹, Köse E.A.¹, Boztosun B.⁴

¹Istanbul Medipol University, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ²Koç University, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey, ³Istanbul Medipol University, Department of Cardiovascular Surgery, Istanbul, Turkey, ⁴Istanbul Medipol University, Department of Cardiology, Istanbul, Turkey

Background and Goal of Study: Transcatheter aortic valve implantation has become an important treatment modality in patients with high risk comorbidities for surgical aortic valve replacement. The objective of this study is to evaluate the cerebral perfusion status using near infrared spectroscopy method especially during the rapid ventricular pacing phase of the transcatheter aortic valve implantation procedure.

Materials and Methods: 20 consecutive patients undergoing trans-femoral aortic valve implantation procedure between May 2015 and March 2016 in our institute were retrospectively evaluated. The periprocedural cerebral oxygenation was measured with a near infrared spectroscopy sensor (INVOSTM-5100 C, Medtronic Inc., Minneapolis, MI, USA) located on the forehead of the patients. All hemodynamic data and cerebral near infrared spectroscopy values were recorded before, during and after the procedure with constant time intervals, especially at the time of rapid ventricular pacing and device deployment.

Results and Discussion: The mean age was 74.4 ± 9.2 years. Male female ratio was 1.8 to 1 (13 males, 7 females). Mean procedure time was 70.2 ± 14.3 minutes. The rapid ventricular pacing included two episodes with a total time for pacing of 22.6 ± 5.1 seconds. There was a statistically significant difference with regard to the heart rate and the cerebral near infrared spectroscopy values ($p=0.006$ and $p=0.02$; respectively) in all patients during the rapid ventricular pacing period. The cerebral near infrared spectroscopy values were statistically lower than baseline levels ($p<0.001$).

Conclusion(s): This observational study presents the significant decrease of cerebral near infrared spectroscopy values during the rapid ventricular pacing phase of the transcatheter aortic valve implantation procedure. Further studies may reveal cut-off values both for near infrared spectroscopy values and rapid ventricular pacing duration in order to determine a critical cut-off level.

References: Hynes BG, Rodés-Cabau J. Transcatheter aortic valve implantation and cerebrovascular events: the current state of the art. *Ann NY Acad Sci* 2012; 1254: 151-163.

07AP10-6

Point of care coagulation tests do not reduce requirements for allogeneic blood transfusions during and after cardiac surgery

Kodaka M., Mukouyama Y., Ichikawa J., Nihei W., Nishiyama K., Komori M.

Tokyo Women's Medical University Medical Center East, Dept of Anaesthesiology & Intensive Care, Tokyo, Japan

Background and Goal of Study: A previous retrospective study showed that point of care (POC) coagulation tests reduce the requirements for hemostatic products and shorten hospital stay.¹

However, few prospective studies have provided evidence that POC coagulation tests have this effect in patients undergoing cardiac surgery.² The current investigation aimed to use logistic regression analysis to assess the efficacy of hemostatic therapy guided either by conventional coagulation analyses or POC, such as ROTEM™ and Hepcon HMS™.

Materials and Methods: Patients scheduled for cardiac surgery with cardiopulmonary bypass (CPB) were randomized to a conventional or POC group. The criteria for conventional coagulation analyses were as follows: hemoglobin (Hb) $>9-10$ mg/dL [t1], fibrinogen (Fib) $>100-150$ mg/dL, platelet count (Plt) $>5 \cdot 10^4 /\mu\text{L}$. A heparin dose of 300-400 U/kg was administered during CPB, the target ACT >480 sec, and reversed with protamine 100%-130% of heparin. ROTEM™ and HMS™ were performed in the POC group. Hemostatic therapy comprised concentrated red cells (CRCs), fresh frozen plasma (FFP), and concentrated platelets (PC).

Samples were collected at four points: baseline, just after commencing CPB, during weaning from CPB, and at the end of surgery.

The primary outcome variables were the number of transfused units and blood loss during operation and the first 48 h after ICU. Secondary outcomes were results of multiple logistic regression analysis (stepwise method) in which the dependent variable was with or without allogeneic blood transfusion and independent variables included groups, Hb, Fib, Plt, antithrombin, and age.

Results and Discussion: Fifty-two patients were enrolled in the study. There were no significant differences in blood transfusion and perioperative bleeding between the groups [Table 1]. The secondary outcomes shown in Table 2 were that only Hb, Plt, and age differed significantly between the groups.

Conclusion: Hemostatic therapy based on POC does not reduce patient requirements for allogeneic blood products during and after cardiac surgery.

References:

- Masui. 2015;64:131-8.
- Anesthesiology. 2011;115:1179-912.

Table 1. Blood transfusion requirements and amount of perioperative bleeding according to group

	Conventional (n=26)	POC (n=26)	P value
Intraoperative CRCs (units)	7.5 ± 4.8	5.3 ± 6.2	0.44
Intraoperative FFP (units)	4.2 ± 5.2	4.5 ± 6.1	0.91
Intraoperative PC (units)	5.0 ± 7.4	3.3 ± 8.2	0.67
Intraoperative bleeding (g)	949 ± 1103	858 ± 471	0.86
Postoperative CRCs (units)	1.6 ± 2.6	1.5 ± 1.9	0.94
Postoperative FFP (units)	0.5 ± 0.5	1.0 ± 0.8	0.63
Postoperative PC (units)	2.0 ± 6.3	0.0 ± 0.0	0.5
Postoperative bleeding (ml)	566 ± 214	689 ± 497	0.55

Table 2: Results of multiple logistic regression analysis (stepwise). B=regression coefficient. Exp(B)=Odds ratio. *P<0.05

	B	SE	Wald	P-value	Exp(B)	95% confidence interval
					lower	upper
Hb*	-0.788	0.327	5.814	0.016	0.455	0.24 0.863
Plt*	-0.283	0.13	4.718	0.03	0.754	0.584 0.973
POC			2.01	0.366		
Age*	0.225	0.082	7.51	0.006	1.252	1.066 1.47
Fibrinogen	0.002	0.008	0.055	0.815	1.002	0.986 1.018
Antithrombin	0.041	0.042	0.926	0.336	1.042	0.958 1.132

[Table 1-2]

07AP10-7

Formation of a large left atrial thrombus within 4 days despite sinus rhythm and heparinization: a case report

Okamura K., Kodaka M., Osada Y., Mukouyama Y., Nihei W., Komori M.

Tokyo Women's Medical University Medical Center East, Dept of Anaesthesiology, Tokyo, Japan

Background: We here present a patient admitted to our institution for sub-acute myocardial infarction and congestive heart failure who developed a huge left atrial thrombus within 4 days of hospitalization despite being in sinus rhythm and receiving anticoagulant therapy.

Case report: A 52 kg, 71-year-old woman developed chest discomfort and dyspnea two weeks before hospitalization. ST elevation was observed in her electrocardiogram (ECG), and akinesis of the anterior septum, and moderate mitral regurgitation (MR) were recognized on transesophageal echo (TEE). A coronary vasodilator and anticoagulant therapy (heparin 15000 U/day) were administered after hospitalization and her symptoms improved. Four days after hospitalization, her CRP had increased, indicating an inflammatory response. Transthoracic echo (TTE) was therefore performed again, revealing a large thrombus (24 mm × 14 mm) in the left atrial appendage. Infectious endocarditis was suspected, and emergency surgery performed on Day 5 of her hospitalization. A huge thrombus attached to the left atrial appendage was again confirmed by TEE (Figure).

The operative procedure comprised removal of the huge thrombus, mitral valve replacement, and coronary artery bypass graft (aorta-saphenous vein-left anterior descending; LAD) was performed and she was discharged on the 17th postoperative day.

No bacteria were detected on culture of the thrombus.

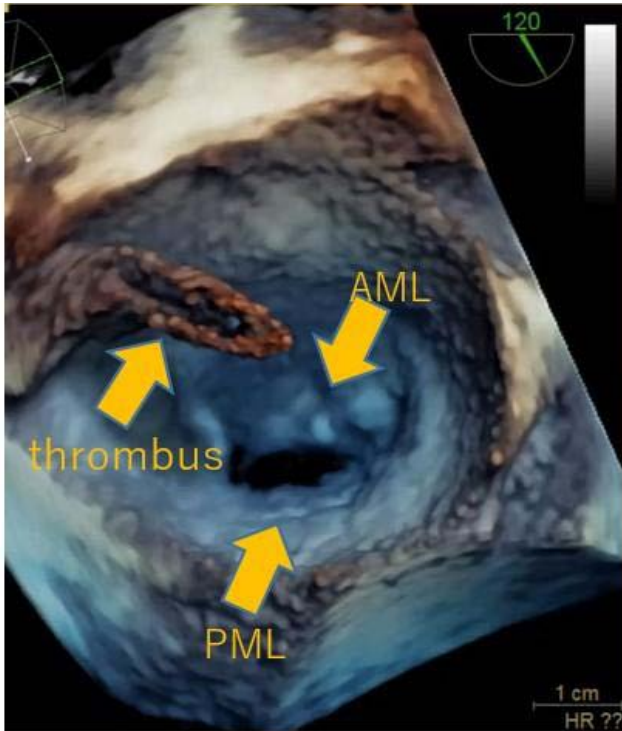
Discussion: The patient had moderate MR but her ECG showed sinus rhythm. Anticoagulation therapy (heparinization) was administered, resulting in adequate prolongation of her APTT. However, by 4 days after admission, a giant thrombus had formed in her left atrial appendage. There were that 4% of LAT develop in patients with sinus rhythm without MR¹, one of the reasons being reduction of cardiac contractility^{1,2}.

References:

1. Med. Bull. Fukuoka Univ. 2006;33(2):97-102
2. J Intern Med.1998;243:281-91

Learning points:

1. This is report of a rare case of MR developing in a patient with LAT without AF while heparinized.
2. In patients with MR with low left ventricular contractions and sinus rhythm, TTE and coagulation tests must be performed to prevent thrombus formation.



AML: anterior mitral leaflet, PLM: posterior mitral leaflet

[Figure: 3D TEE view of mitral valve]

07AP10-8

surgical septal myectomy by transapical approach for relief of left ventricular outflow tract in hypertrophic cardiomyopathy

Simic D.¹, Serrano Zueras C.¹, González A.¹, García Fernández J.¹, Forteza A.², Martín C.²

¹Hospital Puerta de Hierro Majadahonda, Dept of Anaesthesiology & Intensive Care, Majadahonda, Spain, ²Hospital Puerta de Hierro Majadahonda, Dept of Surgery, Majadahonda, Spain

Background: Hypertrophic cardiomyopathy (HCM) is a heart muscle disease characterized by left ventricular hypertrophy. A left ventricular outflow tract (LVOT) gradient is present in most patients with HCM. This is the most important determinant of limiting symptoms in patients with HCM. Both pharmacologic and nonpharmacologic therapy options exist.

Case report: We report a case of septal myectomy by transapical approach under balanced anesthesia and on cardiopulmonary bypass (CPB). It was a 34 years old female with HMC (NYHA class III). Preoperative coronariography with no remarks and transthoracic ecocardiography (TTE) with anteroapical and apical HCM (22mm). LVEF was normal. Monitoring at the OR included ASA standards plus femoral artery canalization, cerebral oximetry, Swan-Ganz catheter and TTE. An apical ventriculotomy was made lateral to the left anterior descending artery. Approximately 10g of ventricular septal muscle was removed. After CPB a severe mitral insufficiency was observed, thus

mitral valve repair (annuloplasty) was performed. Pacemaker in AAI mode. Patient leaves to ICU with Noradrenaline and Dobutamine at low doses.

In the first hours inotropic drugs were withdrawn. Troponins climbed to a peak and extubation was made in the first day after surgery (DAS). In the following days the patient developed a complete heart block and depended on the pacemaker for 4 days. TTE after surgery: mild MI after mitral repair, HCM improved (16mm). Patient was discharged from ICU on the 4th DAS.

Discussion: Septal myectomy relieves LVOT obstruction by direct removal of septal muscle. In addition, abnormalities of the mitral valve can be addressed at the time of surgery. The transapical approach is a difficult procedure and is only performed at very limited hospitals with experience in this pathology. In Spain this was the first time this procedure has ever been made.

LEARNING POINTS: Complications include excessive removal of muscle causing a septal defect, development of branch block or CHB and MI due to papillary muscle section. Myectomy results in resolution of LVOT gradient and improvement of failure symptoms in almost all patients, and is associated with excellent long term survival^{1&2}.

References:

1. Woo A et al. Clinical and echocardiographic determinants of long term survival after surgical myectomy in HCM. Circulation 2005; 111:2033
2. Kunkala et al. Transapical approach to myectomy for midventricular obstruction in HCM. Ann Thorac Surg. 2013 Aug;96(2):564-70

07AP10-11

Cardiac surgery performed in a cardiac transplanted patient: a case report

Ferreira P.¹, Farinha F.²

¹Hospital de São Teotónio - Centro Hospitalar Tondela-Viseu, Dept of Anaesthesiology, Viseu, Portugal, ²Centro Hospitalar São João, Dept of Anaesthesiology, Porto, Portugal

Background: Cardiac recipients present as group of patients who need special anesthetic management. This group's overall survival has increased to more than 75% at 7 years post transplantation¹. Therefore, they may possibly present for routine surgery, most commonly non-cardiac surgery. Less frequently these patients may present for another cardiac surgery. This is a report of a cardiac surgical case in a cardiac recipient.

Case report: A 59 years old male patient, ASA IV, submitted to cardiac transplantation 5 years before because of ischemic dilated cardiomyopathy. Proposed for mitral valve replacement and coronary bypass surgery using extracorporeal circulation. Immunosuppressive medication (azathioprine, tacrolimus, prednisolone) was maintained, changing only the administration route. Intravenous anesthesia with TCI (propofol and remifentanyl). Standard monitoring plus invasive blood and central venous pressure, hourly diuresis, BIS, cerebral oximetry and transesophageal echocardiography were used to guide fluid therapy to maintain adequate preload. Noradrenaline used to maintain hemodynamic stability after bypass phase. Surgery went uneventful. Progressive noradrenaline weaning and extubation 12 hours after surgery. Acute renal failure at ICU, with progressive renal function normalization.

Discussion: Success of cardiac recipient surgery depends on knowledge of transplanted heart physiological changes (denervation effects, hemodynamic changes), optimal anesthetic management and impact of immunosuppressant therapy². We couldn't find in literature any cardiac surgery case in a cardiac transplanted patient. Extracorporeal circulation represents a major factor for hemodynamic instability, with greater importance in a transplanted heart. Aggressive anesthetic approach to maintain hemodynamic stability is vital.

References:

1. Taylor DO et al. Progress in heart transplantation: riskier patients yet better outcomes: a 15 year multi-institutional study. J Heart Lung Transplant 2007; 26:S61
2. Valerio R et al. Anesthetic considerations for an adult heart transplant recipient undergoing non cardiac surgery: a case report. ANAA J 2014 Aug;82(4):293-9

Learning points: Anesthesia for cardiac surgery can be performed safely in heart transplant recipients, despite all pathophysiological changes. Anesthetic pillars are comprehension of preload dependence, proper administration of direct vasoactive drugs if needed, and infectious risk awareness.

07AP11-1**Lipid emulsion attenuates H₂O₂-induced apoptotic cell death in H9c2 rat cardiomyoblast cells**

Shin I.-W.¹, Woo M.-S.¹, Kim Y.-A.², Sohn J.-T.¹, Lee H.-K.¹, Chung Y.-K.¹

¹Gyeongsang National University, Dept of Anaesthesiology & Pain Medicine, Jinju, Korea, Republic of, ²Changwon Gyeongsang National University Hospital, Dept of Anaesthesiology & Pain Medicine, Changwon, Korea, Republic of

Background and Goal of Study: Cardiomyocyte death induced by ischemia/reperfusion injury is an important contributor for myocardial dysfunction. Propofol has been identified that it has a protective effect after myocardial ischemia/reperfusion injury through various experimental methods. We also reported that propofol has myocardial protective effect at the regional ischemia/reperfusion injury in vivo rat model. We presumed that the myocardial protective effect of propofol would be related with lipid emulsion which is used for solvent of propofol. In this study, we investigated that lipid emulsion modulates hydrogen peroxide (H₂O₂)-induced apoptotic cell death in H9c2 rat cardiomyoblast cells.

Materials and Methods: H9c2 cells were treated with H₂O₂ for oxidative stress, and we examine the effect of lipid emulsion on oxidative stress-induced cell death. The effect on the cell viability of H9c2 cells was evaluated by using MTT assay, and Trypan blue. Protein expression of caspase 3, Bcl/2 (B-cell lymphoma 2), Bax (BCL2 Associated X Protein) was measured using the western blot analysis.

Results and Discussion: Our results showed that H₂O₂ induced apoptotic cell death in H9c2 cells, which was associated with decreasing the level of Bcl2. However, decrease of these proteins was restored when pretreated with lipid emulsion and followed with the increase of Bcl2. Cleaved Caspase-3 expression was increased by H₂O₂ oxidative stress, and cleaved Caspase-3 expression was decreased by treatment of lipid emulsion.

Conclusion(s): Our results demonstrate that oxidative stress promotes apoptotic cell death in H9c2 cells, and lipid emulsion regulates oxidative stress induced apoptotic cell death in myocardiocytes H9c2. These results suggest that lipid emulsion may be implicating in the myocardial protective effect against cardiac ischemic reperfusion injury.

References:

- Jin YC, Kim W, Ha YM, Shin IW, Sohn JT, Kim HJ, Seo HG, Lee JH, Chang KC. Propofol limits rat myocardial ischemia and reperfusion injury with an associated reduction in apoptotic cell death in vivo. *Vascul Pharmacol*. 2009;50(1-2):71-7.
- Shin IW, Jang IS, Lee SH, Baik JS, Park KE, Sohn JT, Lee HK, Chung YK. Propofol has delayed myocardial protective effects after a regional ischemia/reperfusion injury in an in vivo rat heart model. *Korean J Anesthesiol*. 2010;58(4):378-82.

Acknowledgements: Il-Woo Shin currently receiving a grant (NRF-2011-0021216) from Nation Research Foundation of Korea (NRF).

07AP11-2**Sevoflurane attenuates systemic inflammatory response and shedding of lung-endothelial glycocalyx in lung resection surgery and one lung ventilation in an experimental model animal**

González Moraga F.J., Casanova J., Garutti I., Simón C., Fernández C., Vara E.

Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

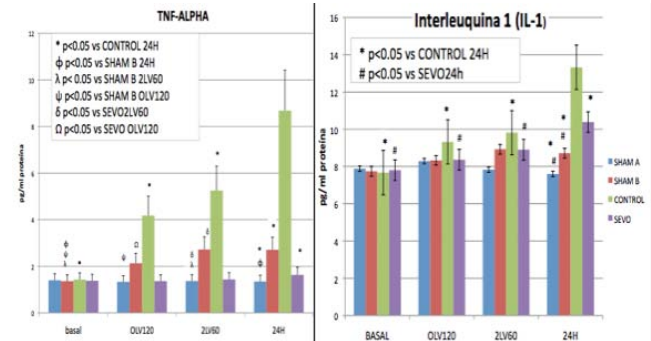
Back ground and Goal of Study: Lung Resection surgery (LRS) with One Lung Ventilation (OLV) is associated with an intense local and systemic inflammatory response (SIR)¹. The aim of this work was to study the effects of the administration of inhaled sevoflurane on the SIR during LRS with OLV and on the shedding of lung-endothelial glycocalyx².

Materials and Methods: 20 swine were divided in 4 groups, 5 animals each. 10 animals underwent to left caudal lobectomy: Group CONTROL (CON) received propofol (8-10 mg kg⁻¹ h⁻¹) and Group SEVOFLURANE (SEVO). 2 additional procedures were performed in 2 groups with the same methodology as in the CON group but without lobectomy nor OLV (SHAM-A), and without

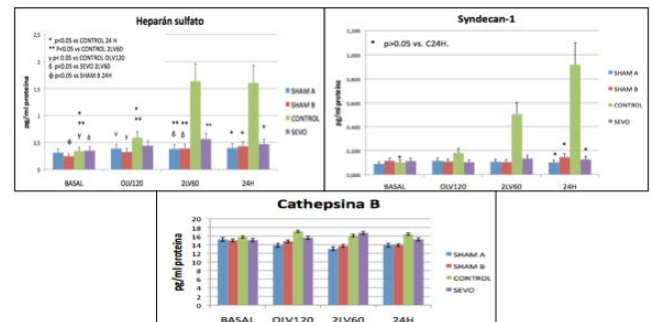
lobectomy but with OLV (SHAM-B). After the procedure the animals were awoken and 24 h., later were again anesthetized.

TNF-alpha, IL-1, cathepsine B, syndecan-1 and heparan sulfate protein expression were gathered through ELISA analysis in blood samples at 30 minutes OLV, 120 minutes OLV, 60 minutes two-lung ventilation and 24 hours. Monitoring include parameters derived of PiCCO system (cardiac output, extravascular lung water, global end diastolic volume and systolic volume variation).

Differences between groups were analysed by ANOVA multiple range test and Wilcoxon test for evolution of the intragroup values. P values <0.05 were considered.

Results:

[TNF-ALPHA and IL-1. ELISA]



[Heparan sulfato, Syndecan-1 and Cathepsina B. ELISA]

Discussion: OLV can by itself promote a SIR after LRS. Sevoflurane use has demonstrated to attenuate inflammatory response and the shedding of lung-endothelial glycocalyx in lung resection surgery.

References:

- Schilling T et al. The pulmonary immune effects of mechanical ventilation in patients undergoing thoracic surgery. *Anesth Analg* 2005;101:957-65.
- Schmidt EP et al. The circulating glycosaminoglycan signature of respiratory failure in critically ill adults. *J Biol Chem* 2014; 289: 8194-202.

07AP11-4**Cardiac arrest following traumatic haemopneumothorax - fighting against time**

Rakanovic D.¹, Svraka D.¹, Janjic D.², Sobot Novakovic S.¹, Djurdjevic Svraka A.³, Dakic Z.²

¹University Clinical Centre of the Republic of Srpska, Dept of Anaesthesiology & Intensive Care, Banjaluka, Bosnia and Herzegovina, ²University Clinical Centre of the Republic of Srpska, Dept of Surgery, Banjaluka, Bosnia and Herzegovina, ³General Hospital Gradiska, Dept of Anaesthesiology & Intensive Care, Gradiska, Bosnia and Herzegovina

Background: Traumatic cardiac arrest may develop as a result of hypoxia - caused by manageable issues such as breathing problems - pneumo/haemothorax and hypoperfusion caused by haemorrhage. This condition rapidly progresses to respiratory insufficiency, cardiovascular collapse and ultimately death if it remains unrecognized and untreated. Favorable patient outcomes require urgent diagnosis and immediate treatment.

Case report: Patient in our study was a female, 21 years old, admitted to emergency department (ED) after car accident, approximately one hour after injury. On admission in ICU patient has classic signs of haemopneumothorax - decreased level of consciousness, dyspnea, tachypnea, tachycardia, hypotension and cyanosis.

One minute after admission patient developed respiratory and asystolic cardiac arrest. Implementing measures CPR according to the protocol, cardiac activity was restored. Cardiopulmonary resuscitation measures continue - mechanical ventilation and catecholamine stimulation with epinephrine. Chest X-Ray confirmed the diagnosis and after performing tube thoracostomy, it was indicated immediate resuscitative thoracotomy to control catastrophic haemorrhage.

We started massive transfusion protocol to. After surgery (lower left lobectomy), patient was transferred to ICU, catecholamine support had stopped and weaning from mechanical ventilation during the night. Twelve hours after the surgery, the patient was conscious, hemodynamic stable, spontaneously breathing, without neurological disturbances.

Discussion: Management of traumatic cardiac arrest must be directed toward identifying and treating the underlying cause of the arrest or resuscitation is unlikely to be successful. Open thoracotomy can be lifesaving for patients with chest trauma if the patient has an arrest immediately before arrival or while in ED. During concurrent volume resuscitation, prompt emergency thoracotomy will control of thoracic and extrathoracic hemorrhage, and should be performed only by experienced providers.

References: Truhlár A. et al. European Resuscitation Council Guidelines for Resuscitation 2015 Section 4. Cardiac arrest in special circumstances. Resuscitation 2015; 95: 148-201

Learning Points: Early recognition, rapid diagnosis and prompt treatment are essential for surviving patients with traumatic hemopneumothorax. Lucky for us, we were faster than time that patients had left.

07AP11-5

Persistent low SpO₂ after atrial septal defect correction surgery. Usual suspect: ventilation. Verdict: not guilty!

Kouna N.¹, Antonopoulos N.², Garini E.¹, Prodromou C.¹, Oikonomopoulos D.¹, Mammi P¹

¹'Aghia Sophia' Children's Hospital, Dept of Anaesthesiology, Athens, Greece, ²'Aghia Sophia' Children's Hospital, Department of Cardiothoracic Surgery, Athens, Greece

Background: Postoperative hypoxaemia in cardiac surgery is often attributed to ventilation or respiratory failure. We present a case of an unpredictable etiology: iatrogenic intracardiac shunt.

Case report: A 15 year-old girl with ASD secundum and supra-valvular pulmonary artery (PA) stenosis, was scheduled for ASD closure and enlargement of the supra-annular valvular PA stenosis with pericardial patch. Pressure gradient between the right ventricle and PA was 50mmHg, with normal PA pressure.

The procedure was uneventful, nevertheless low SpO₂ values between 76-85% were recorded after the end of CPB and after extubation at the CICU, despite good breathing sounds, level of consciousness and inspiratory force. Blood gas showed a consistent low pO₂: 44-55mmHg, a pCO₂: 20-28mmHg, pH: 7.52-7.58 and BE: -(2-5). Application of a non-rebreathing mask increased SpO₂ up to 92%. Subsequent echocardiography revealed kinking of the IVC just before entering the right atrium. Catheterization confirmed the abnormal IVC total blood flow drainage to the left atrium (LA). The IVC's flow diversion to the LA, resulted to a large right to left shunt.

A redo surgical procedure was scheduled, in order to revise the ASD patch and reroute the IVC blood drainage. After the procedure low SpO₂ was reversed, and the patient was discharged after an uneventful course.

Discussion: Unexplained hypoxaemia was due to a rare but well-known post-operative complication of ASD patch closure; a R-L shunt from the IVC to the LA, due to suturing the edge of the ASD to a large prominent eustachian valve that can be mistaken for the lower edge of the ASD. This iatrogenic intracardiac shunt with normal right side pressures resembles another rare clinical syndrome, the Platypnoea-Orthodoxia syndrome, which is characterized by low SpO₂ and dyspnoea while in an upright position.

Possible causes are: intracardiac shunts (PFO, ASD), pulmonary AV shunts or V/Q mismatches in the lungs. R-L shunt can be caused when the right side pressure is elevated or when the heart-lung anatomy is distorted and the venous blood is redirected towards the interatrial communication like in right pneumonectomy with a PFO or ASD.

Learning points: This case highlights the importance of high level of suspicion of surgeons and anaesthetists to persistent low SpO₂ after CPB termination to ASD repairs; an iatrogenic intracardiac shunt may be the cause and complete intraoperative evaluation with TOE will establish the diagnosis.

07AP11-7

Evaluation of ultrasound guided vascular access during cardiac surgery induction

Wong J., Caroline F., David N.

Barts Health NHS Trust, Dept of Anaesthesiology & Intensive Care, London, United Kingdom

Background and Goal of Study: Ultrasound-guided (US) insertion of arterial and venous access is safe and effective in certain situations¹. For elective cardiac surgery access is often left to the anaesthetist based on experience, training and available equipment. We aim to compare US with landmark-palpitation guided (LM) insertions in this study.

Materials and Methods: A prospective service evaluation study was conducted at a tertiary cardiothoracic centre. Eligibility criteria involved adults undergoing elective cardiac surgery. All patients had a protocolled 16/14 gauge peripheral venous cannula (PVC), central venous catheter (CVC) and a radial arterial line. 20 patients of either the US or LM technique were recruited. All access was obtained by a single operator and data was collected with a pre-defined proforma. Primary endpoint of the study was time taken until all access sites were obtained. Secondary endpoints gathered included number of attempts, complications and patient satisfaction. Patient satisfaction was measured using a numerical rating scale between 0 and 10 anchored at "completely unsatisfied" and "completely satisfied" respectively. Statistical tests were performed using independent t-test and Mann-Whitney U as appropriate.

Results and Discussion: 10 patients were recruited into each group and there were no statistical differences between the demographics of the two groups. The mean(SD) time taken to obtain vascular access was 31.3s(±3.6) for the US group and 46.4s(±9.9s) for the LM group (p-value <0.001). Mean attempts for PVC in the US group and LM group was 1.1 and 1.3 (p-value 0.29), 1.1 and 2.2 for arterial lines (p-value 0.02) and 1.1 and 1.5 for CVCs (p-value 0.12). Of the complications recorded the US group had less haematomas (n=1 vs n=3). No other serious complications were recorded. The mean patient satisfaction score for the US and LM groups were 7.8 and 6.3 (p-value 0.01).

Conclusion: The use of US guided vascular access during cardiac surgery induction can reduce the time taken for access, reduce the number of attempts for radial arterial cannulation, improve patient satisfaction and potentially reduce complications. There did not appear to be statistically significant differences in reducing the number of attempts for peripheral and CVC insertion.

References:

1. Lamperti M et al. International evidence-based recommendations on ultrasound-guided vascular access. Intensive Care Medicine. 2012;38(7):1105-1117

07AP11-8

Delayed diagnosis of constructive pericarditis finalized congestive hepatopathy: anesthesia management

Aykut A.¹, Demir A.¹, Kuşvuran Kurtay M.¹, Sert D.E.², Catav Z.²

¹Türkiye Yüksek İhtisas Hospital, Dept of Anaesthesiology, Ankara, Turkey, ²Türkiye Yüksek İhtisas Hospital, Dept of Surgery, Ankara, Turkey

Background: In this article, we aimed to present the anesthesia story of a case with a delayed diagnosis of cirrhosis due to constructive pericarditis.

Case report: 49y, 70kg, male patient, was admitted to hospital due to unconsciousness, shortness of breath, jaundice before. He had edema, ascites, gastrointestinal bleeding, hepatomegaly, encephalopathy, anti HCV positivity, patient was diagnosed as having HCV cirrhosis + hepatic encephalopathy. HCV was negative in revised examinations, diagnosed constructive pericarditis. Patient was operated on with high risk of neurological impairment with apathetic, slow-sense and responsive, partially oriented, moderate deceleration in EEG. Before anesthesia, right-left tSO₂ 43/45, PSI95. In anesthesia in-

duction; ketamine, midazolam, fentanyl, rocuronium were used. Meanwhile, transamin, dobutamine infusion was initiated. After induction, right-left rSO₂ 57/59, PSI41, SEF6.6/6.5, CVP26.TEE was not wanted by surgery because of esophageal varices. Pericardium was removed without cardiopulmonary bypass. After 4 hours he was extubated, infusions were terminated after 2 days.

Discussion: The left heart pulmonary venous return decreases during inspiration. This shifts the interventricular septum to the left and reduces the left ventricular cavity so that stroke volume is reduced. The most important compensatory response to decrease in stroke volume is adrenergic stimulation (1).

So it is important to maintain adrenergic stimulation in the perioperative period. A decrease in baroreflex sensitivity has been shown as a component of cardiac cirrhosis also (2).

Therefore, to prevent adrenergic depression that may be caused by anesthesia induction, induction agents were combined with ketamine and dobutamine. Baseline NIRS before anesthesia 43/45. After anesthesia, rSO₂ increased to 57/59 due to slowing of cerebral metabolism with anesthetics. During operation no pathology was observed in neuromonitoring.

References:

- Forrest P. Anaesthesia and right ventricular failure. *Anaesth Intensive Care*. 2009 May;37(3):370-85.
- Ren X, Andrews AH. Cardiac cirrhosis. <http://emedicine.medscape.com/article/151792-overview>

Learning points:

- It is important to maintain adrenergic stimulation in the perioperative period for optimizing stroke volume.
- The patient who had hospitalized with advanced symptoms was delayed diagnosis of constrictive pericarditis. In such patients with encephalopathy, neuromonitoring will help distinguish the neurological deficit from the new pathologies and provide anesthesia for cerebral protection.

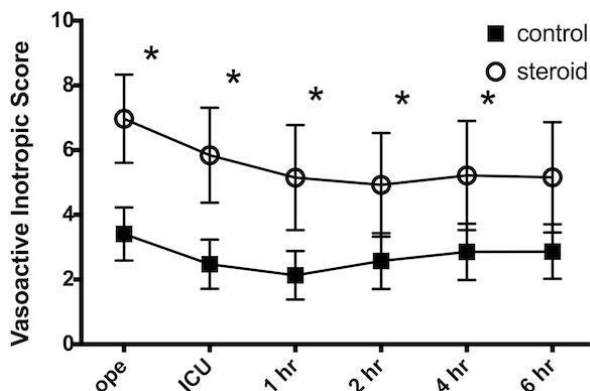
07AP11-9

Effect of steroid administration during cardiopulmonary bypass on postoperative vasoactive inotropic score

Kawamoto Y, Toda Y, Fukunaga S., Etsuko K., Nakatsuka H.
Kawasaki Medical School, Dept of Anaesthesiology & Intensive Care, Kurashiki, Japan

Background and Goal of Study: Steroid administration during cardiac surgery under cardiopulmonary bypass (CPB) remains controversial. It has been reported that steroid administration is effective for hemodynamic instability in septic shock refractory to a high-dose vasopressor. However, the effect of steroid administration during CPB on postoperative use of a vasoactive inotropic agent is unclear. The object is to investigate the effects of steroid administration during CPB on postoperative use of vasoactive agents.

Materials and Methods: This was a retrospective cohort study. Patients who underwent cardiac surgery under CPB during the period from Jan 1, 2014 to Dec 31, 2015 were included in the study. They were divided into two groups depending on steroid administration. Doses of dopamine, dobutamine, epinephrine, noradrenaline, milrinone, and vasopressin at weaning from CPB and at 0, 1, 2, 4 and 6 hours after ICU admission were collected from electronic medical charts and vasoactive inotropic score (VIS) was calculated at each time point. Statistical analyses were done by Student's t test for numerical data, Fisher's test for categorical data, and multivariate analysis of variance for VIS. A P value less than 0.05 was considered significant.



[Vasoactive inotropic score]

Results and Discussion: There were 68 patients (Group S) who received a steroid during CPB and 77 patients (Group C) who did not.

The characteristics of patients were not different between the two groups: age, Group S vs Group C: 70.0 (95%CI: 66.9 to 73.1) vs 70.7 (67.9 to 73.7); patients on chronic dialysis, S: 9.8% vs C: 15.2%; duration of CPB, S: 176.9 (160.1 to 193.6) vs C: 180.1 (164.4 to 195.9) min; duration of surgery, S: 358.5 (327.0 to 390.0) vs C: 374.7 (344.7 to 403.8) min.

VIS was significantly higher in group S than in group C (Fig): VIS at ICU admission, S: 5.84 (4.37 to 7.31) vs C: 2.47 (1.72 to 3.23), $p < 0.001$.

Conclusion(s): Doses of vasoactive agents were not reduced by steroid administration during cardiopulmonary bypass.

07AP11-10

Perioperative Stanford Type A Aortic Dissection (TAAD) in an 84 year old patient undergoing coronary-artery bypass grafting (CABG): a case report

Stefan M., Dilly Rushenas M.-P., Valeanu L., Andrei S., Longrois D.
Centre Hospitalier Universitaire Bichat Claude Bernard, Dept of Anaesthesiology & Intensive Care, Paris, France

Background: Iatrogenic aortic dissection is a rare complication of elective cardiac surgery, occurring in 0.06-0.23% of cases^{1,2}. Despite this, its impact is significant, due to high mortality and morbidity, with early mortality as high as 60%².

Case report: An 84 year old male suffering of left main coronary artery disease, clinically manifest by exertional dyspnoea, was scheduled to undergo surgical revascularization. Pre-operative co-morbidities included a moderately-severe depressed left ventricular ejection fraction (LVEF) and calcification of thoracic aorta.

CABG was performed using bilateral internal thoracic artery technique, allowing complete revascularization. Routine monitoring included transoesophageal echocardiography (TOE).

TOE evaluation while weaning from cardiopulmonary bypass (CPB) revealed acute type A aortic dissection. Immediate replacement of the ascending aorta with a tubular aortic graft was performed, leading to a total CPB time of 170 min and cross clamping time of 104 min (70 min for aortic procedure).

Perioperative complications were cardiogenic shock, with bi-ventricular dysfunction requiring high doses of dobutamine, noradrenaline and inhaled nitric oxide (iNO) and diffuse bleeding, treated by transfusion of packed red blood cells, platelets and 4.5 g of fibrinogen concentrate.

Other post-operative life-threatening complications were ischemic stroke, late-onset septic shock of pulmonary origin and aortic graft infectious endocarditis.

The patient was transferred to the ward after 42 days in the ICU, having made a full neurological and cardiac recovery.

Discussion: While a rare complication of cardiac surgery, TAAD can be managed if a high index of suspicion is maintained. Nonetheless, these patients have high rates of mortality and morbidity and their ICU course poses a significant challenge.

References:

- Fleck, T., Ehrlich, M., Czerny, M., Wolner, E., Grabenwoger, M., & Grimm, M. *Interactive cardiovascular and thoracic surgery*, 2006;5(1), 11-14.
- Leontyev, S., Borger, M. A., Legare, J. et al *European Journal of Cardio-Thoracic Surgery*, 2012;41(3), 641-646.

Learning Points: Routine perioperative TOE monitoring in cardiac surgery can help early detection and prompt management of complications, such as TAAD.

07AP12-1**Enhanced recovery protocol for esophagectomy: a prospective single-center study**

Sizov V.¹, Raevskaya M.², Esakov J.³, Ruchkin D.³, Ilyin S.¹, Kazennov V.²

¹A.V. Vishnevsky Institute of Surgery, Dept of Anaesthesiology, Moscow, Russian Federation, ²A.V. Vishnevsky Institute of Surgery, Dept of Intensive Care, Moscow, Russian Federation, ³A.V. Vishnevsky Institute of Surgery, Dept of Surgery, Moscow, Russian Federation

Background and Goal of Study: Esophagectomy is a high-risk procedure traditionally associated with high morbidity rate up to 40% - 74%. Effectiveness of the fast-track protocols nowadays are widely accepted in different fields of surgery. In a lot of papers it's made the stress on "selected groups" of patients that could be included to ERAS programs. We present our results in implementation of ERAS-concept based protocol for esophagectomy.

Materials and Methods: Single-center prospective non-randomized trial. A total of 92 patients were reviewed, who had undergone esophagectomy between December 2012 and December 2015. The median age was 57 (47; 67) years with male predominance 67 (72,8%). Patients were operated following esophageal cancer, benign stenosis and neuromuscular disease in 56 (60,9%), 25 (27,2%) and 11 (11,9%) cases respectively. Transhiatal and McKeown esophagectomy rate was 50 (54,4%) and 42 (45,6%) respectively. Protocol description: preoperative - routinely counseling by ERAS team, no prolonged fasting; nutrition support, incentive spirometry, fluid and carbohydrates loading;

Intraoperative - avoidance of salt and water overload, judicious use of vasopressors, protective lung ventilation, high-thoracic epidural analgesia, maintenance of normothermia; Postoperative - immediate or early extubation, avoidance of salt and water overload, daily weight measurement, multimodal analgesia, early mobilization, stimulation of gut motility, audit of compliance and outcomes.

Results and Discussion: Median postoperative stay was 8,5 (9,5; 10,5) days with median ICU stay 0,7 (0,6; 0,8) days. 51 (55,4%) patients of 92 [CI: 45,2% - 65,2%] extubated immediately after surgery. In 9 (9,2%) of 92 cases several pulmonary insufficiency (PaO₂/FiO₂ <300 mmHg) was detected in first 3 days after surgery. There was no anastomotic leakage, while total 30-day morbidity rate (Dindo-Clavien I-II grade) was 35 (38%) of 92 [CI: 28,8% - 48,2%] and mortality rate was 4 (4,3%) of 92 [CI: 1,7% - 10,6%] respectively.

Conclusion(s): Implementation of the perioperative care protocols based on ERAS guidelines promotes decrease of postoperative complication rate even in high risk patients undergoing esophagectomy.

07AP12-4**Cardiac paraganglioma, case report**

Buriticá Aguirre A.M.¹, Mata Francisco N.C.¹, Borja Andrés H.², Nieto Martn L.¹, Sánchez Poveda D.¹, Álvarez Martínez D.¹

¹Complejo Asistencial Universitario de Salamanca, Dept of Anaesthesiology & Pain Medicine, Salamanca, Spain, ²Basic Health of Valladolid, Department of Primary Care, Valladolid, Spain

Background: Only 2% of paragangliomas are found in the thorax, and their appearance at heart level and their recurrence in the mediastinum is rare [1].

Case report: The patient is a 45-year-old man with a history of cervical paragangliomas, which had been resected 8 years before. The genetic study was negative. An indium-111 pentetreotide scintigraphy revealed paraganglioma in the mediastinum. A CT scan with contrast shows evidence of a node lesion, 15 x 18 mm in diameter, located next to the root of the aorta (in contact with the left coronary sinus). A coronarography shows a small septal branch which irrigates a structure adjacent to the coronary sinus, catecholamine test in urine after 24 hours was negative.

The tumor is scheduled for removal with extracorporeal circulation (ECC). Anesthetic induction with midazolam 2 mg, fentanyl 150 mg, etomidate 20 mg and cisatracurium 20 mg. Adequate ventilation with facemask and orotracheal intubation without incidences and Cormack-Lehane 2 with direct laryngoscopy. Anesthetic maintenance with sevoflurane (MAC 1) and remifentanyl (0.1-1mg/Kg/min). With the ultrasound view, the central venous triple-lumen catheter is placed and a Swan-Ganz introducer is placed on the right jugular

vein. Basic and advanced monitoring is carried out with TEE (transesophageal echocardiography), INVOS® and BIS®. The procedure lasts approximately 4.5 hours. ECC time: 43 minutes. Aortic clamp time: 25 minutes. The patient does not require transfusion therapy. The anatomical pathology confirms the diagnosis of paraganglioma.

Discussion: Cardiac paragangliomas may cause hypertension, tachycardia, cephalalgia or diaphoresis if they are hormonally active, and they may secrete catecholamines or have a mass effect depending on their size and location. Surgical resection is the ultimate treatment for this type of tumors due to their poor response to chemo- and radiotherapy [3].

References:

1. Wang, Y., Y. Xiao, and X. Wang, *Primary cardiac paraganglioma arising from interatrial septum*. J Card Surg, 2013. **28**(3): p. 274-5.
2. Huo, J.L., et al., *Cardiac paraganglioma: diagnostic and surgical challenges*. J Card Surg, 2012. **27**(2): p. 178-82.

Learning points: Cardiac paragangliomas are rare and some may secrete catecholamines.

Surgical resection is the treatment of choice in spite of the risk of bleeding and the high recurrence rates.

07AP12-5**Influence of regional anesthesia component on the rate of chronic post-thoractomy pain syndrome in lung cancer patients**

Malanova A., Khoronenko V., Baskakov D., Pikin O., Varvarin V. P.A. Hrezen Moscow Cancer Research Institute, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation

Background and Goal of Study: Chronic post-thoracotomy pain syndrome (CPPS) is one of the most often side effects after lung surgery [1]. After extended pulmonary resections performed via thoracotomy approach its incidence varies from 30% to 40% [2]. We aimed to assess the influence of the type of regional anesthesia (paravertebral nerve block (PNB), thoracic epidural anesthesia (TEA) and intercostal nerve block (INB) on the incidence of CPPS.

Materials and Methods: 300 patients (53±8,5 yrs), undergone lung cancer surgery via thoracotomy were randomized into three groups: 1) 100 patients with TEA; 2) 100 patients with PNB; 3) 100 patients with INB. In all groups patients received lornoxicam 8mg two times daily and pregabalin 75 mg two times daily. 40 minutes before the end of the surgery nefopam 20mg was injected intramuscular for the first time and then was continued after extubation from the time of initial pain syndrome during 5 days postoperatively at the same dose twice per day. In the case of persistent pain syndrome morphine 10mg was additionally prescribed. General anesthesia was standard in all groups and included sevofluran, fentanyl, ketamin, rocuronium bromid. Ten-point visual analogue scale (VAS) was used to assess the intensity of CPPS postoperatively. Static and dynamic pain component was assessed in 1 and 6 months after surgery.

Results: There was not any significant difference between groups regarding demographic variables, sex, body mass index, preoperative laboratory tests, type of surgery, anesthesia time and time of discharge. There was no any statistical difference in the intensity of CPPS at rest between groups in 1 and 6 months after surgery. In 1 month patients of PNB suffered from CPPS at rest more frequently than in TEA (p=0,02). The incidence of CPPS was higher in 1 and 6 months after surgery in INB group if compare with TEA group. There was no difference in the intensity of CPPS in all groups of patients in 1 and 6 months postoperatively.

Conclusion: The use of thoracic epidural block decreases the rate of CPPS. The intensity of pain syndrome detected in 1 month after surgery does not change in 6 months period.

References:

1. Wildgaard K, Ravn J, Kehlet H., Prevention of chronic pain after surgery: new insights for future research and patient care // Eur J Cardiothorac Surg -2009; 36: 170-80.
2. Macrae WA. Chronic post-surgical pain: 10 years on // BJA British Journal of Anaesthesia - 2008; 101(1):77-86.

07AP12-7**Tracheostomy following lung transplantation. Retrospective study, incidence and risk factors**

Abdallah Kassab N.A., García Suárez J., Álvarez Bartolomé A., Albajar Bobes A., Simic Silva D., García Fernández J.
Hospital Universitario Puerta de Hierro, Majadahonda, Dept of Anaesthesiology & Intensive Care, Majadahonda, Spain

Background and Goal of Study: Over the past several years, lung transplantation has become a viable therapeutic option for patients with end-stage lung disease. One of the most common complications during the postoperative period is the need of prolonged mechanical ventilation and weaning failure. Tracheostomy is used under certain circumstances to aid in mechanical ventilation weaning in intensive care units and it has been associated with higher morbimortality.

Due to the changes and the advances achieved in the perioperative management, such as the use of Extra Corporeal Membrane Oxygenation (ECMO), in those patients, we reviewed our experience with tracheostomy following lung transplantation over a 2 year period to identify clinical predictors and possible risk factors for receiving a tracheostomy, and to analyse the impact of tracheostomy during postoperative period.

Materials and Methods: The records of all the adult patients who underwent lung transplantation in our center between January 2014 and January 2016 were evaluated.

Patients were divided into two groups, based on whether or not they received a tracheostomy in the acute postoperative period. Clinical, demographic characteristics and perioperative variables were noted.

Results: During this period 84 lung transplants were performed, 31 of those patients received a tracheostomy. Most of the subjects were male (67,5%). All the patients intubated before surgery in the ICU needed a tracheostomy in the postoperative period ($p < 0,001$). In the tracheostomy group, more patients had undergone bilateral-lung transplantation (87,1% vs 71,2%), more blood (4,68% vs 2,35%), plasma ($p = 0,012$) and platelets ($p = 0,006$) were transfused during surgery and in the first 24h ($p = 0,018$).

There was more reintubation ($p = 0,025$) and need of ECMO during the postoperative period ($p = 0,005$), need of nitric oxide and reintervention in the first 72 hours ($p < 0,001$, $p = 0,033$), greater primary graft and diaphragmatic dysfunction ($p < 0,001$, $p < 0,008$), longer times in ICU ($p < 0,001$), and longer lengths of hospitalization ($p < 0,001$).

Conclusion: We need a larger sample rate to achieve a multivariate analysis to identify the possible independent risk factors associated with tracheostomy. We conclude that the control of the variables during the perioperative period is important to optimize outcomes and help to minimize, recognize and treat early lung transplant complications such as prolonged mechanical ventilation and weaning failure.

07AP12-8**Recurrence and survival outcomes after nonintubated versus intubated thoracoscopic lobectomy for clinical stage I non-small cell lung cancer: a propensity-matched analysis**

Man-Ling W.¹, Ming-Hui H.¹, Hui-Hsun H.¹, Hsao-Hsung H.², Jin-Shing C.², Ya-Jung C.¹

¹National Taiwan University Hospital, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China, ²National Taiwan University Hospital, Dept of Surgery, Taipei, Taiwan, Republic of China

Background and Goal of Study: Nonintubated thoracoscopic lobectomy has been described as an alternative surgical treatment for early stage lung cancer since 2011. Despite promising perioperative results, there was no long-term analysis regarding tumor recurrence and patient survival rates. The primary objective of this study was to compare outcomes after lobectomy with or without intubation for stage I non-small cell lung cancer.

Materials and Methods: A retrospective data set including 125 nonintubated thoracoscopic lobectomy patients and 200 intubated patients between January 2011 and December 2013 was used to identify matched nonintubated and intubated cohorts ($n = 115$ per group) using a propensity score matching algorithm that accounted for confounding effects of preoperative patient variables. Primary outcome variables included freedom from recurrence and overall survival. Factors affecting survival were assessed by Cox regression analysis and Kaplan-Meier survival estimates.

Results and Discussion: There was no perioperative mortality in both groups. At an average follow-up of 3.3 years, comparing nonintubated thoracoscopic lobectomy with intubated procedure, no differences were noted in recurrence rates (10.4% vs. 13.9%, respectively; $P = .449$). Furthermore, no significant differences were noted in overall survival (98.3% vs. 95.7%, respectively; $P = .265$). Nonintubated thoracoscopic lobectomy was not found to be an independent predictor of recurrence (hazard ratio, 0.75; 95% CI, 0.35 to 1.59) or overall survival (hazard ratio, 0.41; 95% CI, 0.08 to 2.12).

Conclusion(s): In this propensity-matched comparison, nonintubated thoracoscopic lobectomy was not associated with an increased risk for recurrence and overall survival during the 3-year follow-up. These results will need further validation by randomized trials.

References:

- Chen JS, Cheng YJ, Hung MH, Tseng YD, Chen KC, Lee YC. Nonintubated thoracoscopic lobectomy for lung cancer. *Ann Surg.* 2011;254(6):1038-43.
- Landreneau RJ, Normolle DP, Christie NA, Awais O, Wizorek JJ, Abbas G, Pennathur A, Shende M, Weksler B, Luketich JD, Schuchert MJ. Recurrence and survival outcomes after anatomic segmentectomy versus lobectomy for clinical stage I non-small-cell lung cancer: a propensity-matched analysis. *J Clin Oncol.* 2014;32(23):2449-55.

07AP12-9**Is the Brain Natriuretic Peptide a predictor of new atrial fibrillation in the postoperative care of patients undergoing lung resection?**

Redondo J.M., Becerra I.A., Agudelo M.E., Bajo R.
Hospitalary University Complex in Badajoz, Dept of Anaesthesiology & Intensive Care, Badajoz, Spain

Background and Goal of Study: Atrial fibrillation is one of the more common complications of thoracic and esophageal surgery. It occurs in between 12-39% of patients who undergo a lung resection. This study aimed to investigate a possible relationship between preoperative Brain Natriuretic Peptide (pro-BNP) and presence of atrial fibrillation in the early postoperative period after lung resection.

Materials and Methods: This was a prospective observational study of patients ($n = 62$) who underwent any kind of lung resection surgery (thoracotomy and VATS) in our hospital from January to December 2016. Exclusion criteria were history of previous arrhythmia and lack of informed consent. The following parameters were recorded: demographic characteristics, kind of lung resection surgery, epidural or intravenous postoperative analgesia, preoperative study (ASA physical status classification system, cardiovascular risk factors, pulmonary function tests, baseline arterial blood gas, electrocardiogram, Brain Natriuretic Peptide and haemoglobin), 30-day occurrence of postoperative atrial fibrillation (primary endpoint) and total hospital stay. The study was carried out after the approval of the Hospital Ethic Committee. The data were analyzed with 95% confidence by SPSS20, using descriptive and analytic statistics.

Results and discussion: A total of 62 lung resections were performed (19% pneumonectomies, 50% lobectomies, 10% segmentectomies and 20% wedge resections). We registered 5 cases of 30-day postoperative atrial fibrillation (60% left neumonectomies, 20% right upper lobectomy and 20% left upper lobectomy). All cases were observed in men with cardiovascular risk factors, in the second day after thoracotomy and all of them received epidural analgesia in postoperative period. 30-day postoperative atrial fibrillation rate of incidence was 8 cases per 100 surgery-year in 2016. No statistically significant association between BNP and atrial fibrillation cases was founded ($p = 0.91$). The annual median length of hospital stay was 9 days after lung resection.

Conclusion: Atrial fibrillation is the most common medical complication after thoracic surgery. BNP was not able to be considered as a good predictor of new atrial fibrillation in our lung resection sample. Optimization and study of cardiovascular risk factors in this type of patients is essential.

07AP12-10**Acute myocardial ischemia during placement of right-side double lumen endotracheal tube in a left traumatic pneumonectomy patient: a case report**

Wang K.F., Lan K.M., Chu C.C., Chen J.Y., Chen Y.H.
Chi Mei Medical Center, Dept of Anaesthesiology, Tainan, Taiwan, Republic of China

Background: Anesthetic management of patients with severely damaged lung for major cardiovascular surgery is very challenging to anesthesiologists. Herein, we reported a case that underwent coronary artery bypass grafting surgery (CABG) after traumatic pneumonectomy due to a traffic accident.

Case report: A 62 y/o man without any medical history suffered from a traffic accident. He was sent to hospital and left hemopneumothorax was noted. Consciousness was clear and vital signs were stable on admission. However, desaturation and short of breath developed after admission. Both MRI and bronchoscopy suggested that left main bronchus was totally obliterated. Then, repair of the left main bronchus was arranged. After anesthetic induction, he was intubated with a right-side double lumen tube (DLT). However, during adjustment of the tube, desaturation and significant ST segment de-

pression of ECG occurred. We immediately changed a single lumen for him and performed a trans-esophageal cardiac echography, which demonstrated severe inferior hypokinesia of left ventricle. The surgery was therefore postponed, and he was sent for emergent coronary catheterization, which revealed severe stenosis of all 3 coronary arteries. Coronary stenting was failed, and a CABG was arranged. In addition, left pneumonectomy was suggested during the coronary grafting surgery. Left pneumonectomy was successfully performed under extra-corporeal system. Then CABG was performed without major event. Finally, he was discharged uneventfully.

Discussion: Intubation with right-side DLT is more time consuming than does left-side DLT. This patient was totally dependent on his right lung because left lung was complete dysfunction. Before successful adjusting the right upper opening of tube to right upper lung, this lobe could not be ventilated. During this period, desaturation precipitated the expression of undiagnosed coronary artery disease. We suggest performing an immediate echocardiographic evaluation, and emergent catheterization, if indicated.

References: Coronary artery bypass grafting and/or valvular surgery in patients with previous pneumonectomy. Alexander Fragkidis, Alexander Dimitriou and Dimitrios Dougenis. Journal of cardiothoracic surgery 2012, 7: 110

Learning points: If cardiac events occur, operation cancellation and further work up may be considered. Pneumonectomy under cardiopulmonary bypass may prevent risk of desaturation during surgery.

Acute Pain Management

08AP01-1**Pregabalin for improving the quality of anesthesia recovery in bariatric surgery: randomized, double-blind, placebo-controlled clinical trial**

de Jesus Martins M.¹, Martins C.P.M.O.¹, Sacramento B.B.C.², Augusto Bastos Mello C.³, Leal Alves R.¹, Sueli Pinheiro Módolo N.⁴
¹Federal University of Bahia, Dept of Anaesthesiology, Salvador, Brazil, ²BAHIANA - Escola de Medicina e Saúde Pública, Research and Development Department, Salvador, Brazil, ³Hospital Teresa de Lisieux, Dept of Surgery, Salvador, Brazil, ⁴São Paulo State University, Dept of Anaesthesiology, Botucatu, Brazil

Background and Goal of Study: Obesity is a chronic disease characterized by excessive accumulation of body fat. Due to the associated risks, it has been considered a major public health problem in developed countries. Bariatric surgery, (open gastroplasty), has been used as an important strategy to approach this pathology, in countries undergoing surgery, especially when associated with other comorbidities.

Postoperative pain, however, is a frequent problem in the postoperative management of these patients. Pregabalin is a structural analogue of the gamma-aminobutyric acid neurotransmitter (GABA) that binds to the alpha-2-subunit of the voltage-dependent calcium channel, blocking the development of hyperalgesia and central pain sensitization.

We aimed to compare pregabalin versus placebo to compare improvement in quality of postoperative recovery through Quality of Recovery score analysis (QOR 40) and reduction of opioid consumption. The hypothesis was that pregabalin promotes better post-surgical recovery quality than placebo.

Materials and Methods: After ethics committee approval, 60 healthy patients eligible for open gastroplasty under general anesthesia were recruited. The study was a prospective, randomized, placebo-controlled, double-blinded trial. Patients undergoing abdominal gastroplasty were randomized to receive pregabalin, group 1 (75 mg orally 1 hour before surgery) or an identical placebo pill, group 2.

The primary outcome was the quality of recovery-40 score at 24 hours. Secondary outcomes included opioid consumption and postoperative pain scores. A *P* value <0.05 was used to reject type I error.

Results and Discussion: Sixty patients completed the study. The mean in global recovery scores (quality of recovery-40) at 24 hours after surgery in group 1 was 183.7 (sd 12.4) x 182 (sd 9.1) in group 2 (*P* = 0.614). The total consumption of opioids in the 24 hours did not present a statistically significant difference between the groups. Nausea, vomiting, and time to postanesthesia care unit discharge were not significantly reduced in the pregabalin group compared with placebo.

Conclusion(s): There were no statistically significant differences between pregabalin and placebo to improve the quality of postoperative recovery and reduction of opioid consumption in bariatric surgeries. Further studies are required to determine the potential pain-reducing benefit of pregabalin in the postoperative setting.

08AP01-2**Reduction of pain intensity in adult patients with acute pain due to fractures, dislocations and other injuries treated with low-dose methoxyflurane: a subgroup analysis of a Phase III, randomised, double-blind, placebo-controlled study**

Coffey E¹, Dissmann P², Mirza K.³, Lomax M.⁴

¹Nottingham University Hospitals NHS Trust, UK, Emergency Department, Nottingham, United Kingdom, ²James Cook University Hospital, Emergency Department, Middlesbrough, United Kingdom, ³Colchester Hospital University Foundation NHS Trust, Accident and Emergency, Colchester, United Kingdom, ⁴Mundipharma Research Limited, Biostatistics and Clinical Data Science, Cambridge, United Kingdom

Background and Goal of Study: Although methoxyflurane has been used for pain relief in analgesic doses (administered via the Pentrox® inhaler, 3mL dose) for over 30 years, there are limited data from the ED setting, or outside Australia and New Zealand. This Phase III study [1,2] evaluated the short-term efficacy and safety of methoxyflurane at low analgesic doses in treating acute pain in patients aged ≥12 years presenting to the ED with minor trauma. This abstract presents key efficacy results for 2 subgroups: adults with fractures or dislocations, and adults with 'other' injuries (mainly sprains, soft tissue injury and muscular pain, plus burns and injuries due to foreign body).

Materials and Methods: At triage, patients (N=300) were randomised 1:1 to receive methoxyflurane (up to 6mL) or placebo (normal saline), self-administered as required via a Pentrox® inhaler. Rescue medication (paracetamol/opioids) was available immediately upon request. Subgroup analyses of change from baseline to 5, 10, 15 and 20 minutes in visual analogue scale (VAS) pain intensity (primary endpoint, analysed using repeated-measures ANCOVA) and number of inhalations to first pain relief were performed.

Results and Discussion: The dislocation/fracture subgroup included 21 males and 18 females, mean age 37 years (N=36 for fractures and N=3 for dislocations). Mean±SD baseline VAS scores were 67.5±21.8mm in the methoxyflurane group and 67.3±14.1mm in the placebo group. The overall adjusted mean change from baseline in VAS pain was -28.1mm for methoxy-

flurane and -16.5mm for placebo (estimated treatment effect: -11.6, 95% CI: -22.8, -0.4, $p=0.0426$). Pain relief was achieved within 10 inhalations for 90% of methoxyflurane and 53% of placebo patients.

Conclusion(s): Low-dose methoxyflurane was shown to provide effective short-term analgesia in patients with fractures, dislocations and other minor trauma injuries.

References:

1. Coffey F et al. *Emerg Med J*;31:613-8, 2014.
2. Coffey F et al. *Adv Ther*;33:2012-31, 2016.

Acknowledgements: The study was funded by Medical Developments International (MDI) Limited. Medical writing support by Karen Mower (Scientific Editorial) and funded by Mundipharma Research GmbH & Co.KG.

®PENTHROX is a registered trade mark of MDI Limited.

08AP01-3

Safety and efficacy of Sufentanil Sublingual Tablet System for postoperative pain relief after laparotomic hysterectomy

Leykin Y., Busetto N., Laudani A.

Pordenone Medical Centre, Dept of Anaesthesiology & Intensive Care, Pordenone, Italy

Background: Hysterectomy is one of the most frequently performed major surgical interventions. In the industrialized world about 20% of women can be expected to have a hysterectomy by age 60. Chronic pain after surgery remains an issue, being reported by 4.7-31.9% after hysterectomy. The intensity of postoperative pain is considered a significant risk factor for the development of chronic pain.¹ For this reason an effective postoperative pain control becomes even more necessary.

Sufentanil Sublingual Tablet System (SSTS) (Zalviso®) was recently approved in Europe for treatment of moderate-to-severe acute postoperative pain in hospitalized patients. This handheld PCA device delivers a fixed dose of 15 mcg sufentanil tablets on a PRN basis, allowing patients to self-titrate to their own comfort level.²

We performed an analysis to evaluate clinical application of SSTS for postoperative pain relief after hysterectomy, assessing effectiveness, safety, and patient satisfaction.

Materials and Methods: Observational case series on 20 patients who underwent laparotomic hysterectomy under general anesthesia, between July 2016 and September 2016. Postoperative pain was managed by the exclusive use of SSTS. Prior to the end of surgery, paracetamol 1 g, morphine 0.1 mg/kg, ondansetron 4 mg were administered. Efficacy was assessed by patient reports of pain intensity on an 11-point numerical rating scale (NRS). Safety assessments included vital signs, and adverse events (AEs) Patient satisfaction was assessed via the Patient Global Assessment (PGA) of method of pain control, with "success" defined as the proportion of patients responding "good" or "excellent".

Results and Discussion: Average patient age was 52 years, BMI was 26.5 (range 18.3-34.8). Mean number of doses was 19 (range 4-51) over 72 hours, with inter-dosing intervals of 165 minutes. Median NRS was 0 (range 0-4) at rest, and 2 (range 0-6) during movement. No desaturation ($SpO_2 < 92\%$) was found. Nausea and vomiting were the most common AEs. PGA scores were positive, with a success rate of 91%.

Conclusions: In our clinical experience, SSTS has proved an effective and safe device for postoperative pain relief after laparotomic hysterectomy.

References:

- 1 Brandsborg B et al. Chronic pain after hysterectomy. *Acta Anaesthesiol Scand*. 2008 Mar;52(3):327-3.
- 2 Minkowitz HS. A review of sufentanil and the sufentanil sublingual tablet system for acute moderate to severe pain. *Pain Manag*. 2015;5(4):237-50.

08AP01-4

The analgesic effect of nefopam with fentanyl in intravenous patient-controlled analgesia after arthroscopic orthopedic surgery

Jeong M.A., Oh Y.N., Kim T.Y.

Hanyang University Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Balanced analgesia combined with non-narcotic drugs and opioids has the benefit of reducing side effects of opioids and increasing analgesic effect. Nonsteroidal anti-inflammatory drugs (NSAIDs) can cause gastroduodenal problem, renal dysfunction, bleeding tendency, and etc. However, nefopam is a centrally-acting non-opioid analgesic, which has no effect on bleeding time and platelet aggregation. In this study, we present efficacy and side effects of nefopam compared with ketorolac in intravenous fentanyl based patient-controlled analgesia after shoulder arthroscopic orthopedic surgery

Materials and Methods: A prospective randomized, double-blind study was conducted. 92 patients were randomly divided into two groups to receive intravenous PCA, which were nefopam group (fentanyl 20 µg/kg and nefopam 120 mg in total 100 ml, n = 46) and ketorolac group (fentanyl 20 µg/kg and ketorolac 2 mg/kg in total 100 ml, n = 46). After the operation, a blinded observer assessed the pain with a numeric rating scale (NRS) and visual analog scale (VAS), and side effects at 10 min, 30 min, 1, 4, 8, 12, 24, and 48 hr after the operation. Total infused PCA volume and the numbers of pressed PCA bolus button were also assessed at 10 min, 30 min, 1, 4, 8, 12, 24 hr after the operation.

Results and Discussion: There were no significant differences in VAS score, NRS score, total PCA infusion volume or numbers of pressed bolus button and other side effects between two groups.

Conclusion(s): Nefopam is considered to be an appropriate alternative drug to be co-administered with fentanyl based PCA for patients who have difficulty using NSAIDs as an assistant drug of fentanyl based PCA.

References:

1. Kehlet H, Dahl JB. Anaesthesia, surgery, and challenges in postoperative recovery. *Lancet* 2003;362:1921-8.
2. Buvanendran A, Kroin JS. Multimodal analgesia for controlling acute postoperative pain. *Curr Opin Anaesthesiol* 2009;22:588-93.
3. Kim K, Kim WJ, Choi DK, Lee YK, Choi IC, Sim JY. The analgesic efficacy and safety of nefopam in patient-controlled analgesia after cardiac surgery: A randomized, double-blind, prospective study. *J Int Med Res* 2014;42:684-92.
4. Durrieu G, Olivier P, Bagheri H, Montastruc JL, French Network of Pharmacovigilance C. Overview of adverse reactions to nefopam: an analysis of the French Pharmacovigilance database. *Fundam Clin Pharmacol* 2007;21:555-8.

08AP01-5

The combination of parecoxib and propacetamol reduces opioid consumption and hypoxemic episodes following unilateral hip arthroplasty

Essex M.¹, Camu F.², Bhadra Brown P.³, Cheung R.⁴

¹Pfizer, Global Medical Affairs, New York, United States, ²Algos Consulting BVBA, Chairman, Ghent, Belgium, ³Pfizer Inc, Statistics, New York, United States, ⁴Pfizer Inc, Medical, New York, United States

Objective: Opioids provide postoperative analgesia but are associated with several side effects including respiratory depression. Multimodal analgesic approaches aim to reduce opioid use and the occurrence of opioid-related events. This study assessed opioid sparing effects and impact on respiratory function of paracetamol and parecoxib, an injectable cyclooxygenase-2 inhibitor, following unilateral hip arthroplasty.

Methods: At last stitch, patients received parecoxib 40mg IV twice daily (PAR), propacetamol 2g IV four times daily (PROP), parecoxib 40mg IV twice daily + propacetamol 2g IV four times daily (PAR+PROP), or placebo. Study treatment continued up to 48 hours. All treatment arms could receive supplemental patient-controlled analgesia in the form of an IV bolus of morphine. Cumulative supplemental morphine consumption and Opiate Symptom Distress Questionnaire (OSDQ) scores were assessed at 24 and 48 hours post-surgery. Respiratory function was continuously assessed via pulse oxim-

etry and the occurrence of hypoxemic events (oxygen saturation <90%) were recorded. Movement-related pain was assessed at 24 hours post-surgery.

Results: All active treatment groups consumed significantly less supplemental morphine compared with the placebo at 24 (all $p < 0.01$) and 48 (all $p < 0.001$) hours. The PAR and PAR+PROP groups exhibited significantly less opioid distress, as assessed by the OSDQ, at 24 hours compared with placebo (both $p < 0.05$). The combination PAR+PROP group also exhibited significantly less opioid distress at 48 hours compared with placebo ($p = 0.005$). The frequency of patients experiencing a hypoxemic event was significantly less in the PAR+PROP group (2.8%) compared with placebo (13.2%; $p = 0.026$). The frequency of patients experiencing a hypoxemic episode in the PAR (9.7%) and in the PROP (4.2%) groups was not significantly different from placebo. Across all treatment groups, there was no significant correlation between the frequency of hypoxemic events and patient age ($r = -0.134$), the dose of morphine received at the time of the event ($r = 0.177$), or time since initiating study treatment ($r = 0.231$). Movement related pain was significantly lower in the PAR ($p = 0.025$) and PAR+PROP ($p < 0.001$) groups versus placebo.

Conclusions: The combination of parecoxib and propacetamol provided significant analgesic and opioid-sparing effects, including a reduction in the frequency of hypoxemic episodes, following unilateral hip arthroplasty. Sponsored by Pfizer.

08AP01-6

A phase 3 open label study of the sufentanil sublingual tablet 30 mcg for treatment of acute post-operative pain

Jove M.¹, Minkowitz H.², Hutchins J.³

¹Dekalb Medical Center, Dept of Surgery, Decatur, United States,

²Memorial Hermann Memorial City Medical Center, Dept of Anaesthesiology, Houston, United States, ³University of Minnesota, Dept of Anaesthesiology, Minneapolis, United States

Introduction: The sufentanil sublingual tablet system (Zalviso™) is a non-invasive, patient-controlled analgesia (PCA) product recently approved in Europe for treatment of acute moderate-to-severe post-operative pain in a hospital setting. A second sufentanil product, a 30 mcg tablet (SST 30 mcg) dispensed sublingually by a healthcare professional via a single-dose applicator, has just completed Phase 3 development for treatment of moderate-to-severe pain in medically-supervised settings, such as short-stay surgery or emergency medicine. The primary objective of this study was to evaluate the safety and efficacy of SST 30 mcg in the management of acute post-operative pain in both inpatient and outpatient surgical settings.

Methods: This was a multicenter, open-label trial in patients 40 years and older who underwent an orthopedic or abdominal surgical procedure. All patients signed an IRB-approved Informed Consent Form and participating research centers were encouraged to enroll patients with a more advanced age and/or one or more medical co-morbidity. The primary efficacy variable was the time-weighted summed pain intensity difference (SPID) over the 12-hour study period (SPID12). Efficacy was assessed by patient reports of pain intensity on an 11-point numerical rating scale (NRS), (0 = no pain, and 10 = worst possible pain). Safety was monitored via vital signs, including oxygen saturation, as well as assessment of adverse events (AEs) and the use of concomitant medications. A safety and efficacy sub-group analysis by surgery type was additionally performed.

Results: A total of 140 patients were enrolled in the study; 83 abdominal surgery, 18 major joint replacement, 10 bunionectomy, and 29 "other" surgery patients. Average patient age was 54.7 years; 54% were female. Mean baseline pain intensity scores ranged from 5.0 for joint replacement to 6.7 for bunionectomy. Mean SPID12 scores for all SST 30 mcg patients was 36.04, with higher (better pain relief) values observed in abdominal patients (39.27) compared to orthopedic patients (22.18). The most frequently reported AEs for all cohorts were nausea (27.1%) and headache (5.7%).

Discussion: Results of this study suggest that SST 30 mcg was effective and well tolerated for the management of moderate to severe acute pain in post-operative patients following a broad range of inpatient and outpatient surgery types.

08AP01-7

Analgesic effects of Co-Crystal of Tramadol-Celecoxib in patients with moderate or severe pain at baseline: subgroup analysis of a randomised, double-blind, Phase II clinical trial in patients with acute pain after dental surgery

Dastros-Pitei D.¹, Videla S.², López-Cedrún J.L.³, Puyada A.², Plata-Salamán C.², Monner A.⁴

¹Mundipharma Research Limited, Medical Science Department, Cambridge, United Kingdom, ²Laboratorios del Dr. Esteve S.A.U, Clinical Investigation, Barcelona, Spain, ³Complejo Hospitalario Universitario A Coruña, Oral Surgery, A Coruña, Spain, ⁴Hospital Universitari de Bellvitge, Oral and Maxillofacial Surgery, Barcelona, Spain

Background and Goal of Study: Co-Crystal of Tramadol-Celecoxib (CTC) is an analgesic co-crystal in development by Esteve and Mundipharma Research (as E-58425 and MR308, respectively). In a Phase II trial, CTC (100, 150 and 200mg) showed greater analgesic efficacy vs. tramadol 100mg or placebo in patients with moderate or severe acute pain after dental surgery. This post-hoc subgroup analysis assessed efficacy by pain severity at baseline (moderate or severe).

Material and Methods: This was an independent ethics committee-approved Phase II trial (EudraCT No. 2011-002778-21). Patients aged ≥ 18 years who, ≤ 4 h after surgical extraction of ≥ 2 impacted third molar teeth requiring bone removal, reported pain intensity (PI) ≥ 50 mm on a visual analogue scale (VAS) were randomised to 1 of 6 treatments: 50mg (equivalent to 22mg tramadol/28mg celecoxib), 100mg (44mg/56 mg), 150mg (66mg/84mg) or 200mg (88mg/112mg) CTC, 100mg tramadol or placebo. VAS PI was assessed at baseline and at 26 timepoints up to 24 h. The primary endpoint was sum of PI difference from 0-8 h (SPID8).

Results and Discussion: Data from 288 patients (122 male; 284 white; mean age 24.5 years) were evaluated (50mg [n=30&15 with moderate and severe baseline pain, respectively]; 100mg [n=31&16]; 150mg [n=34&20]; and 200mg CTC [n=31&15]; tramadol [n=27&22]; placebo [n=33&14]). In patients with moderate pain (VAS 50-60 mm), mean SPID8 was 18.33, -50.02, -80.94, and -126.98 h*mm for 50, 100, 150, and 200mg CTC, respectively. Reductions in pain with CTC were even more pronounced in patients with severe pain (VAS >60 mm; -99.82, -166.08, -237.81, and -267.54 h*mm). Tramadol was also more effective in patients with severe pain (-74.95 h*mm) vs. those with moderate pain (101.29 h*mm). For placebo, mean SPID8 was similar in patients with moderate and severe pain (73.05 and 65.87 h*mm, respectively). In both subgroups, SPID8 was significantly improved with 150 and 200mg CTC vs. placebo or tramadol ($p \leq 0.0258$; unadjusted p-value from analysis of variance).

Conclusion: CTC and tramadol appear to be more effective in patients with severe baseline pain than in those with moderate baseline pain. In both subgroups, the highest doses of CTC (100, 150 and 200mg) were more efficacious than 100mg tramadol and placebo.

Acknowledgements: Study funding: Laboratorios del Doctor Esteve, S.A.U. Medical writing support: Louise Niven DPhil (Aspire Scientific Ltd; funded by Mundipharma Research GmbH & Co.KG).

08AP01-8

Dosing observations and pharmacokinetics by surgery type across four randomized, placebo-controlled trials with the sufentanil sublingual tablet

Dahan A.¹, Estebe J.-P.², Jove M.³

¹Leiden University Medical Center, Dept of Anaesthesiology, Leiden, Netherlands, ²Centre Hospitalier Universitaire Rennes, Dept of Anaesthesiology, Rennes, France, ³Dekalb Medical Center, Dept of Surgery, Decatur, United States

Introduction: Postsurgical complications related to inadequate pain management negatively affect patient welfare and hospital performance. The Sufentanil Sublingual Tablet System (SST 15 mcg; Zalviso®), a PCA device dispensing 15 mcg tablets, was recently approved in Europe for treatment of acute post-operative pain. A second sufentanil product, a 30 mcg tablet (SST 30 mcg) dispensed by a healthcare professional in medically supervised

settings such as short-stay surgery or the Emergency Department, just completed phase 3 development. Data evaluating two dosage formulations of SST is now available across a broad range of orthopedic and abdominal surgical pain models. The primary objective of this analysis was to evaluate drug utilization and sufentanil plasma concentrations by surgery type across the SST 15 mcg and SST 30 mcg pivotal trials.

Methods: Detailed dosing data were analyzed from four randomized, placebo-controlled studies; two using SST 15 mcg following joint replacement (TKA and THA) or open abdominal surgery (OA), and two using SST 30 mcg following bunionectomy or abdominal surgery. Pain intensity (PI) in all trials was assessed via 11-pt NRS (0-10). Dosing data included mean, median and overall number of sufentanil doses. Plasma sufentanil concentrations were derived from blood samples drawn at 12, 24 and/or 48-hours after the first dose. Adverse event (AE) rates between the cohorts was additionally compared.

Results: 430 inpatients received treatment with SST 15 mcg; 152 TKA, 163 THA and 115 OA. 147 outpatients received treatment with SST 30 mcg; 40 bunionectomy, 52 abdominoplasty, 32 laparoscopic abdominal and 23 hernia repair. Baseline PI ranged from "5" for hernioplasty to "6.5" for abdominoplasty with reductions for all SST patients statistically separating from placebo within 15-60 minutes of initiating therapy ($p \leq 0.030$). Mean number of SST 15 mcg doses over the first 24 hours ranged from 20 (OA) to 23 (TKA) compared to 4-5 for all SST 30 mcg patients. Sufentanil plasma levels at 12 hours were highest in TKA (106 pg/ml) patients and lowest in abdominoplasty patients (37 pg/ml). Nausea was the most frequently reported AE across all cohorts.

Conclusion: Across the SST 15 mcg and 30 mcg pivotal trials, management of acute post-operative pain was demonstrated across a broad range of surgery sub-populations. Clinical findings also suggest that SST may be an effective analgesic option for inpatient and outpatient surgical settings.

08AP01-9

Efficacy of low-dose methoxyflurane analgesia in adult patients presenting to the emergency department with acute pain due to contusions and lacerations: a sub-analysis of a Phase III, randomised, double-blind, placebo controlled UK study (STOP!)

Coffey F.¹, Dissmann P.², Mirza K.³, Lomax M.⁴

¹Nottingham University Hospitals NHS Trust, UK, Emergency Department, Nottingham, United Kingdom, ²James Cook University Hospital, Emergency, Middlesbrough, United Kingdom, ³Colchester Hospital University Foundation NHS Trust, Accident and Emergency, Colchester, United Kingdom, ⁴Mundipharma Research Limited, Biostatistics and Clinical Data Science, Cambridge, United Kingdom

Background and Goal of Study: Despite a large volume of published literature supporting the efficacy and safety of methoxyflurane at analgesic concentrations[1], previous studies have been mostly observational and uncontrolled. This Phase III study[2,3] investigated the efficacy and safety of low-dose methoxyflurane analgesia administered via the Pentrox[®] inhaler for the treatment of acute pain due to minor trauma in the Emergency Department. We present results of a sub-analysis of 2 pain endpoints in adult patients with contusions or lacerations (N=60).

Materials and Methods: 300 adult and adolescent patients were randomised 1:1 to receive methoxyflurane (≤ 6 mL) or placebo (normal saline), both inhaled as required from a Pentrox[®] inhaler. Rescue medication (paracetamol/opioids) was available immediately upon request. The primary efficacy endpoint was change from baseline in visual analogue scale (VAS) pain intensity, analysed using repeated measures ANCOVA. The number of inhalations taken before first pain relief was also summarised.

Results and Discussion: The methoxyflurane subgroup (N=30) included 27 patients with contusions and 4 patients with lacerations (1 had both); 16 male, 14 female, aged 18-67. The placebo subgroup (N=30) included 26 patients with contusions and 6 patients with lacerations (2 had both); 13 male, 17 female, aged 18-68. Mean \pm SD VAS pain scores at baseline were 69.0 \pm 16.6mm in the methoxyflurane group and 63.5 \pm 22.1mm in the placebo group. Mean change in VAS pain intensity from baseline to 5, 10, 15 and 20 min was greater for methoxyflurane (-24.8, -34.6, -42.7 and -44.2mm, respectively) than placebo (-9.2, -12.0, -10.4 and -12.8mm, respectively).

Overall, there was a highly significant treatment difference (estimated treatment effect, -25.5mm; 95% CI -34.5 to -16.5; $p < 0.0001$). A total of 25 patients (83%) in the methoxyflurane group experienced their first pain relief with

1-10 inhalations (1-5 inhalations: n=13; 6-10 inhalations: n=12) vs 15 patients (50%) in the placebo group (1-5 inhalations: n=8; 6-10 inhalations: n=7).

Conclusion(s): The results show that low-dose methoxyflurane administered via the Pentrox[®] inhaler is a rapid-acting and effective analgesic in patients presenting with acute pain due to contusions or lacerations.

References:

1. Grindlay J, Babl FE. *Emerg Med Australas*;21:4-11, 2009.
2. Coffey F et al. *Emerg Med J*;31:613-8, 2014.
3. Coffey F et al. *Adv Ther*;33:2012-31, 2016.

08AP01-10

Nabilone as an analgesic adjuvant during general balanced anesthesia in laparoscopic cholecystectomy

Rosas Saldívar J.M.¹, Juárez Pichardo J.S.², Rivera Ordoñez A.³

¹Secretaría de Salud de la Ciudad de México, Dept of Anaesthesiology, México, Mexico, ²Centro Médico ABC, Dept of Anaesthesiology & Pain Medicine, México, Mexico, ³Secretaría de Salud de la Ciudad de México, Dept of Anaesthesiology & Pain Medicine, Mexico, Mexico

Goal of Study: Assess the efficacy of premedication with 2mg of nabilone as an analgesic adjuvant to fentanyl during general anesthesia in patients undergoing Laparoscopic Cholecystectomy.

Materials and Methods: A controlled clinical study was performed, whose 52 patients were studied, aged 18 to 60 years, ASA I or II, with BMI <30 kg/m², scheduled electively. The patients excluded from this study were pregnant or nursing women, addicts and psychiatric illnesses. They were randomly divided into two groups composed of 26 each. The members of group 2 were given 2mg of nabilone orally two hours prior to surgery. An established induction protocol was used for both groups, the transanesthetic maintenance was administered with desflurane and fentanyl perfusion, recording total dose and calculated plasma concentration. Also reported adverse effects associated with the administration of fentanyl and nabilone and the presence of postoperative pain. Using Pearson X² test for qualitative variables and Student's T test for quantitative variables, with a 95% confidence interval [CI].

Results and Discussion: There are multiple references that tell us about the nociceptive properties of cannabinoids and in which beneficial role for the management of chronic pain is demonstrate. As for acute pain, a systematic review by McQuay, concluded that there was insufficient evidence to justify its use in that context, since it offers an analgesia equivalent to the use of weak opioids, which is modified substantially with the results obtained in our study. The results of this research show that nabilone as a premedication anesthetic, it significantly reduces the consumption of fentanyl during general anesthesia ($p < 0.005$), using 45.5% less opioid than those receiving conventional management.

Conclusion: Nabilone is effective as adjunctive analgesic, and due to their pharmacological properties, it can be used as premedication, having proven to be a safe drug. Absence of postoperative nausea and vomiting was demonstrated in patients who were premedicated with nabilone.

References:

1. Cichewicz DL. Synergistic interactions between cannabinoid and opioid analgesics. *Life Sciences*. 2004; 74(11):1317-1324.
2. Gofeld M, Robinson S, Faclier G. Administration of nabilone for postoperative pain control in the marijuana-addicted: Case study. *Acute Pain*. 2006; 8:29-32.
3. McQuay HJ, Moore RA. An evidence based resource for pain relief. 6a ed. Oxford: Oxford University Press; 1998.

08AP01-11**Does patient controlled epidural analgesia is the best option for postoperative analgesia in cancer surgery? - A Romanian experience**

Zgaia A.O.¹, Achimas Cadariu P.², Lisencu C.², Vlad C.², Sandesc D.³, Irimie A.⁴

¹Oncology Institute Cluj-Napoca, Dept of Anaesthesiology & Intensive Care, Cluj-Napoca, Romania, ²Oncology Institute Cluj-Napoca, Dept of Surgery, Cluj Napoca, Romania, ³University of Medicine and Pharmacy 'Victor Babes', Dept of Anaesthesiology & Intensive Care, Timisoara, Romania, ⁴University of Medicine and Pharmacy 'Iuliu Hatieganu', Dept of Surgery, Cluj Napoca, Romania

Background and Goal of Study: Despite the advantages of locoregional analgesia for postoperative pain, patient controlled epidural analgesia (PCEA) is rarely used and is not included in local protocols and guidelines for postoperative pain management in Romania. The aim of our study was to investigate the efficiency of PCEA in postoperative period in cancer surgery, regarding pain control, postoperative complications and other advantages as early mobilization, return of bowel movements.

Materials and Methods: We performed a prospective, randomized, controlled study, which included 100 patients scheduled for surgery for gastrointestinal cancer. Patients were randomly allocated into two parallel groups: Group 1 - patients receiving intravenous opioids Group 2 -patients receiving PCEA. Acute postsurgical pain, postoperative mobilization, bowel movements and complications were assessed at certain intervals of time, for a period of 48 hours post-operative.

Results and Discussion: Patients in the Group 2 had significantly lower intensity of postoperative pain than patients in the Group 1 (p-value <0.001). Also, these patients had early mobilization (p-value <0.001) and bowel movements (p-value <0.001), and less nausea and vomiting in the postoperative period (p-value <0.001).

Conclusion: Our study demonstrated that PCEA for the management of acute postsurgical pain for patients scheduled for gastrointestinal cancer surgery decreases the intensity of acute postoperative pain, incidence of nausea and vomiting and facilitates early mobilization and resumption of bowel movements.

08AP02-1**Chronic post surgical pain after carpal tunnel syndrome surgery**

Sansone P., Donatiello V., Pace M.C., Passavanti M.B., Pota V., Aurilio C.
University of Campania 'Luigi Vanvitelli', Department of Woman, Child and General and Specialized Surgery, Naples, Italy

Background and Goal of Study: Evaluation of efficacy of Tapentadol vs combination of Tapentadol/Pregabalin in chronic post surgical pain after carpal tunnel syndrome (CTS) surgery.

Materials and Methods: 76 patients >65 yrs old with chronic pain after CTS surgery (NRS>5) were evaluated already treated with Tapentadol 100-500mg/die (TAP Group) and, TAPRE group was treated with association of 100-500mg/die and Pregabalin 150-300 mg/die. All patients have been treated for 8 weeks and visited at T0 (baseline), T1 (15 days), T2 (30 days) T3 (60 days); pain intensity was evaluated with NRS scale and quality of life was evaluated with EQ-5D. Side effects had been recorded.

Results and Discussion: After 30 days NRS was (6.6 +/- 1.74) TAP, (6.2 +/- 2.11) TAPRE. At T3, NRS= 3.9 +/- 1.57 in TAP and 4.3 +/- 1.13 in TAPRE. EQ5-D showed a significant quality of life improvement in both groups. Side effects incidence: TAP 2,1% vs TAPRE 7,9 % (p<0.05). Side effects recorded were: dizziness and drowsiness, tachycardia, upper abdominal pain. No significant differences were observed in both groups and side effects were significantly higher in TAPRE group.

Conclusion(s): Tapentadol represents a useful and safe alternative to association Tapentadol/Pregabalin in treatment of chronic postsurgical pain after CTS surgery.

08AP02-2**Does protocolled pain management improve post-surgery pain after thoracic or video-assisted thoracoscopic surgery (VATS)?**

Schouten-Waisvisz A.¹, Keers J.², Duinker P.¹, ten Hagen A.¹

¹Martini Hospital Groningen, Dept of Anaesthesiology, Groningen, Netherlands, ²Martini Hospital Groningen, Research and Development Department, Groningen, Netherlands

Background and Goal of Study: Thoracotomy is a painful surgical procedure. The aim of this study was to evaluate whether protocolled pain management would provide better postoperative analgesia.

Materials and Methods: In a retrospective cohort study we compared conservative pain management (2015, N = 40) with protocolled post-surgery pain management (2016, N = 41) in patients who underwent lung surgery. The new hospital policy was to use thoracic epidural analgesia for at least 3 days post-surgery. Patients started oral oxycodone 10 mg slow release at 6.00 am the day they the thoracic epidural catheter was removed. In case of NRS ≥4, thoracic epidural analgesia is continued.

The following data were collected: demographics, information about surgery procedures, days of thoracic epidural analgesia, time to start oral oxycodone after removal of the epidural catheter, use of NSAIDs, postoperative pain scores (NRS) during five days.

To compare treatment outcomes in both groups we applied t-tests for continuous measures and Chi² tests for categorical measures. P-values <0.05 were statistically significant.

Results: No differences in demographics were found between the groups. The mean duration remaining thoracic epidural analgesia did not differ between the two cohorts, although the number of epidural catheters removed at the first two days decreased from 45% in 2015 to 22% in 2016. In the 2015 cohort, NSAIDs were significantly more administered (30.8% vs. 7.3%; p <0.05). There were no difference between 2015 and 2016 in postoperative pain. The mean NRS scores ranged between 2.15 and 2.97.

Conclusion: Thoracic epidural analgesia provides effective treatment for postoperative pain after thoracic surgery. This cohort study showed low pain scores in both programs without significant differences. Low pain scores in 2015 can be explained by the more frequent use of NSAIDs.

08AP02-3**Evaluation of acute postoperative pain control and identification of risk factors - experience in a tertiary care center**

Albuquerque D., Rocha Abecasis M., Resende A.
Centro Hospitalar Lisboa Norte - Hospital Santa Maria, Dept of Anaesthesiology, Lisbon, Portugal

Background and Goal of Study: Postoperative pain is quite common and most patients report poor pain control in the post-operative period, which is linked to worse outcomes. The complexity of acute pain led to the development of acute pain services (APS). Currently there is no optimal model for APS. In our institution, we developed an PACU-based anaesthesiologist-led APS that is responsible for pain management of patients under PCAs or regional catheter-based analgesia and by physician referral. The aim of this study is to evaluate post-operative pain control in our institution and identify risk-factors and areas for improvement.

Materials and Methods: During one week period, we assessed all patients who were admitted to our central postanesthetic care unit for VAS-score at 0 and 24 hrs, age, type of surgery, type of anaesthesia, type of post-operative analgesia and in-PACU time. Statistical analysis was performed using SPSS 2.0 and we applied χ^2 /f-Fisher tests and t-Student/Mann-Whitney tests, considering p-value <0,05.

Results and Discussion: Data was from 101 patients, 47 female and mean age 62 yrs (23-95). Anaesthetic technique was 80% general anaesthesia, 15% regional anaesthesia, 2% combined anaesthesia and 2% sedoanalgesia. At 0hrs, 82% reported mild pain (VAS<3), 10% moderate pain (VAS 4-6) and 8% severe pain (VAS>6). At 24hrs, 56% had mild pain, 33% moderate pain and 11% severe pain. Postop analgesia was scheduled intravenous (73%) plus surgical site local infiltration (2%), epidural (12%), peripheral nerve block (11%), intravenous PCA (1%) or PCEA (1%). Age (p=0,007) and anaesthetic technique (p=0,002) had a statistically significant relation to pain at 0hrs. Pain at 0hrs (p=0,007) and age (p=0,002) were related to pain at 24hrs.

Conclusion(s): Our study shows that there is room for improvement in post-operative pain control in our institution. Regional anaesthesia appears to be related to better early postoperative pain control, though no association with later pain. Good early pain control was associated with better pain control at 24 hours and may be an important predictor of post-operative pain control. Age was associated with worse post-operative pain control. This study suggests important predictors of poor pain control that could be used as criteria for APS referral - age and pain upon PACU admission.

08AP02-4

Opioids for post-surgical pain: potential cause of chronic use?

Chatziperi A.

Northern Deanery, Dept of Anaesthesiology, Newcastle Upon Tyne, United Kingdom

Background and Goal of Study: Opioids remain the mainstay for the management of moderate to severe postoperative pain. In selected patient groups, treatment with opioids may need to continue for a variable period of time after discharge.

Over the last 30 years, the use of opioids to manage acute pain has regained its place in accepted medical practice. The WHO promoted pain as the "fifth vital sign" with the intent of swinging the pendulum back to appropriately treating patients' pain.

This survey aimed to identify the magnitude of inappropriate postoperative discharge prescribing of opioids by the hospital doctors and the role of GP in optimizing and monitoring postoperative opioid prescribing.

Materials and Methods: We prospectively selected 91 patients who underwent general, gynecological or orthopedic procedures between 01/04/2015 and 01/05/2015.

Patients on preexisting opioid medications and those under 18 yrs. of age were excluded from the study. We reviewed patient's hospital discharge letter and discharge prescriptions using the electronic patient record keeping system (e records) in our Trust.

We then sent letters to the patients' GP, requesting information regarding their ongoing prescriptions 1 month following the discharge from the hospital. The GP had option to respond with a fax, email or a letter in a prepaid envelope that was included in our requesting letter.

Results and Discussion: We reviewed the postoperative discharge prescription of 90 patients.

13 patients underwent general surgery while 25 had gynecological and 53 orthopaedic procedure.

66 (73%) of the patients had a prescription with opioids at the time of discharge.

11(16%) patients had clear instructions in their discharge letter about the length of the opioid consumption.

Responses were received from 43 (47%) GPs for postoperative opioid prescribing after discharge from the hospital.

12 (28%) patients continued the opioids for a month at least after they had their operation.

Conclusion(s): The use and efficacy of opioid for management of post surgical pain in the community after discharge from hospital is debatable. Clear discharge instructions regarding the intended period of opioid use for post surgical pain and subsequent timely review by GP for continued need for opioids and side effects assessments is a joint responsibility.

More awareness and communications among hospital doctors and GP is warranted to address this issue of inappropriate post surgical opioid use.

08AP02-5

Prediction of persistent pain 4, 8 and 12 months after breast cancer surgery by a simple risk model

Dereu D., Mathivon S., Savoldelli G., Rehberg-Klug B.

Hôpitaux Universitaires de Genève, Dept of Anaesthesiology, Geneva, Switzerland

Background and Aim: Persistent postoperative pain concerns many patients following breast cancer surgery. Multiple studies have already identified numerous risk factors. If preventive measures could be targeted to a subgroup of patients at high risk of persistent pain, positive results would be more likely.

Therefore, we constructed a risk model of persistent pain at 4 months, based on known risk factors (IASP 2016 world congress abstract). The secondary aim was to investigate the predictive performance of this model for pain at 8 and 12 months.

Methods: Following ethics committee approval and written informed consent, 200 patients were included in a prospective observational study. Preoperatively, patients completed questionnaires for known risk factors. At 4, 8 and 12 months postoperatively, persistent pain was assessed.

To construct a multivariable model, we used parameters identified by literature review and a univariate analysis of our data: history of depression, pre-existing pain at the surgical site, high acute pain expectation, and young age. The model was developed to predict "clinically significant pain" at 4 months (defined as either resting pain >3/10, pain on movement >5/10, or pain necessitating analgesics).

The area under the ROC curve (AUC-ROC) of the predictive model was assessed to investigate the performance of the model in discriminating patients with and without a clinically important pain at 8 months and 12 months.

Results: The logistic regression model predicted clinically important pain at 4 months with an AUC-ROC of 0.81. At 8 months, 22/91 (24.2%) patients reported clinically significant pain. Based on the model predicting clinically important pain at 4 months, the average predicted risk was 22.3% in patients without pain at 8 months and 36.6% in patients with pain (AUC-ROC 0.615). At 12 months, 15/83 (18.1%) patients reported clinically significant pain. The average predicted risk was 21.0% in patients without pain at 12 months and 42.1% in patients with pain at 12 months (AUC-ROC 0.689).

Conclusions: A simple risk model with 4 parameters may allow to identify patients with high (>30%) risk of persistent pain at 4 months already before breast cancer surgery. However, the performance of this risk model for the prediction of pain at 8 and 12 months was much lower. Larger confirmatory studies are needed to evaluate its long term predictive performance.

08AP02-6

Predictors of severe postoperative pain after laparoscopic cholecystectomy

Kuchyn I., Bielka K., Babych V.

National O. Bogomolets Medical University Institute of Postgraduate Education, Dept of Surgery, Anesthesiology and Intensive Care, Kyiv, Ukraine

Background and Goal of Study: Laparoscopic cholecystectomy is generally associated with less pain compared to open approach. Although, pain still remains a challenge in clinical practice, since 80% of patients will require opioid analgesia [1]. Pain after laparoscopic cholecystectomy is the main complaint and one of the reasons to prolong hospital stay. The aim of our study was to reveal predictors of severe postoperative pain in patients after laparoscopic cholecystectomy.

Materials and Methods: 100 patients after laparoscopic cholecystectomies were admitted to this observational prospective study. Exclusion criteria were: age under 18 and over 75 years; inability to obtain an informed consent from the patient; pregnancy or lactation. The criteria for severe postoperative pain were pain level measured with visual analogue scale (VAS) as 7 or more during at least 30% of time at first 24 hours after surgery. Pain was assessed every 1-2 hour during 48 hours after surgery. Multivariable binary regression models with stepwise selection procedures were conducted providing odds ratio (OR) estimates.

Results and Discussion: 20 from 100 patients (20%) were determined as patients with severe postoperative pain. In the multivariable regression, significant predictors of severe postoperative pain were: female gender (OR 3.95CI 0.95-10, p=0.046), young age (OR 146.95CI 3-839, p=0.003), severe preoperative pain (OR 40.95CI 10-155, p=0.0001), preoperative anxiety/depression (OR 13.5.95CI 4-50, p=0.0001). Intraoperative ketamine use were associated with significantly lower incidence of severe pain (OR 6.8.95CI 1.1-14, p=0.03). There was no association between ASA level and postoperative pain.

Conclusion(s): In this prospective study we determined the predictors of severe postoperative pain in patients after laparoscopic cholecystectomy. They were female gender, young age, severe preoperative pain and preoperative anxiety, depression. Intraoperative ketamine use was associated with significantly lower incidence of severe pain, however future studies are needed.

References: 1. AhmedB, Elmawgoud M.A.A, Doaa R. Antinociceptive effect of ($\alpha 2$ - Adrenoceptor Agonist) dexmedetomidine/mepiperidine, topically, after laparoscopic gynecologic surgery. J Med Sci 2008; 8:400-4.

08AP02-7**Staying longer is worth the effort! Interventions for a patient-oriented working-hours model in postoperative pain therapy**Göttermann A., Weinmann C., [Meissner W.](#)*Jena University Hospital, Dept of Anaesthesiology & Intensive Care, Jena, Germany*

Background: There is broad agreement in literature that patients benefit from specialized acute pain services. At Jena University Hospital, specialized pain nurses are on duty during regular working hours, i.e. from 07:00 to 15:30 h. Beyond this time, no specialized pain care is provided. Thus, postponing working hours of pain nurses might offer a benefit for patient care.

Material and methods: After surgery, patients are seen by a pain nurse on the ward. As normal working hours end at 15:30 h, many patients have to wait until the next day for this consultation. In our study, working hours were postponed until 18:30 h for a test period of 3 months to cover more post-op patients on the day of surgery. Results were compared with outcome data from the same wards from a previous period with nursing pain services offered between 07:00 - 15:30 h.

On post-op day 1, patient reported outcomes were collected by use of the QUIPS questionnaire. QUIPS results from 2 wards about pain intensity, impairments caused by pain, wish for more pain treatment, satisfaction with the pain therapy and the patients' perception of how much they could participate in decisions were compared with data from a period in the past when working hours were as usual.

Results and Discussion: 157 patients were included, 22 of them did not want to participate in the survey. Data analysis showed significant improvements in patients' perception of their involvement in decisions about pain therapy (7.56 on a numeric rating scale, compared to 5.63 in the control group), a decrease in patients' wish for more pain treatment and positive tendencies in satisfaction. Regarding pain intensity and impairments caused by pain, no significant differences could be identified.

Conclusion: Post-surgical patients are more satisfied with their pain therapy, feel more involved in therapy decisions, and ask for less additional pain medication if a specialized pain nurse sees them in the late afternoon or early evening on the day of surgery.

Keywords: Acute pain service, working hours, pain nurse, postoperative pain IRB Jena University Hospital No. 2722-12/09, dated 08 December 2009

08AP02-8**Tough cookies: the older the patients, the more pain tolerating?**Weinmann C., Komann M., [Meissner W.](#)*Jena University Hospital, Dept of Anaesthesiology & Intensive Care, Jena, Germany*

Background: Postoperative pain is a common aftermath of surgery. However, individual perceptions of pain intensity, impairments caused by pain as well as satisfaction with pain therapy differ depending on type of surgery, medication, gender and age. Some studies have shown that patient reported maximum pain decreases with increasing age¹. This study wanted to analyze if these findings can be confirmed by registry data, and if additional outcome parameters like e.g. pain-caused interferences with activities in bed also show this phenomenon.

Material und Methods: This study is based on data from the PAIN OUT registry. In order to avoid variability, we only looked at data from patients after total knee replacement (ICD 9 code 81.54). Data from 2,390 patients (collected between 01 February 2010 and 04 November 2016 in 54 hospitals around the world) have been analyzed with regard to the item "worst pain since surgery" and "pain interference with activities in bed" on postop day 1. A linear regression model with age as independent variable and functional impairment as dependent variable was applied.

Results and Discussion: Patient reported maximum pain levels on a numeric rating scale from 0 - 10 decreased significantly with age (coefficient: B = -0.028, p<0.001). In contrast, functional impairment caused by pain did not change significantly with age.

Conclusion: Our study has confirmed that the older the patients, the lower their reported maximum pain levels. However, elderly patients do not report less functional impairment caused by pain. As functional impairment is a more clinically relevant parameter for postoperative recovery than numeric pain in-

tensity, these findings suggest that elderly patients might tend to underreport their pain levels, and that asking about functional impairment might be a better tool for pain assessment.

Literature: Gerbershagen et al., Procedure-specific Risk Factor Analysis for the Development of Severe Postoperative Pain, *Anesthesiology*, 120(5), May 2014, p 1237-1245

PAIN OUT has been approved Jena University Hospital's ethics board, reference no. 2723-12/09.

08AP03-1**Serratus plane block impact in pain and opioid uptake in oncological breast surgery**[Casasempere Sanus A.](#), [Mazzinari G.](#), [Ortega Monzó J.M.](#),[Rovira Soriano L.](#), [Belaouchi M.](#), [Esparza Miñana J.M.](#)*Hospital de Manises, Dept of Anaesthesiology, Manises, Spain*

Background and Goal of Study: Regional anaesthesia is related with less incidence of cancer recurrence and less chronic pain development. The paravertebral block is the most common regional technique in breast surgery, but it is difficult to perform and is not free from complications. Alternatively, ultrasound guided serratus plane block achieves complete analgesia of the axillo-mammary area by reaching the nerves between the pectoral and the serratus muscles (pectoral nerves, supraclavicular and long thoracic nerve) with a high security profile.

The goal of this study is to evaluate the effect of the serratus plane block on opioids requirements during surgery and the immediate postoperative period as well as on the level of postoperative pain in oncological breast surgery.

Materials and Methods: We present a randomized intervention study (NCT02905149). Patients recruited undergoing oncological breast surgery are assigned to Control (intravenous opioid) or Serratus group. Every patient receives general anaesthesia with opioid analgesia according to the current hospital protocol. The block is performed with 20 ml 0.5% Levobupivacaine immediately after induction. In the postoperative period every patient is given a morphine PCA infusion pump which allows boluses of 1 mg every 15 min but no continuous infusion. Patients are followed-up during 24 h, asked for opioid consumption and pain estimated by VAS. We analyzed differences in opioid uptake in 24 h and pain VAS scores at set intervals (1,3,6,12,24 h).

Results and Discussion: We offer preliminary results from the data analysis of the first 11 recruited patients. The serratus plane block was effective in all cases. The cumulative opioids consumption over 24 h was higher in control group (35.2 mg, SD 5.96, 95% CI 21.92,48.48) than in Serratus group (21.5 mg, SD 3.41, 95% CI 13.89, 29.11). VAS scores for 24 h cumulative pain at rest and movement were higher in control than in Serratus group (AUCRcontrol 54.3, AUCRserratus 7.08, AUCMcontrol 75.9, AUCMserratus 13.3). Serratus group pain VAS scores were 2 or more points lower than the control group scores, both at rest and at movement.

Conclusion(s): Serratus plane block provides adequate intraoperative and postoperative analgesia for oncological breast surgery. It is a simple, reproducible and safe technique, and may be an alternative to opioid analgesia or paravertebral block.

08AP03-2**Spinal morphine for laparoscopic segmental colonic resection (SALMON-trial): a randomised controlled trial**[Koning M.V.](#)¹, [Teunissen A.J.W.](#)², [van der Harst E.](#)³, [Stolker R.J.](#)¹¹*Erasmus Medical Center, Rotterdam, Dept of Anaesthesiology,**Rotterdam, Netherlands,* ²*Maasstad Ziekenhuis, Dept of**Anaesthesiology, Rotterdam, Netherlands,* ³*Maasstad Ziekenhuis,**Dept of Surgery, Rotterdam, Netherlands*

Background and Goal of Study: Post-operative pain management after laparoscopic segmental colonic resections remains controversial. We compared two methods of analgesia within an Enhanced Recovery After Surgery (ERAS)-program. The goal of the study was to investigate whether spinal morphine would limit the need for systemic opioids, thereby decreasing the systemic side-effects and enhancing recovery as compared to intravenous opioids.

Materials and Methods: A single-center randomized double-blinded controlled trial was performed after approval of an independent ethical committee (NL43488.101.13). All patients who were scheduled for laparoscopic segmental colonic resections were considered. Exclusion criteria were patients in whom contra-indications were present for spinal anaesthesia. Furthermore rectal tumors were excluded and operations that were converted to open surgery. After written informed consent patients were allocated to a spinal group (S) or a control group (C). S group received single shot spinal bupivacaine/morphine (12.5 mg/300 mcg). C group received a placebo and intraoperative piritramide (0.1 mg/kg). Both groups received standardised general anaesthesia and a PCA-pump as postoperative analgesia. All patients were treated according to an ERAS-protocol. A Fisher's exact-test and a Mann-Whitney-U-test were used for ordinal and continuously data, respectively. A $P < 0.05$ was considered significant.

Results and Discussion: 56 patients were enrolled. In the S-group patients were earlier "fit for discharge" than those in the C-group (3 (3-4)[1-28] vs 4 (3-5)[2-25] days, $p=0.044$). Sixteen patients (59%) in the S-group versus 10 patients (34%) in the C-group were fit for discharge on the third postoperative day. Furthermore, there was a decrease in opioid-use and lower pain scores on the first postoperative day in the S-group. There were no differences in adverse events (except for more pruritus in the S-group), time-to-mobilisation or patient satisfaction.

Conclusion(s): This RCT shows that spinal morphine is an appropriate method of analgesia for laparoscopic colonic segmental resections within an ERAS-program. Recovery is faster and less painful in the S-group. However, more pruritus was recorded on the first postoperative day. Other studies have confirmed these results, although data on faster recovery remains controversial. [1-3]

References:

1. Kong et al. Anaesthesia 2002
2. Levy et al. Br J Surg 2011
3. Wongyingsinn et al. Br J Anaesth 2012

08AP03-3

Stellate ganglion block in addition to regional anaesthesia for major upper limb surgery with chronic painful syndrome: preliminary three cases

Truong H.-N., Pandin P., Rasero V., Colesnicenco A., Estruch I., Van Obbergh L.

CUB Erasmus Hospital / ULB, Dept of Anaesthesiology & Intensive Care, Brussels, Belgium

Background: Stellate Ganglion Block (SGB), is regularly used for facial, head, neck and upper limb (UL) neuropathic pain (1, 2). If SGB impact on postop pain following UL surgery (3-5) under general anaesthesia (GA) is reported; the interaction with UL regional anaesthesia (RA) remains unclear. We present 3 cases about major UL surgery performed under SGB+ULRA.

Case report: Table displays cases data. Subfacial SGB was performed at C6 level after US tracking (Fig1). SGB and ULRA anaesthetic dye extend was followed by US and confirmed by xRay (Fig2). Sympathetic blockade signs were present (Tab) before GA, (sevoflurane 0.5-1MAC) induced for the patients' comfort. At the anaesthesia emergence, the patients were comfortable (VAS<5-10mm).

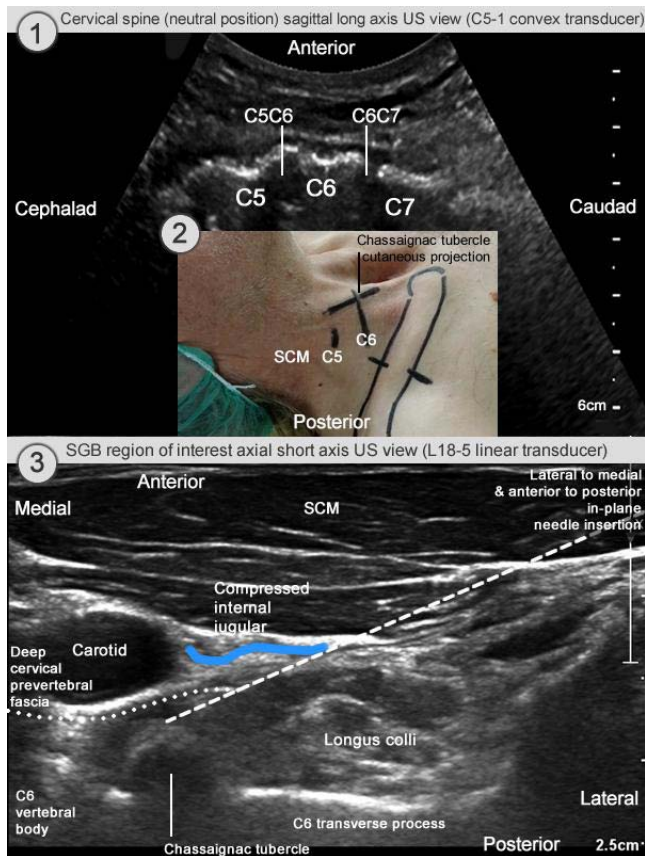
Discussion: With SGB arguments (Tab & Fig2), SGB+ULRA might be an option in the chronic painful patients. However, we need prospective randomized and comparative trials to better understand the control of the interaction between sympathetic and somatic innervation for laying down further recommendations.

References:

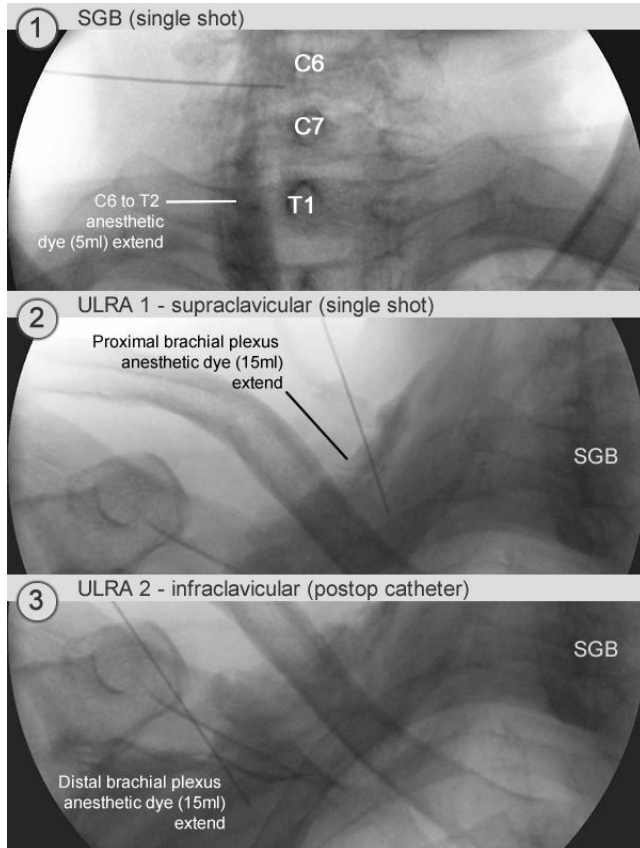
1. Orthopaedics and Traumatology 2009; 10: 179-183
2. Medical Hypotheses 2009; 72: 657-661
3. Pain Physician 2015; 18: E379-E388
4. Anaesthesia 2011; 66: 611-614
5. Anaesthesia 2014; 69: 954-960

Learning points: The association of sympathetic and somatic nervous blocks would enhance pain relief following major and extensive UL surgery.

	Case 1 Right poly-traumatized multi-operated UL	Case 2 Left shoulder desarticulation - UL amputation	Case3 Left traumatized UL proximal amputation
Demographics Medical History	M 57yo ASA2 88kg/177cm/BMI27 Alcoholism UL CRPS spasticity (baclofene) Medio-ulnar paresis	F 28 yo ASA2 62kg/168cm/BMI22 Hypothyroidism	M 48yo ASA2 96kg/171cm/BMI34 Alcoholism Schizophrenia
Preop VAS	30-40mm	40-70mm	30-60mm
Preop Analgesia (systematic'vs on demand ²)	Acetaminophen ² Diclofenac ² Tramadol ² Baclofene ¹	Acetaminophen ¹ Diclofenac ² Tramadol ² M+ sulf ²	Acetaminophen ¹ Diclofenac ¹ Tramadol ² M+ sulf ²
Guidance media & RA mixtures - SGB (single shot) - ULRA (catheter)	- US/Nrv stim 5ml Ropi0.375+Lido1+Iohexol (extend C6-T2) - US/Nrv stim (supra+infraclavicular combination) 30ml Ropi0.5+Lido1+Iohexol	- US/Nrv stim 5ml Ropi0.375+Lido1+Iohexol (extend C5-T1) - US/Nrv stim (interscalene) 20ml Ropi0.5+Lido1+Iohexol	- US/Nrv stim 7ml Ropi0.375+Lido1+Iohexol (extend C5-T2) - US/Nrv stim (interscalene) 20ml Ropi0.5+Lido1+Iohexol
Adverse effect/Claude Bernard Horner/HR variation/ MAP variation	No / Yes / ↑ / No	No / Yes / ↓ / No	No / yes / ↓ / No
Anesthesia duration (min)/ Surgery duration (min)/ Tourniquet	174 / 138 / Yes (121min)	222 / 185 / No	192 / 165 / No
Postop Analgesia	Acetaminophen Diclofenac PCPA Ropi0.2 (48h) Morphine Sulf if needed Baclofene	Acetaminophen Diclofenac PCPA Ropi0.2 (72h) Morphine Sulf if needed	Acetaminophen Diclofenac PCPA Ropi0.2 (72h) Morphine Sulf if needed
Postop VAS (at rest/mvt)	0-10mm/0-10mm	10-20mm/10-20mm	0-20mm/10-20mm
Follow-up	- No CRPS recurrence - Discharge: D2 postop	- D15 postop: phantom limb allodynia (amitriptyline) - Discharge: D16 postop - D30 postop: normal shoulder movements & neuropathic treatments stopped	- D3 postop: amputated limb tingling+ burning pain at PCPA stop (pregabalin) - D10 postop: phantom limb allodynia (amitriptyline) - Discharge: D21 postop - D40 postop neuropathic treatments stopped



[Fig.1 Exclusive US tracking for SGB in Pat1]



[SGB & ULRA anesthetic dye extend (xRay) in Pat1]

08AP03-4

The analgesic efficacy of continuous thoracic paravertebral block with clonidine added to ropivacaine early postoperatively, after radical mastectomy

Cindea L.¹, Gherghina V.², Balcan A.¹, Samoilă B.¹, Buzatu G.¹

¹Emergency Clinical Hospital of Constanta, Dept of Anaesthesiology & Intensive Care, Constanta, Romania, ²Ovidius University of Constanta, Dept of Anaesthesiology & Intensive Care, Constanta, Romania

Background and Goal of Study: We hypothesized that thoracic continuous paravertebral block with ropivacaine and clonidine, as adjuvant, could improve acute postoperative pain management compared to local anaesthetic alone, during first 24h post-procedure in radical mastectomy patients.

Materials and Methods: 74 ASA I-III women, candidates to elective radical mastectomy under general anaesthesia, participated in this prospective randomized double-blind study. Prior to surgery, a catheter prepared for postoperative continuous infusion was inserted in T4 paravertebral space in all patients. The patients were randomly allocated to two groups: group S (n=38) with continuous thoracic paravertebral block performed with a bolus of 0.3ml/kg 0.2% ropivacaine followed by 0.1ml/kg/h of local anaesthetic added with 1µg/ml clonidine and, respectively group C (n=36) treated according to the same protocol without clonidine. For postoperative analgesia during study period both groups received PCA with iv morphine.

The primary endpoints were the intensity of postoperative pain (VAS) evaluated at 2, 4, 8, 12, 24h and supplemental opioid requirements.

The incidence of sedation, nausea vomiting episodes, complications associated to the paravertebral block, hemodynamic parameters and patient satisfaction were documented too, as secondary endpoints. Mann-Whitney test and χ^2 test were used as statistics ($p < 0.05$).

Results and Discussion: Demographic data were similar in both groups. The postoperative pain control was statistically superior in group S during study period ($p < 0.05$). The need for supplemental opioid administration was significantly lower in group S as compared to group C ($p < 0.05$). The number of patients free from sedation and nausea vomiting during first 24h postoperatively was significantly higher in group S ($p < 0.05$). Hemodynamic parameters were comparable in both groups. No complications attributed to the paravertebral block were detected. Regarding patient satisfaction, the number of subjects that rated their early postoperative analgesia as very satisfactory was significantly higher in group S, too ($p < 0.05$).

Conclusion(s): Clonidine added to 0.2% ropivacaine in continuous thoracic paravertebral block resulted in significant clinical advantages compared to local anaesthetic alone in terms of better pain control with less adverse events during first 24h postoperatively after radical mastectomy.

08AP03-5

A randomized non-inferiority controlled trial of retrolaminar block versus paravertebral block for pain relief after lung surgery

Sugiyama T.¹, Kataoka Y.², Shindo K.¹, Itoi K.³, Sato Y.⁴, Tanaka S.⁵

¹Hyogo Prefectural Amagasaki General Medical Center, Department of Anesthesia, Amagasaki, Japan, ²Hyogo Prefectural Amagasaki General Medical Center, Hospital Care Research Unit, Department of Respiratory Medicine, Amagasaki, Japan, ³Hyogo Prefectural Amagasaki General Medical Center, Department of Respiratory Surgery, Amagasaki, Japan, ⁴Hyogo Prefectural Amagasaki General Medical Center, Department of Cardiology, Amagasaki, Japan, ⁵Graduate School of Medicine and Public Health, Kyoto University, Department of Pharmacoepidemiology, Kyoto, Japan

Background and Goal of Study: Retrolaminar block (RLB) is a modified paravertebral technique with local anaesthetic injected at retrolaminar site. The aim of this non-inferiority, parallel-group, and randomized study was to compare analgesic efficacy of paravertebral block (PVB) and RLB after lung surgery.

Materials and Methods: Eligible subjects were adult patients scheduled to undergo video-assisted thoracoscopic surgery (VATS) or limited thoracotomy due to lung disease. After IRB approval and informed consent, patients were randomly allocated to receive either a PVB or RLB according to a computer-

generated sequence and sealed opaque envelopes. The PVB was induced by injecting 20 mL of 0.50% ropivacaine and the RLB by injecting 40 mL of 0.25% ropivacaine. As primary outcome variable, we considered the area under the curve (AUC) of the postoperative pain intensity using the trapezoidal method. Pain intensity was assessed by 11-point numerical rating scale (NRS) and we converted observed NRS (0-10) into VAS (0-100 mm) proportionally. We compared the AUC of the converted NRS (AUC-cNRS) on coughing between 1 and 2 hours after operation. The non-inferiority margin was set at 25 mm × h in the AUC-cNRS. Patients and nurses assessing the pain intensity were blinded to group assignment. Secondary outcomes included time to perform block, NRS for pain intensity at rest and on coughing at 1, 2, 4, 24, and 48 hours after operation, the incidence of postoperative nausea and vomiting, time to first morphine use after operation, and cumulative morphine consumption at 24 and 48 hours after operation.

Results and Discussion: In each group, 25 patients were randomized and analyzed. No significant difference in the AUC-cNRS was noted between the groups ($P = 0.117$). The mean difference in the AUC-cNRS (group RLB minus group PVB) was 13.42 mm × h, 95% confidence interval, -3.48 to 30.32 mm × h. However, when patients with unexpectedly extended skin incision were excluded from the analysis, the AUC-cNRS of group RLB was significantly higher compared with group PVB ($P = 0.0388$). The time to perform block was longer in group PVB compared with group RLB ($P < 0.0001$). No significant differences were noted in the remaining secondary outcomes.

Conclusion: Non-inferiority of RLB compared to PVB was not confirmed. Though RLB has the advantage of shorter time to perform, RLB is not recommended for patients undergoing VATS or limited thoracotomy, due to lack of efficacy compared with PVB.

08AP03-6

Analgesic effects of bilateral superficial cervical plexus block in thyroid operation

Nunes Ferreira M., Sousa Correia J., Afonso A., Cardoso G.
IPO Porto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Bilateral superficial cervical plexus block (BSCP) is a simple non-invasive technique that can be used as analgesic measure in the perioperative period of thyroidectomy. The purpose of this study is to assess the analgesic effects of this technique during the intraoperative and postoperative periods of thyroid operations and to determine whether it reduces the adverse effects of general anesthesia.

Materials and Methods: A retrospective study was conducted between January-October 2016 in a single-center. 42 patients with indication of elective thyroid operations, ASA 1 or 2 were studied: 15 received a BSCP with 5 milliliters of 1% Ropivacaine per side after induction of general anesthesia; and 27 patients receive only systemic analgesia (SA). All were submitted a Fentanyl, Propofol, Rocuronio and Desflurane anesthesia.

The following variables were analyzed: Amount of opioid consumed during surgery, Postoperative pain (the time to the first analgesics required and amount of opioid consumed in the recovery room), recovery room stay, Postoperative nausea and vomiting in the recovery room were also assessed. We used SPSS (PSAW Statistics 18) for statistical analysis, non-parametric tests were performed and a value $p < 0.05$ as defined as a statistically significant result.

Results and Discussion: There were no significant differences in patient characteristics. It was found that the BSCP group consumed fewer opioids during surgery ($p < 0.001$) (average consumption of fentanyl in milligrams (mg): BSCP 0.11 vs SA 0.28).

We observed a longer duration of analgesia in BSCP group ($p = 0.003$) (average of time in minutes (min) BSCP 38.3 vs SA 8.9) and a smaller amount of morphine consumed in recovery room ($p = 0.018$) (average consumption in mg: BSCP 0.4 vs SA 2.1). The recovery room stay was fewer in BSCP group ($p = 0.021$) (average of time in min: BSCP 50.0 vs SA 58.9). It should be noted that there were no complications in both groups. No statistically significant differences in the remaining variables.

Conclusion(s): BSCP reduces analgesic use in intra and postoperative periods of thyroid operations. It also significantly shortens the recovery room stay.

08AP03-8

Comparative study of postoperative pain in elderly undergoing open hernia repair - spinal anesthesia vs. combined spinal and ilioinguinal block

Ologoiu D., Negoii M., Ologoiu D., Cotae A., Scricieiu A., Grintescu I.M.

Emergency Clinical Hospital of Bucharest, Dept of Anaesthesiology & Intensive Care, Bucharest, Romania

Background and Goal of Study: Preoperative and immediate postoperative pain in inguinal hernia repair is associated with reported frequency from 0% to 54%. Onset of post-hernia repair pain usually occurs immediately after surgery and predictive factors include repair of recurrent hernia, preoperative pain, severe early postoperative pain, psychological vulnerability or psychiatric disorder. Chronic pain is the most frequent long-term complication of treating inguinal hernia. Ilioinguinal/ iliohypogastric (IHN) block has been shown promise for postoperative analgesia and preventing chronic pain.

Materials and Methods: 154 patients undergoing open inguinal hernia repair with a mesh were randomly allocated to receive spinal or combined spinal with IHN block with ropivacaine 0.5% before surgery. Patients were monitored for visual analog scale (VAS) scores at rest and cough (in post-anesthesia care unit at 4 and 12h) and at rest, cough and movement (at 24, 48h and 1month). Pain at 1 month was assessed using the DN4 questionnaire for neuropathic pain.

Results and Discussion: Median VAS pain scores at rest were lower in the IHN group at 4 h (11 vs 25, $P0.04$), at 12 h (20 vs 40, $P0.014$), and at 24 h (29 vs 43, $P0.013$). Pain after the first 24 h and at 1 month after surgery, and DN4 scores were better in IHN group ($P 0.01$). The proportion of patients with VAS.40 mm on movement at 1 month was better 18.2% vs 42.4% in the spinal and IHN groups, respectively ($P0.08$). Postoperative morphine requirements were lower during the first 24 h in the IHN block group ($P0.03$).

Conclusion(s): As part of a multimodal analgesia strategy IHN block provides successful perioperative analgesia. In comparison to only subarachnoid anesthesia, combined spinal with IHN block technique has proved superior and very effective providing better pain control and the occurrence of chronic pain.

08AP03-9

Comparison of intraoperative epidural analgesia and intraoperative periarticular injection on acute pain control after total knee arthroplasty

Karasu D.¹, Sahin N.², Cansabuncu G.³, Yilmaz C.¹, Cansabuncu S.¹, Ozkaya G.⁴

¹University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Dept of Anaesthesiology & Intensive Care, Bursa, Turkey, ²University of Health Sciences Konya Training and Education Hospital, Dept of Surgery, Konya, Turkey, ³University of Health Sciences Bursa Yuksek Ihtisas Training and Education Hospital, Dept of Surgery, Bursa, Turkey, ⁴Uludag University, Department of Biostatistics, Bursa, Turkey

Background and Goal of Study: Multimodal analgesia is achieved by the combined use of analgesic agents acting on different parts of the pain pathway. Our aim is to compare effects of epidural analgesia and periarticular injection on the postoperative pain for 48 hours after total knee arthroplasty (TKA) and on the early functional outcomes.

Materials and Methods: The study protocol was approved by the Local Ethics Committee and Australian New Zealand Clinical Trials Registry (Ref: ACTRN12616000677404). This was a single-center, prospective, randomized-controlled, and double-blind study. Eighty patients with unilateral TKA were included in this study. Patients were treated with epidural morphine in Group E ($n = 40$) and with periarticular injection (100 ml cocktail solutions: bupivacaine, adrenaline, dexmedetomidine, magnesium sulfate, methylprednisolone, morphine and normal saline) in Group P ($n = 40$).

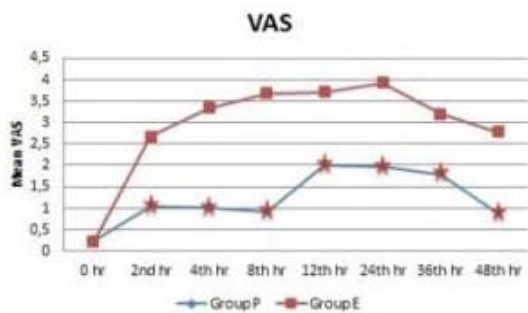
All patients received postoperative analgesia with an epidural patient-controlled device and useage of bupivacaine + fentanyl was recorded for 48 hours. The maximum range of motion (ROM), functional status, visual analog scale (VAS), and dynamic visual analog scale (DVAS) were assessed.

Results and Discussion: 24 and 27 patients were analyzed statistically in Group P and Group E, respectively. Demographical characteristics of the patients were not significantly different between two groups. Lower VAS and DVAS scores at 48 hours, lower amount of consumed analgesics at 24th and 48th hours, higher ROM values at 2nd and 3rd day and more nausea, vomiting and itching at 12th and 24th hours were observed significantly in Group P.

Conclusion(s): Periarticular injection with multimodal drugs in TKA was found superior to epidural analgesia in our study because of lower VAS-DVAS score, less analgesic consumption, fewer side effects, and more range of knee motion.

	Group P (n=24)	Group E (n=27)	P
ROM 1st day	96.04±13.18	100.56±13.61	0.236
ROM 2nd day	103.33±13.40	100.93±10.83	0.001*
ROM 3th day	107.08±9.43	104.07±10.09	0.002*

[Table I: Range of motion according to groups]



[Figure 1: Mean values of Visual Analogue Scale (VAS) according to groups *p<0.05]

08AP03-10

Continuous blocking of brachial plexus for proximal humerus surgery: where to place the catheter?

Giner-Crespo-Azorin L., Gómez-Diago L., Rodríguez-Gimillo P., Hernández-Cádiz M.J., Moliner-Velázquez S., De-Andrés-Ibañez J. *Consorcio Hospital General Universitario de Valencia, Dept of Anaesthesiology & Pain Medicine, Valencia, Spain*

Introduction and Objective: Proximal humerus fracture (PHF) are relatively common and can present moderate-severe postoperative pain requiring a multimodal approach, with NSAIDs, opiates and segmentary regional techniques (1).

The current standard of approach is the ultrasonographic guidance for the blockade of the brachial plexus at different locations (interscalenic, supra or infraclavicular), and either continuous or single puncture techniques can be performed (2,3).

The objective of this study is to evaluate the analgesic quality and safety of the continuous regional techniques performed in our Hospital for postoperative analgesia after open surgery of PHF.

Materials and Methods: Retrospective study of patients undergoing PHF surgery in between 2014 and 2016 was performed. We included patients with continuous echocardiographic (interscalenic, supra or infraclavicular) brachial block with levobupivacaine 0.125% (5-7 mL/h, bolus 5 mL). Demographic characteristics, type of blockade, rate of infusion, VAS at 24 hours and complications were recorded.

Results: Twenty-one patients were collected (8 arthroplasty, 13 osteosynthesis). Women/Men: 17/4. Age 68,48 years (SD 13.48). BMI 29.43 (SD 3.97). ASA I/II/III: 3/14/4. Five infraclavicular catheters (24%), 7 interscalenic (33%) and 9 supraclavicular (43%) were collected. The infusion rate was 5ml/h (52%) or 7ml/h (48%).

The analgesic control was adequate in all patients, with mild pain at 24 hours (24h VAS repose/movement 1.12/2.20 (SD 1.45/1.42)). There were no significant differences in analgesic quality between the different types of block. Only one patient with supraclavicular catheter presented motor blockade. An accidental outflow of infraclavicular catheter (20%) and four of interscalene catheters (56%) were observed.

Discussion and Conclusion(s): Continuous regional brachial plexus techniques at the interscalene, supraclavicular or infraclavicular level provide adequate postoperative analgesia in proximal humeral surgery, with no difference between different sites of approach for the block performance. The rate of accidental catheter outflow is higher at the interscalenic level, than with placement of the catheter at the supra or infraclavicular level, that according our results seemed preferable.

References:

1. M.J. Fredrickson, S. Krishnan, C.Y. Chen. *Anaesthesia* (2010);65: 608-624.
2. Price DJ. *Anaesth Intensive Care*. (2007);35: 575-81.
3. Bharti N, Bhardawaj N, Wig J. *Anaesth Intensive Care* (2015);43: 468-472

08AP03-11

Initial evaluation of efficacy and safety of ultrasound guided lumbar plexus block in patients with ankylosing spondylitis undergoing total hip arthroplasty

Kumar K., Kumar S., Kumar A.

All India Institute of Medical Sciences, Dept of Anaesthesiology & Pain Medicine, New Delhi, India

Background: Ankylosing spondylitis (AS) brings a new set of challenges to the anaesthesiologist starting from the upper airway, restrictive pulmonary disease, cardiac involvement and access to the neuraxis. ¹ In view of difficult airway and neuraxial approach, awake fiberoptic followed by general anaesthesia has become standard anaesthetic management in these patients. Postoperative pain management in AS patients undergoing Total hip arthroplasty (THA) is a major concern as it mainly relies on opioid-based regimens. Anterior approaches to lumbar plexus with femoral nerve blocks have limited role in THA whereas, posterior approach have higher risk of bleeding complications without Ultrasonography (USG) guidance.

Objectives: Initial evaluation of efficacy and safety of USG guided lumbar plexus block in patients with AS undergoing total hip arthroplasty.

Materials and Methods: Medical records of 10 AS patients who underwent total hip arthroplasty and received Lumbar plexus block under ultrasound guidance, with 30 ml of 0.25% Bupivacaine with 1µg/kg clonidine in a period of last 6 months were reviewed. Clinical efficacy and safety was assessed by the use of intraoperative opioids and complication if any, in anaesthesia chart and by assessing the numerical rating pain scores and the need for rescue analgesia in postoperative notes.

Results and Discussion: A total 10 AS patients undergoing unilateral THA had received USG guided lumbar plexus block. Intraoperative opioids was required in only 1 out of 10 patients. Postoperative pain scores were below 4/10 in all the patients and were well managed with round the clock intravenous Paracetamol and Diclofenac. None of the patients had any intraoperative or postoperative complications.

Conclusion: Overall, lumbar plexus block is a safe and effective regional technique under USG guidance, which provides good opioid sparing analgesia in AS patients undergoing THA.

References: 1. Woodward LJ, Kam PC. Ankylosing spondylitis: recent developments and anaesthetic implications. *Anaesthesia*. 2009;64:540-548. Wittmann FW, Ring PA.

08AP04-1

Comparison of tramadol and peritonsillar bupivacaine infiltration for postoperative pain relief after tonsillectomy in children: a prospective double blind randomized controlled trial

Ameye L., Van de Velde M., Rex S., Teunkens A.

UZ Leuven, Dept of Anaesthesiology, Leuven, Belgium

Background and Goal: Achieving sufficient postoperative analgesia following tonsillectomy in children remains challenging. Conflicting data have been published on the use of local anesthetic infiltration for post-tonsillectomy pain relief. We hypothesized that peritonsillar infiltration with bupivacaine decreases postoperative pain and reduces the incidence of postoperative nausea and vomiting (PONV) after tonsillectomy in children when compared to intravenous (IV) administration of tramadol.

Materials and Methods: After obtaining ethical committee approval and written parental informed consent, 200 patients, between 4 and 10 years old, were included in this prospective, double blind trial and randomised in a 1:1 ratio to either an intraoperative tramadol bolus of 3 mg/kg (administered IV after induction of anesthesia) plus an infiltration with 5 mL of saline at the end of surgery or to an IV bolus injection of placebo after induction of anesthesia and a peritonsillar infiltration with 5 mL bupivacaine 0.25% at the end of surgery. All patients received paracetamol and ketorolac IV at the start of surgery. Primary endpoints were the frequency and dose of postoperative piritramide administration.

The pain score was registered using the Wong-Baker Faces rating scale and analgesics were given whenever the given face represented a pain level above patient's pain threshold. Secondary endpoints included the incidence of PONV and oral analgesic requirement during the first 24 hours, incidence of adverse events and discharge times. Groups were compared using the Fisher's Exact test for proportions and the Mann-Whitney-U-test for continuous variables. A $p < 0.05$ was considered statistically significant.

Results and Discussion: Significantly more patients in the infiltration- than in the tramadol-group required piritramide postoperatively (81% vs 57%; $p < 0.001$). Moreover, the total dose of piritramide needed for postoperative analgesia was significantly higher in the infiltration group (median dose [interquartile range]: 0.8[0.5,1.4] mg vs 0.5[0,0.8] mg; $p < 0.001$). Groups did not differ with regard to the incidence of PONV during the first 24 hours, oral analgesic consumption, adverse events and discharge times.

Conclusion(s): The results of the present study suggest that infiltration with bupivacaine is associated with an increase in postoperative pain when compared to an intravenous bolus of tramadol.

08AP04-2

Continuous interscalene blockade in postoperative pain management in patients operated of total shoulder arthroplasty

Acevedo Bambaren I, Dominguez F, Martín J, Pestaña D.

Ramón y Cajal Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal: It is well known that the total shoulder arthroplasty (TSA) causes severe pain during the first 24 hours, which could delay the hospital discharge and increase the incidence of adverse effects associated with high doses of opiates. There is a current trend to use regional techniques for the intraoperative and postoperative pain management, showing a possible benefit with continuous interscalene nerve block (CISNB) compared to single puncture.

The aim of this study is to present our experience in the use of CISNB in the management of postoperative pain in patients undergoing total shoulder arthroplasty.

Materials and Methods: We retrospectively reviewed the records of 7 patients (5 female / 2 male), Undergoing TSA under general anesthesia combined with CISNB. The characteristics in terms of age and ASA classification were similar in patients enrolled. All patients were carried to the Postoperative Acute care Unit and discharged between 3 and 5 hours. Interscalene catheter was ultrasound guided placed. In all patients the surgery were done in beach chair position. Before the surgery a bolus of 15 ml of ropivacaine 7.5% was administered.

In the postoperative period patients were followed by the Acute Pain Management Unit (APMU). Pain assessment by Visual Analogue Scale (VAS), anti-inflammatory medication, numbers of intravenous morphine rescues and side effects were evaluated at 24 and 48 hours.

Results: Mean age was 81 years (87/65). American Society Anaesthesiologists score was II in 2 patients and III in 5. In all of them the same pattern of postoperative analgesia was followed using the AMPU intravenous protocols for shoulder surgery (Metamizol 2 g each 8 hours combined with Paracetamol 1g / 8h and ropivacaine 0,2% trough perineural catheter, programmed with a continuous infusion of 5 ml/h and bolus of 5 ml each 30 min). The VAS scale average at 24 and 48 hours after surgery, at rest and in motion was 3,3 and 4,1 (24 h); 1,3 and 2 (48 h), respectively. Intravenous morphine with PCA requirements average at 24 and 48 was 1,1 mg and 1,3; respectively. No one patient presented side effects.

Conclusion: CISNB provides safe and effective postoperative analgesia in the immediate postoperative period for patients with shoulder arthrosis undergoing total shoulder replacement.

08AP04-4

Continuous peripheral nerve block for inpatients ischemic pain: case series

Fernandes H., Santos S., Ashmawi H., Vieira J., Espada E., Gouvêa Á.

Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Dept of Anaesthesiology & Pain Medicine, São Paulo, Brazil

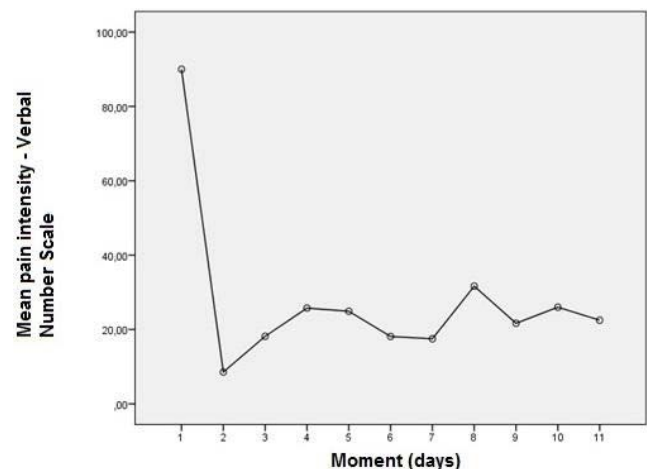
Background: Peripheral arterial obstructive disease (PAOD) curses with severe ischemic pain, hard to manage with systemic analgesics. Continuous peripheral nerve block may be an effective alternative with fewer side effects.

Case report: Case series: fifteen patients with ischemic standing pain undergoing systemic analgesia with strong oral and / or intravenous opioids (PCA - patient controlled analgesia) associated with adjuvant medications evolved with irregular pain control, with incidence of adverse effects (drowsiness, nausea, and constipation). Fourteen patients submitted to popliteal sciatic perineural catheter placement, one patient had the infra-gluteal perineural sciatic catheter. The procedures were performed guided by ultrasonography and with the aid of a peripheral nerve stimulator. Patients were maintained with 0.2% Ropivacaine perineural PCA (rate of 8mL/h, 6mL bolus, 30min interval, and Limit in 4h of 60mL), and they evolved with better control of pain, less need for opioids and adjuvants, and lower incidence of side effects. Summarized evolution in the figure below, where pain evaluated by Verbal Numbers Scale (VNS).

Discussion: PAOD curses with pain, at rest and positional, and systemic analgesia is not always satisfactory, leading to the risk of adverse effects (sedation, nausea, vomiting, constipation, pruritus, respiratory depression, addiction). Regional analgesia, such as continuous epidural analgesia through a catheter, has been used with good response, but with possible side effects (hypotension, motor block, catheter site infection, concomitant anesthesia of the opposite limb). Peripheral regional analgesia, possibly with lower deleterious effects, may be an alternative. With benefits already evidenced mainly in the postoperative analgesia of orthopedic surgeries, the continuous peripheral nerve block use in patients with PAOD has not been reported by many literature.

References: Smith BE, Fischer HB, Scott PV. Continuous sciatic nerve block. *Anaesthesia*. 1984;39(2):155-7

Learning points: Lower limb ischemic pain can be well managed by continuous peripheral nerve block.



[Figure 1]

08AP04-5

Effect of epidural patient-controlled analgesia on the postoperative bleeding after unilateral total knee arthroplasty: a propensity score analysis

Jin S.-J.¹, Lee B.A.², Lee K.³, Choi S.-S.¹

¹Asan Medical Center, College of Medicine, University of Ulsan, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Korean Public Health Office, Dept of Anaesthesiology & Pain Medicine, Hoengseong-gun, Korea, Republic of, ³Asan Medical Center, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Epidural analgesia provides better pain relief compared with parenteral regimens in patient undergoing total knee arthroplasty (TKA). In postoperative period after TKA, effect of epidural analgesia on bleeding is not consistent in various studies. We, therefore, compared the effect of both epidural and intravenous patient-controlled analgesia (PCA) on postoperative bleeding in patient underwent unilateral TKA.

Materials and Methods: A total of 2,600 patients who underwent TKA were divided into 2 groups as follows: intravenous PCA group (n = 2,339) and epidural PCA group (n = 128). We performed multiple logistic regression analysis to determine propensity score using the following variables: sex, age, body mass index, ASA physical status class, preoperative laboratory values, anesthesia techniques, re-do TKA, primary diagnosis, and intraoperative variables. After 1:1 propensity score-matching, final analysis was performed with 212 patients. The primary endpoint was comparison of the total amount of postoperative blood loss and incidence of red cell transfusion (more than 3 units) in the two groups.

Results and Discussion: The postoperative blood loss was higher in the epidural PCA group than in the intravenous PCA group (900.9 ml vs. 737.8 ml, respectively, P = 0.007). The incidence of administration of packed red blood cells (more than 3 units) was significantly higher with the epidural PCA group than with the intravenous PCA group (30.2% vs. 16.0%, odds ratio [95% confidence interval]: 2.5 [1.201-5.205], respectively, P = 0.029).

Conclusion(s): This propensity score-matching analysis showed that postoperative blood loss and incidence of red cell transfusion in patients underwent unilateral TKA were significantly higher with the epidural PCA group compared with the intravenous PCA group.

08AP04-6

Effect of transversus abdominus plane block on postoperative analgesia and patient comfort in patients undergoing abdominal surgery under general anesthesia

Yukse N.¹, Isbir A.C.², Mimaroglu C.³, Gursoy S.³, Kaygusuz K.⁴, Ozdemir Kol I.²

¹Sivas State Hospital, Dept of Anaesthesiology, Sivas, Turkey, ²Cumhuriyet University Hospital, Dept of Anaesthesiology, Sivas, Turkey, ³Cumhuriyet University Hospital, Dept of Anaesthesiology & Pain Medicine, Sivas, Turkey, ⁴Cumhuriyet University Hospital, Dept of Anaesthesiology & Intensive Care, Sivas, Turkey

Background and Goal of Study: Transversus abdominus plan(TAP) block is defined regional approach in recent years, providing analgesia after abdominal surgery in the anterior wall of the abdomen. The aim of this study is to investigate the effects of TAP block on postoperative analgesia quality and pain on patient comfort by removing the additional stresses(prolongation of time to stand up, nausea, vomiting) caused by pain in the patients undergoing general anesthesia, such as cesarean section, myomectomy and hysterectomy.

Materials and Methods: Patients undergoing abdominal surgery, it was planned to investigate the postoperative analgesia and comfort of 50 patients aged 18-65 years, including ASA I-II group, with and without transversus abdominus plane block.

Results and Discussion: TAP block was observed in patients who underwent at all hours of the VAS score was lower than in patients without the TAP block (p<0.05).

1 hour and 30 min for patients undergoing block analgesic requirements were significantly different when compared with other groups (p<0.05). Patients with tap block had less postoperative analgesic requirement, less nausea and

vomiting, and these patients could walk earlier. It was observed that the same patients were able to cough earlier and to release their secretions.

Conclusion(s): TAP block is a highly effective regional anesthesia method for relieving pain in the postoperative period. With TAP block, side effects will be reduced as the amount of analgesics applied in the postoperative period will decrease.

References:

1. Mark J. Young et al. (2012) Clinical Implications of the Transversus Abdominis Plane Block in Adults Hindawi Publishing Corporation Anesthesiology Research and Practice Volume 2012, Article ID 731645, 11 pages
2. Reinoso-Barbero F, Población G, Builes LM, Cas-tro LE, Lahoz AL. Successful ultrasound guidance for transversus abdominis plane blocks improves post-operative analgesia after open appendicectomy in children. Eur J Anaesthesiol. 2012 ;29(8): 402-4.

08AP04-8

Efficiency and safety of the rectus sheath block analgesia following midline laparotomy

Kinnunen M.¹, Kokki M.¹, Purdy M.², Anttila M.³, Kokki H.⁴

¹Kuopio University Hospital, Anaesthesia and Operative Services, Kuopio, Finland, ²Kuopio University Hospital, Department of Surgery, Kuopio, Finland, ³Kuopio University Hospital, Department of Obstetrics and Gynecology, Kuopio, Finland, ⁴University of Eastern Finland, Dept of Anaesthesiology & Intensive Care, Kuopio, Finland

Background and Goal of Study: The efficiency of rectus sheath block (RSB) in postoperative pain management has not been established. This study was designed to evaluate the efficiency and safety of RSB after midline laparotomy.

Materials and Methods: A total of 56 patients undergoing midline laparotomy were randomized in four groups: control (n=12), single bolus (n=16), repeated boluses (n=12) and continuous infusion (n=17) RSB analgesia groups. Consumption of oxycodone with iv PCA-pump for rescue analgesia were registered for 48 hours. Pain scores and patient satisfaction were assessed by a numerical rating scale (0-10). All complications during the hospital stay were recorded.

Results and Discussion: Oxycodone consumption was similar in all four groups (table 1). Pain at rest at the first postoperative morning was less in the repeated boluses-groups than that in the control group. Patient satisfaction was better with in the repeated boluses-group compared to the control-group (p=0.025).

Data are 95% confidence interval of means.	Control n = 12	Single bolus n = 16	Repeated doses n = 12	Infusion n = 17
12 h after surgery	24-49	29-61	22-39	16-26
24 h after surgery	35-86	50-98	37-62	33-54
48 h after surgery	55-131	78-167	58-94	55-96

[Table 1. Cumulative oxycodone consumption (mg).]

Conclusions: Multimodal postoperative analgesia with RSB using repeated boluses via catheters enhanced patient satisfaction but the oxycodone consumption was similar to other groups.

08AP04-9

Epidural analgesia for acute post-operative pain control - reasons for early or postponed catheter removal

Czajkowska K., Gomes P., Oliveira S., Ferreira C., Matias F. Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology, Coimbra, Portugal

Background and Goal of Study: Epidural analgesia is highly effective for controlling acute pain after surgery with minimal side-effects and high patient satisfaction¹. Although there is no absolute limit to the length of time of an epidural analgesia, it is advisable that it should last for at least 48-72 hours post-operatively. The goal of this study is to identify the main reasons for an early (<48h) or postponed (>72h) epidural catheter removal.

Materials and Methods: We conducted a retrospective study using data collected by the Acute Pain Unit of patients submitted to a surgical procedure in main operating theatres of our centre, between December 2015 and December 2016. We used SPSS software for the descriptive analysis.

Results and Discussion: We observed 87 patients, 41 females (47,1%) and 46 males (52,9%), with medium age of 60,6y ($\pm 15,6y$), mostly classified as ASA II (n=51; 58,6%) or ASA III (n=22; 25,3%). Most patients (58,6%) underwent major abdominal surgery, 25 oncologic orthopaedics (28,7%). 8 patients (9,2%) were opioid-tolerant. 47 patients (54,0%) had epidural analgesia during the targeted period of time (48-72h). The average time was 3,1d ($\pm 2,2d$). Early catheter removal was due to no longer need for epidural analgesia (n=68; 78,2%), catheter dislocation (n=6; 6,9%), inadequate analgesia (n=4; 4,6%), hemodynamic instability (n=1; 1,1%), severe nausea (n=1; 1,1%) and motor weakness (n=1; 1,1%). 28 patients had epidural for more than 3 days (32,2%), 11 of those patients belonged to oncologic orthopaedics ward. Catheter removal after 72h mostly depended on a longer need for pain control and in 9 cases (10,3%) it was due to an abnormal hemostasis. There were no harmful events related. 71 patients (91,0%) evaluated their analgesia as satisfactory and 7 patients (9,0%) as unsatisfactory.

Conclusions: Most patients had epidural analgesia for the targeted period of time. Early catheter removal was, in most cases, due to no longer need for epidural analgesia. In some cases it was associated with severe secondary effects (nausea, motor weakness). Postponed catheter removal was mostly due to persistence of pain or to abnormal hemostasis. In patients opinion, epidural analgesia for post-operative pain showed to be satisfactory.

References: 1. The Royal College of Anaesthetists et al (2004), Good Practice in the Management of Continuous Epidural Analgesia in the Hospital Setting.

08AP04-10

Improvement of epidural catheter congruency to incisional dermatome using Plan-Do-Check-Act strategy at a university hospital

Cadore Stefani L., Prates Vitória L.

Hospital de Clínicas de Porto Alegre, Dept of Anaesthesiology & Pain Medicine, Porto Alegre, Brazil

Background and Goal of Study: It's estimated that 3 out of 4 patients receive inadequate postoperative pain management. Epidural technique with local anesthetic prevents the pain pathophysiological response better than systemic analgesia if the catheter is congruent with surgical site. Previous Porto Alegre Clinical Hospital (HCPA) cases review found poor pain management and incongruent epidural catheters. Based on these data, we evaluated the quality of postoperative analgesia through catheters congruence before and after introduction of improvement plan among anaesthetists at HCPA.

Materials and Methods: Using quality tools for process control: Plan-Do-Check-Act (PDCA), we defined strategies to improve post operative epidural analgesia. Plan: after the identification of a large number of incongruent epidural catheters (42%) we planned to improve the congruence to 90%. Do: implementation of education strategy: registrar directed tutorials, all department members online tutorials, acute pain service with anaesthetic consultant supervision, weekly multidisciplinary rounds. Check: we identified congruent catheters in multiple surgeries after the strategies adopted. Act: definition of the new process as local standard.

Results and Discussion: Based on post operative follow up of 592 patients, from July 2012 to July 2013, the procedures were divided according to surgical site. The insertion level was considered congruent when the epidural catheter was placed congruent with surgical incision. Significant improvement ($p < 0.05$) was found at most surgical sites. The upper abdominal (considered congruent when catheter was inserted at thoracic level 6 to 8) showed the most impressive difference, from 15.1% of congruence to 79.7%, a 64.6% of improvement ($p < 0.001$) (IC 95%). Looking at overall numbers, in 2012-2013, 58% of 294 patients had incongruent catheters, while 42% had congruent ones. After the intervention, in 2015-2016, 241 patients demonstrated 16.7% of incongruent catheters against 83.3% of congruency, which corresponds to 98.3% of improvement. The data analyses was performed using winpep program and kiskquare test.

Conclusion(s): We found a significant improvement in catheter congruence after the adoption of a quality improvement strategy. PDCA allowed us to implement the change and continuously to improve processes. We are now motivating the team to maintain these and also implementing new strategies.

08AP04-11

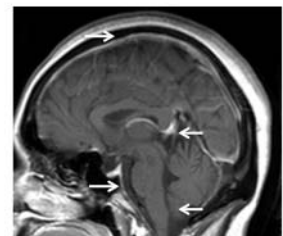
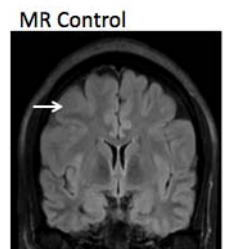
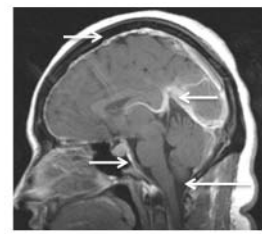
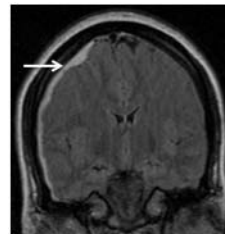
Intracranial subdural hematoma following epidural analgesia in obstetrics

Martínez S.¹, Comps O.¹, Medrano S.², Montes A.¹

¹Parc de Salut MAR, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain, ²Parc de Salut MAR, Neuroradiology, Department of Imaging and Radiodiagnostics, Barcelona, Spain

Background: Post-dural puncture headache is a common complication after neuraxial anesthesia and is frequent in obstetrics. The persistence of headache despite adequate treatment, however, should alert us to the possibility of other more serious causes.

Case report: A 27-year old primigravida who received uneventful epidural analgesia during childbirth. Twelve hours after delivery, she presented moderate fronto-occipital headache, whose intensity increased when she was in the sitting position. She was diagnosed with post-dural puncture headache (PDPH) due to accidental dural puncture and was treated with paracetamol, metamizole, caffeine and hydrocortisone, with a good response. After 24-h, incapacitating headache, with no other symptoms, reappeared, and an epidural blood patch (EBP) was performed. As a result, the headache improved. Twenty-four hours later, she was readmitted for headache without other symptoms. We performed a second EBP, but the symptoms failed to improve. Because the persistence of the headache a cranial magnetic resonance (MR) was requested, which evidenced a subdural hematoma (SDH) in the right hemisphere with alterations of cerebrospinal fluid hypotension. The patient was hospitalized for a week and given conservative treatment, with improvement of the symptoms. Two months later, a second MR was performed, which showed the disappearance of SDH.



[MR initial and control]

Discussion: Epidural is used routinely and serious complications are infrequent. After a dural puncture, there is a risk of intracranial SDH. PDPH may be the only symptom and its persistence despite multiple treatments requires that other causes be ruled out with imaging studies.

It is important to be aware of the risk factors for PDPH and to make a differential diagnosis so that a SDH may be diagnosed and treated quickly. Early suspicion can prevent neurological consequences.

References:

Turnbull DK, et al. Br J Anaesth 2003;91:718-729
Bleeker CP, et al. Br J Anaesth 2004;93:461-464

Learning points: Intracranial SDH is an infrequent complication of epidural. It may present as persistent PDPH and necessitates differential diagnosis with MR.

Early differential diagnosis is important to avoid severe sequelae.

08AP05-1**Acute postoperative pain in a tertiary hospital: data from electronic clinical histories analyzed according to All Patient Refined-Diagnosis Related Groups**

Trillo L.¹, Martínez S.¹, García J.¹, Arbonés E.¹, Comas M.², Montes A.¹

¹Parc de Salut MAR, Dept of Anaesthesiology & Pain Medicine, Barcelona, Spain, ²Parc de Salut MAR, Epidemiology and Evaluation, Barcelona, Spain

Background and Goal of Study: To describe the frequency of acute postoperative pain (APOP), recorded by means of pain indicators in electronic clinical histories (ECHs), according to All Patient Refined-Diagnostic Related Group (APR-DRG) categories. The APR-DRGs codes group patients according to similarity of clinical characteristics, diagnostic and procedures undertaken, and intensity of resource requirements. This universal classification system makes it possible to compare patients with the same surgeries and complexity within and between hospitals (benchmarking).

Materials and Methods: A pain chart was developed for recording APOP indicators from the ECHs. This chart enabled real-time study of interactions between indicators and APR-DRGs. We analyzed the percentages of patients in 9 APR-GRDs who reported pain >3 and >7 on a numerical rating scale (NRS) during the first 24 hours after surgery. The data were analyzed and presented as bi-monthly percentages.

Results and Discussion: Table I shows the percentage of patients with NRS >3 and >7 within 24 hours of surgery in the 9 APR-DRGs. The frequencies of pain >3 and >7 were higher in patients undergoing grade II surgeries (225, appendectomy; 263, laparoscopic cholecystectomy) than in patients undergoing some types of grade III surgeries (120, thoracic; 221, colon; 260, liver and pancreas). However, another grade III procedure, orthopedic surgery, had the highest percentage of patients with pain >3 and >7.

APR-DRGs		NRS>3 January- February	NRS>3 March- April	NRS>3 May- June	NRS>7 January- February	NRS>7 March- April	NRS>7 May- June
225	Appendectomy	15.7 %	16.2 %	15.2 %	3.6 %	4.2 %	2.7 %
540	Caesarean Section	4.1 %	4.3 %	6.5 %	0.6 %	0.0 %	0.6%
263	Laparoscopic Cholecystectomy	11.6 %	11.5 %	9.2 %	3.8 %	2.7 %	2.2 %
304	Vertebral Arthrodesis	10.3 %	13.3 %	11.4 %	2.2 %	1.9 %	1.8 %
120	Thoracotomy	9.6 %	8.1 %	10.3 %	0.4 %	0.8 %	2.1 %
221	Intestinal Surgery	6.5 %	5.8 %	3.3 %	0.8 %	0.7 %	0.3 %
260	Liver/ Pancreatic Surgery	6.3 %	6.4 %	7.1 %	1.4 %	0.9 %	0.7 %
302	Knee Replacement	14.8 %	17.1 %	14.8 %	1.3 %	1.6 %	1.5 %
301	Hip Replacement	10.4 %	13.6 %	10.6 %	1.6 %	1.6 %	1.3 %

[Percentage of patients with NRS>3 and >7]

Conclusion(s): Patients undergoing grade III surgeries generally experienced better pain control, with the exception of orthopedic surgery, which continues to cause poorly controlled pain. This study approach using APOP indicators from ECHs may be applicable to all surgical settings.

08AP05-2**Analysis of complications associated with epidural analgesia - a 5-year audit**

Freitas Silva R., Resendes H., Lima C., Cabral T., Simas J., Borges J.

Divino Espírito Santo Hospital, Dept of Anaesthesiology, Ponta Delgada, Portugal

Background and Goal of Study: Epidural analgesia is a widely used method in the treatment of postoperative pain. Its increasing use is due to the high efficacy and low rate of associated complications.¹ The objective of this study was to evaluate the records of the Acute Pain Service (APS) of Divino Espírito Santo Hospital (DESH) over a period of 5 years, in order to know:

1. number of epidural catheters used for post operative analgesia;
2. complications associated with their use.

Materials and Methods: Retrospective study using an Excel database of APS registries from June 2011 to September 2016.

Results and Discussion:

1. During the referred period the APS followed a total of 10866 patients, to which 29778 follow-up visits were performed. 4010 epidural catheters were used for intra and postoperative analgesia.

2. Through the analysis of the records we were able to identify 189 complications associated with the catheter or drugs administered by the epidural route including: 99 accidental exteriorizations, 21 episodes of severe hypotension, 11 cases of nausea and vomiting, 10 punctures of the dura mater, 9 non-functioning catheters and 9 cases of severe pruritus. There were also 8 deaths while undergoing analgesic protocol, 5 cases of paresthesia of lower limbs, 4 urinary retentions, 2 cases of hallucinations and 2 of bradycardia. We also identified other 9 isolated cases of complications.

Conclusions: Epidural analgesia is not free of risks and complications, so that the audits of the registries performed are important. From the analysis performed it was possible to get the following conclusions:

- In Divino Espírito Santo Hospital epidural analgesia is a widely used method for the treatment of acute postoperative pain;
- There was no mortality or morbidity directly associated with the placement and use of epidural catheters.
- Incomplete or missing records are a limitation to the full assessment of the reported complications and their systematic implementation should be encouraged among all service providers

References:

1. MJ Paech, R. Godkin, Complications of obstetric epidural analgesia and anaesthesia: a prospective analysis of 10 995 cases; in International Journal of Obstetric Anesthesia; vol 7, issue 1, 1998;
2. R. Baraz, R.E. Collis; The management of accidental dural puncture during labour epidural analgesia: a survey of UK practice, in Anesthesia, vol 60, issue 7, 2005

08AP05-3**Analysis of pain indicators in a tertiary care hospital: study based on electronic clinical histories**

Martínez S., Trillo L., García J., Montes A.

Parc de Salut MAR, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain

Background and Goal of Study: Electronic clinical histories (ECHs) now used in most hospitals provide data for analysis of pain indicators.¹ We aimed to compare pain intensity in patients treated on medical and surgical wards.

Materials and Methods: Pain indicators for all patients admitted to the hospital's medical and surgical wards from July 2015 to June 2016 were analyzed. The indicators gathered from the ECHs were the percentages of patients reporting pain assessed as >3 (moderate) or >7 (severe) on a verbal numerical rating scale (NRS) once or twice consecutively. We used Pearson's χ^2 test of independence to compare data for each quarter between medical and surgical wards.

Results and Discussion: Table 1 compares pain indicators reported on medical and surgical wards in each quarter. Significantly more patients on medical wards than surgical wards ($p<0.05$) reported severe pain both once and twice consecutively in all quarters. The results for moderate pain reported once and twice consecutively by medical ward patients were better in some quarters, however the incidence of moderate pain reported twice consecutively still exceeded the 5% recommended as a standard of care by some scientific associations.²

	JUL-SEP 2015		OCT-DEC 2015		JAN-MAR 2016		APR-JUN 2016	
	Medical	Surgical	Medical	Surgical	Medical	Surgical	Medical	Surgical
N° of Patients	1873	2066	2334	2732	2314	2637	2281	2706
NRS > 3, %	39,4*	45,2*	40,9	42,8	40,4	42	38,5*	43,6*
NRS > 7, %	18,3*	14,7*	20,6*	14,4*	21,7*	14,1*	18,5*	14*
NRS > 3 twice consecutively, %	13,1	14,7	15,1	14,7	14,4*	16,8*	13,5	15,1
NRS > 7 twice consecutively, %	5,7*	2,1*	6,6*	1,8*	7,1*	3*	5,9*	2*

[Table 1. Pain on medical and surgical wards between July 2015 and June 2016]

*Statistically significant differences between medical and surgical wards ($p<0.05$)

Conclusion: Analysis of ECHs pain indicators demonstrated a higher incidence of intense pain on medical wards in our hospital. The incidence of two consecutive assessments revealing either moderate or severe pain on medical wards is higher than quality of care guidelines advise. These findings warrant analysis of the reasons for pain on these wards and the creation of protocols to assess and treat it.

References:

1. Joint Commission on Accreditation of Healthcare Organizations. Pain assessment and management standards-Hospitals. Comprehensive accreditation manual for hospitals. Handbook: Joint Commission on Accreditation of Healthcare Organizations, 2001
2. Raising the standard: A compendium of audit recipes. 3rd edit. The Royal College of Anaesthetists 2012

08AP05-4

Analysis of the severity of pain in the wounded during the conflict in eastern Ukraine and the effectiveness of pain management in the prehospital settings

Pylipenko M.¹, Kuchma A.², Cheremskiy A.³

¹PL. Shupyk National Medical Academy of Postgraduate Education, Dept of Anaesthesiology & Intensive Care, Kyiv, Ukraine, ²Ministry of Health of Ukraine, Emergency Medicine, Kyiv, Ukraine, ³District Hospital, Dept of Anaesthesiology & Intensive Care, Kyiv, Ukraine

Background and Goal of Study: Ukrainian medics have been treating many wounded for about 3 years during the armed conflict in eastern Ukraine, but the problem of acute pain treatment remains unsolved. The problem is mainly due to significant differences in terms and conditions of care, differences in the supply of medics. By this time agonist-antagonist of opioid receptors are available for the soldiers for severe pain self-treatment, but for the medics (even for physicians) efficient medication such as ketamine and fentanyl is not yet available at the prehospital stage. The aim of the study is collection and analysis of information about the severity of pain and efficacy of pain management in wounded at the prehospital stage.

Materials and Methods: We have interviewed medics (physicians and nurses) who directly provided care for the wounded battlefield zone. 35 medics, including 15 doctors, anesthesiologists agreed to complete the questionnaire. The questions were next:

1. What percentage of wounded had the most severe (unbearable) pain before injection of analgesics?
2. What was the average level of pain in injured according to 10-point scale?
3. Do you agree with availability of opioid receptors agonist-antagonist for soldier's self-care of severe pain in the absence of physician or paramedics?

Results and Discussion: The questionnaire respondents estimated that they provided care to about 2,565 wounded, of whom 852 were severely injured. Unbearable pain occurred in $42 \pm 31\%$ of the wounded. The average level of pain was 5 ± 2 points (of 10-point scale). Assessment of pain depended neither on education (physician or other medical personnel), or length of service. Of the surveyed anaesthesiologists 62% voted "FOR" the availability of opioid receptors agonist-antagonist for soldier's self-care of severe pain without a doctor or paramedic. These results indicate that the problem of pain relief of the wounded are still far from being resolved. So decision for reduction in availability of opioid receptors agonist-antagonist for soldier's self-care should be made only while increasing the availability to combat medics of effective analgesics such as ketamine and fentanyl, according to NATO standards.

Conclusion: Our preliminary data suggests that many wounded have unbearable pain and their analgesia is still not sufficient in the prehospital phase. Filling questionnaires is simple and efficient method to receive reliable information.

08AP05-5

Anesthesia audit: control of acute postoperative pain

Fernández Sánchez C.I., Morandeira Rivas C., Martínez López A., Miguel Martín M.N., Arnal Velasco D., García del Valle S. Hospital Universitario Fundación Alcorcón, Dept of Anaesthesiology & Intensive Care, Alcorcón, Spain

Goal of Study: Postoperative pain is one of the most common problems of hospital care.

Our objective is to perform an audit to determine the existence of pain and its intensity in the immediate postoperative period-24 hours- in patients undergoing scheduled surgery, as well as to evaluate compliance with the postoperative analgesic protocol prescribed.

Materials and Methods: For our audit we collected data during a month, by reviewing the medical history, following the pattern: first and third week patients operated on Tuesday and Thursday, and second and fourth week on Monday and Wednesday, according to inclusion and exclusion criteria (only scheduled surgery, >18 years, not ambulatory surgery...).

The variables collected were: age, sex, personal history, surgical specialty, type of anesthesia used, analgesic protocol, postsurgical reanimation unit time and Visual Analogue Scale (VAS) in there, VAS in hospitalization unit in three first shifts of nursery until the first 24 hours after surgery. In case the VAS was not collected, we reviewed the plant nursing commentary, assuming "controlled pain" and "mild pain" as optimal control of pain, and "moderate or severe pain" as uncontrolled pain.

Statistical analysis using SPSS.

Results: There is no statistical association between pain control and surgical specialty, nor with the protocol of acute pain used, nor with the type of anesthesia used. Slight tendency to worse pain control in women. There is a weak positive association, statistically significant ($p = 0.001$) between the time of stay in postsurgical reanimation unit and the VAS registered on it.

The complete compliance with the protocol is 12.3%, seeing that the causes of noncompliance are almost 30% for not registering the VAS, 20% for not administering all the analgesia prescribed, and 51% for both reasons. Despite this there is optimal pain control in 83% of cases.

Conclusion: The control of acute postoperative pain is optimal, despite the institutional and organizational barriers. The existing protocols in our hospital help to the quality and safety of the patient.

This is the first part of the audit. We consider it convenient to have meetings with nursing teaching the need to comply with the protocols (both in the administration of drugs and in the collection of VAS), since one of the keys in the control of postoperative pain is to anticipate it.

After these training sessions, the second part of the audit will have to be performed to assess its effect.

08AP05-6

Pain management practice in teaching hospitals

AlJabari A., Massad I.

University of Jordan, Dept of Anaesthesiology & Intensive Care, Amman, Jordan

Background and Goal of Study: The aim of our survey was to assess the status of acute postoperative pain management in Jordan, to evaluate the current postoperative pain management practices, identify areas requiring improvement in pain management, to help caregivers optimize pain management with uphold high care standards and identify deficits.

Materials and Methods: 84% were responders to our five questions questionnaire of pain management in Jordan including: governmental, military services, university and private sector teaching hospitals. the results of 5 survey questions were as follow .

Results and Discussion: The first question: which of the following employees is responsible to prescribe the postoperative pain management drugs at your institute? We found that 45.5% Jordanian Anesthetists were responsible for prescription then Surgeons 40.9% and both 13.6%.

The second question: for which of the following employees does your institute provide regular on site postoperative pain management training? Anesthetists 54.4% were providers then surgeons 9.1%, both 22.7% and others such as ward nurses, recovery room nurses were 13.6%.

The third question: are your patients informed preoperatively about postoperative pain management in your institute? Yes systematically in 32%. Yes if specific /difficult cases 40.9%. Yes on patient demand 13.6%, and No 13.6%.

The fourth question: Are there specific written postoperative pain management protocols in place for treating postoperative pain in ward? Yes for all patients 22.7%, Yes for following cases (Patient controlled analgesia, Regional or Central block) 40.9%, and NO 27.3%.

The fifth question: If specific protocols exist for aboUd a. J. et. al treating postoperative pain in ward, are they applied in daily practice? Always 22.7%, Often 18.2%, Rarely 45.5%, and Never 13.6%.

Conclusion(s): We conclude that despite the growing trend in pain management, our patients are still suffering from postoperative pain in Jordan. no two health care institutions are exactly alike, but rather differ in personnel resources⁴, available equipments and medications, and patient population 5.

08AP05-7

Pain scales to detect pain in intubated critical patients

Kuchyn I., Bielka K.

Bogomolets National Medical University, Dept of Anaesthesiology & Intensive Care, Kyiv, Ukraine

Background and Goal of Study: Pain is an important problem in the intensive care unit (ICU), and inadequate pain management increase morbidity and mortality (1). Self-reporting is the best method for evaluation of pain, but pain is more difficult to assess in noncommunicative patients, who receiving respiratory support or sedated.

The purpose of this study was to compare different scales to assess the pain in intubated uncommunicative ICU patients.

Materials and Methods: The prospective observational study was conducted in Bogomolets National Medical University, clinic "Boris", Kyiv, Ukraine. 80 ICU patients (Gr.1 (n=40) - communicative and Gr.2 (n=40) - noncommunicative) were included. All patients were intubated and received respiratory support (predominantly pressure support ventilation) due to general illness. The two groups did not differ statistically by gender, age, severity of illness etc. Investigators observed patients during rest and noxious stimulation (trachea suctioning) and assess their pain with Visual Analogue Scale (VAS) in communicative group, and with PAINAD-scale, Behavior pain scale (BPS) in noncommunicative group.

Results and Discussion: All scales were sensitive in revealing the patient's pain response ($p < 0.005$). The VAS score assessed by the patient had the significant correlation with BPS ($r = 0.67$, $p < 0.05$) and PAINAD score ($r = 0.7$, $p < 0.05$).

Conclusion(s): All scales were sensitive in revealing the patient's pain response ($p < 0.005$). The VAS score assessed by the patient had the significant correlation with BPS ($r = 0.67$, $p < 0.05$) and PAINAD score ($r = 0.7$, $p < 0.05$).

References: 1. Radnovich R, Chapman CR, Gudin JA, et al. Acute pain: effective management requires comprehensive assessment. *Postgrad Med* 2014;126:59-72

08AP05-8

Pain treatment in austere environment. Description of analgesics, devices and techniques performed in a casualty treated in isolated place

Navarro-Suay R.¹, López-Soberón E.², Castillejo-Pérez S.¹, Puente-Barba A.², Pelet-Pascual E.³, García-Aroca M.A.²

¹Hospital Central de la Defensa Gómez Ulla / IMIDEF, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Hospital Central de la Defensa Gómez Ulla, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ³Hospital Central de la Defensa Gómez Ulla, Dept of Anaesthesiology & Pain Medicine, Madrid, Spain

Background: Medical care in combat on the current asymmetric conflicts like Iraq and Afghanistan, has undergone some changes in the diagnosis, treatment and approach of acute and chronic pain. Currently, the mainstay of analgesic treatment is early onset (from the scene and through all military medical steps) and multimodal analgesic therapies (drugs such as ketamine and fentanyl, antiinflammatory and adjuvant drugs as anticonvulsants, antidepressants or anxiolytics and peripheral nerves perfusion or epidural). This measure has shown decreased incidence of chronic pain and phantom limb incidence.

The goal of the study is to describe our experience with drugs, equipment and analgesic techniques performed in an isolated environment, showing the example of a patient with trauma.

Case report: Male (90 kg, 1.72 cm), 44 years with no relevant medical history, who while working with a machine suffers an injury in his right hand (diagnosed catastrophic hand). VAS is analyzed (first care, after premedication, in the education operating room (5 min) and the recovery room (60 minutes). As well drugs and anesthetic techniques performed in an isolation environment (warship) were describe.

In the clinical case report, we employed midazolam (3 mg iv) and ketamina (45 mg iv) during first care; fentanyl (150 mcgr) during induction; remifentanyl (0,2-0,05 mcg/Kg/min iv), morphine (4 mg iv), ketamine (25 mg iv) and NSAIDs during anesthesia maintenance and finally pregabalin (75 mg iv) in recovery area. The anesthetic techniques performed were local anesthesia, general anesthesia and regional anesthesia (ultrasound-guided axillary block). The VAS before our intervention was 6/10, that prior to the induction of anesthesia was 3/10 and post-education (5 minute and 60 minutes) was 2/10 and 3/10 respectively.

Discussion: Trauma pain military perspective is quite different to civil approach.

References: Wyldbore M, Aldington D. Trauma pain - a military perspective. *British Journal Pain* 2013; 4: 1-6.

Hunter JG. Managing pain on the battlefield: an introduction to continuous peripheral nerve blocks. *J R Army Med Corps* 2010; 156(4): 230-2.

Scott DM. Regional anaesthesia and analgesia on the front line. *Anaesth Intensive Care* 2009; 37: 1008-11.

Learning points: Despite the isolation environment, you should employ drugs, equipment and analgesic techniques that allow an adequate pain control.

08AP05-9

Postoperative analgesia in kidney transplantation

Rodrigues C.¹, Oliveira S.¹, Adrego T.², Gomes P.¹

¹Coimbra Hospital and University Centre, Dept of Anaesthesiology, Coimbra, Portugal, ²USP Baixo Mondego, Public Health Department, Coimbra, Portugal

Background and Goal of Study: Postoperative pain in kidney transplantation may be severe and is usually undertreated. Systemic analgesia may be limited by renal impairment and altered pharmacokinetics. The goal of this study is to analyse postoperative analgesia regimen following renal transplantation.

Materials and Methods: We performed a retrospective analysis of all patients submitted to kidney transplant (KTx) between December 2015 and November 2016, followed by Acute Pain Unit (APU) in our institution. Acute pain database was analysed.

Statistical analysis was performed using SPSS Statistics® 24, percentages were used for categorical variables, mean with standard deviation (SD) or median with quartiles for numerical variables, depending on normality. The Qui-squared, T-Student and one-way ANOVA test or Spearman's correlation were used as appropriate.

Results and Discussion: From the 135 KTx, only 57 patients were followed by APU. The mean patient age was 49 years (SD 13), 71,9% were males. Intravenous opioid administration provided the mainstay of analgesia and paracetamol was used in all patients. 63,6% of patients used drug infusion balloon (DIB) and 36,4% patient-controlled analgesia (PCA).

The opioids used were tramadol (63,3%), morphine (10,9%) and fentanyl (25,5%). DIB population used tramadol. PCA group used morphine or fentanyl (only bolus regimen).

86% of patients reported good pain control, 7% bad pain control and 5,3% sufficient pain control. In median, analgesia was used for 2 days (P25 1; P75 2). 7% of patients experienced adverse effects of analgesia.

The age does not correlate with the type ($p = 0,683$), duration ($p = 0,848$) and quality of analgesia ($p = 0,791$), nor the type of opioid used ($p = 0,076$) or adverse effects ($p = 0,996$). The gender does not correlate to the type ($p = 0,731$), duration ($p = 0,196$) and quality of analgesia ($p = 0,244$), nor the type of opioid used ($p = 0,397$). The gender was related significantly to the presence of adverse effects ($p = 0,030$). Quality of analgesia and the presence of adverse effects were not related to the type of analgesia or opioid.

Conclusion(s): Current practice in our institution provides a good quality of analgesia, with minimal side effects and no harmful events. Presently, the use of PCA is being promoted, namely the use of fentanyl. PCA is an effective technique and due to negative feedback loop limits the adverse effects of opioids. An opportunity for improvement is the number of patients followed by APU.

08AP05-10**The comparison of postoperative pain severity in different types of hospitals in the eastern Poland**

Borys M., Zyzak K., Wróblewski K., Piwowarczyk P., Czuczwar M.
Medical University of Lublin, Dept of Anaesthesiology & Intensive Care, Lublin, Poland

Background and Goal of Study: Pain assessment and treatment still does not cover all patients requirements. Many patients suffer from severe pain in postoperative period.

The main goal of the study was the assessment of pain severity among patients from different types of hospitals (primary, secondary and tertiary centers) in the similar types of surgeries.

Materials and Methods: The prospective, observational study. The VAS (visual-analogue scale) was used to measure pain severity 4 times on the day of surgery (at 4, 4-8, 8-12, 24 hour). Demographic data, a types of hospital, surgery and anaesthesia were also collected. Only adults who were able to note their pain severity participated in the study. VAS was not received from the patients anesthetized under local technique with or without sedation. The analysis of variances (ANOVA) and t-test were used to assess the statistics. Contingency tables were utilized for demographics. All measurements were done with Statistica 12.5 (Stat Soft. Inc., Tulsa, USA).

Results and Discussion: The study was conducted from November 2015 to June 2016 in 7 hospitals in the south-eastern Poland: 2 university, 2 secondary and 3 primary hospitals. 269 women and 293 men participated in the study.

The number of patients from tertiary hospitals was 284, from secondary hospitals 154 and primary ones was 124.

There was no statistical difference in general VAS value between types of hospitals. The average values of VAS: tertiary hospitals 29.49 (27.43-31.54), secondary hospitals 28.87 (26.08-31.66) and primary hospitals 30.02 (26.91-33.13); $F=0.149$, $p=0.861$.

However, there was a significant difference between primary and secondary hospitals at 4 hour ($F=7.32$, $p=0.000727$). 0-4 VAS values: primary hospitals 40.25 (35.62-44.88), secondary hospitals 28.12 (24.02-32.34). Moreover, the difference was found between primary hospitals and both secondary and tertiary hospitals ($F=7.29$, $p=0.000745$). The mean 8-12 VAS values were: primary hospitals 20.37 (16.34-24.39), secondary hospitals 30.62 (27.0-34.23), tertiary hospitals 27.73 (25.06-30.38).

Conclusion(s): The type of hospital may influence patients' pain severity, but more research needs to be done.

References: Acute pain assessment tools: let us move beyond simple pain ratings. Gordon D. *Current Opinion in Anaesthesiology*; 2015;565-569

08AP05-11**Visual analogue scale cannot measure postoperative pain in an objective fashion, on the contrary, pain vision can measure postoperative pain in an objective way**

Uchida M.
Saitamaseikeikai Hospital, Dept of Anaesthesiology & Pain Medicine, Higashimatsuyama, Japan

Introduction: Visual analogue scale (VAS) is the common method for evaluating the degree of pain. However, the VAS consists of the patient's own subjective evaluations, so that there are large individual differences, and no quantitative analysis can be readily performed. In experimental trials, ketamine (ket) has been shown to reduce hyperalgesia, prevent opioid tolerance, and lower morphine consumption. However, in clinical trials in humans have shown mixed results in terms of effectiveness. To evaluate postoperative pain by using intravenous patient-controlled (IV-PCA) system with concomitant infusion of fentanyl (fen) and ket, we compared VAS to a pain vision.

Methods: Anesthesia was performed with AOPRfK (air-oxygen-propofol-remifentanyl-low dose ket) in orthopedic surgery. A PCA system was started after extubation. Patients were divided into three groups randomly and received different dosing regimens of co-administration of fen and ket by using PCA system. The infusion rate of fen was $0.5\mu\text{g}/\text{kg}/\text{h}$ in all groups. Group K0 ($n=21$): patients were given only fen, Group K0.5 ($n=21$): fen + ket $0.5\text{ mg}/\text{kg}/\text{day}$, Group K1.0 ($n=21$): fen + ket $1.0\text{ mg}/\text{kg}/\text{day}$. We evaluated patient's condition in the night on the day of surgery. Pain was measured by using VAS (0-10, 0: no pain, 10: worst possible unbearable pain), degree of pain was mea-

sured by using PainVision® PS-2100 (OSACHI Co., Ltd., Nagano, Japan). Sedation Score was measured by using Richmond Agitation-Sedation Scale (RASS). Statistical analysis was performed by using Wilcoxon Signed-Rank Test in VASs, degrees of pain, and RASSs between GroupK 0 vs. GroupK 0.5, GroupK 0 vs. GroupK 1.0, and Groupk 0.5 vs. Groupk 1.0. $p<0.05$ was considered to be statistically significant.

Results:

1. VAS: VASs were not significantly different among groups.
2. Pain degree analysis: GroupK 0 vs. Groupk 0.5 $p>0.05$, GroupK 0 vs. Groupk 1.0, and Groupk 0.5 vs. Groupk 1.0 $p<0.01$.
3. RASS: RASSs were not significantly different among Groups.

Discussion: Okuda T. et al. (1) reported that VAS expresses factors that include the patient's psychological state and dissatisfactions at a given time, rather than simply evaluating actual pain in the treatment of acute phase of herpes zoster.

Conclusions: VAS cannot measure postoperative pain in an objective fashion, on the contrary, pain vision can measure postoperative pain in an objective way.

Reference: The Japanese Journal of Dermatology 2005; 115: 2373-80

08AP05-12**NoL Index performance in patients with beta-blockers**

Edry R., Rechea V., Dikust Y.
Rambam Medical Center, Dept of Anaesthesiology, Haifa, Israel

Background and Goal of Study: Chronic Beta blockade (BB) causes alterations in physiological parameters and in their variation in response to various stimuli like pain and nociception. NOL (Nociception Level) is an index of nociception based on a non-linear combination of HR, heart rate variability, photo-plethysmograph wave amplitude, skin conductance, skin conductance fluctuations, and their time derivatives. Previous data showed high sensitivity and specificity of NoL index to painful stimuli.[1] Being based on physiological parameters potentially influenced by BB, it is interesting to evaluate NOL performance in such cases. A subgroup of our population with chronic BB treatment was excluded from previous analysis. We evaluate the performance of NoL to accurately assess nociception in this subgroup compared to patients with no BB.

Materials and Methods: 79 patients scheduled for elective surgery under general anesthesia were enrolled. 10 patients took BB medications. 12 patients were technically excluded from analysis [1] which included 58 patients in the non BB group (General) and 9 patients in the beta blockers group (BB). NOL index was evaluated before and after various stimuli: tetanic stimulation with and without analgesia, intubation, 1st skin incision/trocar insertion and a period of no pain.

Results and Discussion:

- NOL values before, after and in reaction to stimuli were not statistically different between the general and BB groups.
- NOL Index changed significantly after intubation and incision and remained unchanged around non painful stimuli in BB group.
- NOL values increased after tetanic stimuli in the BB group by 7.017 and 8.852 respectively, on the borderline of significance, probably due to the small number of patients.
- For cutoff 15 NOL points, calculated sensitivity and specificity of NOL Index in BB patients was 77.8% and 100%, respectively.

Conclusion(s): Although based on a small sample, the NOL Index changed significantly after clinical noxious stimuli in patients with chronic BB treatment. Since NOL Index is based, among others, on heart rate and derived parameters, this important observation contributes to its reliability. Further studies with larger samples are needed to confirm that observation.

References: Edry R, et al. Intraoperative validation of the Nociception level Index. A non-invasive nociception monitor. *Anesthesiology* 2016;125(1):193

08AP06-1**Sufentanil sublingual tablet system for postoperative pain control in fast-track total knee arthroplasty**

Balcaen M.¹, Thienpont E.², France M.-N.¹, Dupont C.¹, Lavand'homme P.¹

¹*Cliniques Universitaires St Luc U.C.L., Dept of Anaesthesiology, Brussels, Belgium*, ²*Cliniques Universitaires St Luc U.C.L., Dept of Surgery, Brussels, Belgium*

Background: Sufentanil sublingual tablet system (SSTS) is a novel non-invasive patient-controlled analgesia (PCA) system which might benefit patients enrolled in fast-track process. In total knee arthroplasty (TKA), SSTS has been compared either to placebo (1) or to intravenous PCA morphine (2). We here assessed postoperative analgesic efficacy and side effects of SSTS compared with non-invasive standard treatment (ST) after fast-track TKA.

Methods: Retrospective analysis of medical records from TKA patients (October-December 2016) was performed. SSTS (sufentanil tablet 15 µg, lock out 20 min) was compared with ST in use (fentanyl TTS patch 12 µg/h and rescue morphine sulfate 10 mg tablet every 4h) for 72h. Exclusion criteria: age >75 yrs, preoperative strong opioid use. Intraoperative and postoperative management (celecoxib, paracetamol) were standardized. Pain during night, at rest and with movement was recorded. Analgesics consumption and side effects were noted. Statistics used unpaired t-test and Fisher exact test, P<0.05 was significant.

Results and Discussion: 37 SSTS patients were compared with 24 ST patients. Demographic data were similar (age, BMI, sex ratio and preoperative pain scores). Morphine titration and pain when leaving PACU did not differ. In ward, over 72h, SSTS patients used 13 tablets (median;IQR: 6-17) and ST patients used 30 mg oral morphine dose (median;IQR 20-50) to supplement fentanyl patch 12µg/h. Calculating total oral morphine equivalence (1 tablet SSTS=10 mg oral morphine; fentanyl TTS patch 12 µg/h=30 mg oral morphine per day) found no difference over 72h. Postoperative pain scores also did not differ. Dizziness was higher in ST group (21% vs 8%,p=0.036). In SSTS group, 1 patient was oversedated, 5 patients (13.5%) with unrelieved pain shifted to ST, 6 patients (16.2%) experienced technical problem with the device.

Conclusions: SSTS provides acceptable postoperative analgesia for fast-track TKA. Satisfaction related to PCA mode is high but 13% patients report ineffective pain relief (1;2). Cost and technical problems should be taken into account. Further studies are needed to determine who will really benefit from SSTS.

References:

1. Jove M et al, *Anesthesiology* 2015; 123:434-43;
2. Melson T et al, *Pain Practice* 2014;14:679-88.

08AP06-2**Use of non-opioid adjuvant analgesics for colo-rectal surgery**

Patel S.¹, Robertson B.²

¹*Pennine Acute NHS Trust, Dept of Anaesthesiology, Rochdale, United Kingdom*, ²*Queen Elizabeth Hospital, Dept of Anaesthesiology, Chirliie, United Kingdom*

Background and Goal of Study: Colorectal anaesthesia group-UK (CAG-UK) organises annual colorectal anaesthesia meeting. Our aim was to find out current practice of use of NOAA among participants of 2016 meeting.

Materials and Methods: We distributed printed survey questionnaire form comprising of several clinical question at the start on the day of meeting in April 2016. Eight clinical questions were formulated by a member of CAG-UK. Questions were related to use of NOAA for nature of surgery (elective or emergency, open or laparoscopic). Type of NOAA, likely does and duration of use were asked. Inquiry was done whether NOAA are used as a part of enhanced recovery pathway and whether there is a departmental guideline for NOAA or not. We excluded routinely used common analgesics paracetamol and NSAIDs.

Results and Discussion: 83 forms were returned from 115 participants. 50%use NOAA for both open and laparoscopic surgery. More participants used NOAA for only open (11%) then only laparoscopic surgery. 35% used NOAA routinely while 28% never used any group of NOAA. Majority (50%) have knowledge that NOAA are useful for enhanced recovery of colorectal surgical patients, only 15% have guidelines for use of NOAA.

The use of NOAA was found to be variable among anaesthetists - Gabapentin 15.8%, Pregabalin 12.1%, Clonidine 15.8%, Dexmedetomidine 3.6%, Ketamine 35.3%, Lidocaine 8.5%, Magnesium 17%, Dexamethasone 48.7%, ER guidelines suggest avoiding opioids for acute pain relief due to potential side effects. NOAA can be useful in the management of acute postoperative pain. However, except lidocaine infusion NOAA for colorectal surgery are not well researched. Current practice for the use of NOAA for colorectal surgical pain relief is not known in the UK.

Conclusions: Use of NOAA is not evidence based and is variable. There is a need for more research for the use of various NOAA within enhanced recovery protocol.

References:

Ljungqvist O. ERAS--enhanced recovery after surgery: moving evidence-based perioperative care to practice. *JPEN. Journal of parenteral and enteral nutrition.* 2014;38:559-66.

Feldheiser A, Aziz O, Baldini G, Cox BP, Fearon KC, Feldman LS, Gan TJ, Kennedy RH, Ljungqvist O, Lobo DN, Miller T. Enhanced Recovery After Surgery (ERAS) for gastrointestinal surgery, part 2: consensus statement for anaesthesia practice. *Acta Anaesthesiologica Scandinavica.* 2016;60(3):289-334.

08AP06-3**Use of non-opioid analgesics and dipyrone / metamizole: data from clinical practice**

Reist L.¹, Erlenwein J.², Stüber F.¹, Stamer U.M.¹

¹*University of Bern, Inselspital, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland*, ²*University of Göttingen, Dept of Anaesthesiology, Göttingen, Germany*

Background: Non-opioid analgesics are frequently used for the treatment of acute and chronic pain. Dipyrone (metamizole) is an alternative to NSAIDs and paracetamol, however, the use of this drug is discussed controversially.

Methods: An electronic survey considering the use of non-opioid analgesics in the perioperative and chronic pain setting was mailed to anaesthesiologists and pain physicians of the German national societies. The questions aimed at details of analgesic use and, specifically, at observed dipyrone related side effects. Furthermore, the monitoring of a dipyrone treatment was addressed.

Results: Of the colleagues working in German, Austrian and Swiss institutions, 2112 and 934 filled in the questionnaire aiming at acute and chronic pain management. Of the respondents, 86% administered a non-opioid during anaesthesia, 73% postoperatively, with the majority favouring dipyrone (81%;56%). Paracetamol (30%;36%) and NSAIDs (19%;34%) were used less often. For treatment of chronic pain, dipyrone was used in combination with other non-opioids (77%) or as the only non-opioid analgesic (20%), with 2.9% never using dipyrone. Any haematological side effects were reported by 18% and 16%, respectively; 3% and 1.5% of the participants indicated an agranulocytosis. A concomitant medication with drugs also known to cause changes in white blood cells counts (antibiotics, methotrexate, carbamazepine each >5%) was mentioned by 19% (acute) and 28% (chronic) of the respondents indicating haematological side effects. Nine colleagues reported a fatal outcome in the acute pain setting (multiple entry of one case by several colleagues possible). A drug causality assessment was not feasible. The majority of colleagues (acute: 73%, chronic 59%) never perform blood cell counts to monitor possible haematological side effects.

Conclusions: Dipyrone is the preferred non-opioid analgesic in the perioperative and chronic pain setting. Due to the unfavourable cardio-vascular side effect profile of NSAIDs and COX2-inhibitors and paracetamol's low analgesic potency, anaesthesiologists seem to prefer dipyrone in those countries where this drug is marketed.¹⁻⁴

References:

1. Schönhofer et al. *Lancet* 2003 ;361 :968
2. Kotter et al. *PlosOne* 2015;10:e0122918
3. Bhala et al. *Lancet* 2013;382:769
4. Williams et al. *Lancet* 2014;384:1586

08AP06-4**Improving postoperative pain management after major abdominal surgery**

Zabolotskikh I., Musaeva T., Makarenko V.
Kuban State Medical University, Dept of Anaesthesiology & Intensive Care, Krasnodar, Russian Federation

Background and Goal of Study: Management of acute postoperative pain has received attention in recent years. Inadequately treated pain can lead to detrimental physiological effects and may also have psychological, economic and social adverse effects. The goal of the study is to improve the quality of postoperative analgesia after major abdominal surgery.

Materials and Method: Assessment of 600 patients was performed. The median age was 52.0 (48,0-64,0) years. The duration of surgery was more than 180 minutes.

All patients were divided into 3 groups according to the level of direct current potential (DCP) that was measured before the surgery: low negative level of DCP (< -14 mV) ($n = 206$), average level of DCP ($-15 - (-29)$ mV) ($n = 224$), high level of DCP (> -30 mV) ($n = 170$) and received epidural analgesia postoperatively. The measurement of DCP was conducted in a continuous recording for 10 minutes from the active electrode located in the middle of the forehead, and the reference electrode - in the tenor region. Pain was assessed every hour by visual analogue scale (VAS) during 8 hours after surgery.

Results and Discussion: The analysis of pain at rest by VAS was between 1 and 3 in 90.7% of patients with average level of DCP, 84.6% in patients with high level of DCP and 79.8% patients with low level of DCP. The VAS on movement was 1-3 in 86.2% of patients with average level of DCP, 52.6% in patients with high level of DCP and 43.8% patients with low level of DCP. The VAS on rest was 4 - 6 in 5.4% of patients with average level of DCP, 11.2% in patients with high level of DCP and 13.4% patients with low level of DCP. The VAS on movement was 4-6 in 7.9% of patients with average level of DCP, 15.7% in patients with high level of DCP and 39.1% patients with low level of DCP. Ketorolac supplementation reduced the severity of pain in patients with low level of DCP in 86% and high level of DCP - in 95% of cases.

Conclusion(s): It is necessary to perform pain assessment by VAS scale not only in rest, but also in the movement. In patients with low and high levels of DCP ketorolac supplementation improves postoperative pain management.

References: Zabolotskikh I., Musaeva T., Makarenko V., Kuklin V., Bjertnaes L. Visual analog scale and efficacy safety score validity in monitoring efficacy of the postoperative pain prediction. Regional Anesthesia and Pain Medicine. 2015. T. 40. № 5S1. C. e144.

08AP06-5**Oxycodone vs. fentanyl for Intravenous patient-controlled analgesia after laparoscopic gynecological surgery**

Kim N.S.
Soonchunhyang University Cheonan Hospital, Dept of Anaesthesiology & Pain Medicine, Cheonan, Korea, Republic of

Background and Goal of Study: Oxycodone, a semi-synthetic thebaine derivative opioid, have been widely used for moderate to severe pain. The aim of this study was to compare the efficacy and side effects of oxycodone and fentanyl on post-operative pain with intravenous patient-controlled analgesia (IV-PCA) after laparoscopic gynecological surgery.

Materials and Methods: One hundred-twenty two patients were randomized to postoperative pain treatment with either oxycodone ($n = 62$, Group O) or fentanyl group ($n=60$, Group F). The patients received 7.5 mg oxycodone / 150 mcg fentanyl with ketorolac 30 mg at the end of anesthesia and then continued with IV-PCA (potency ratio 50:1) for 48 hr postoperatively. Blinded observer assessed postoperative pain using numerical rating scale (NRS), infused PCA dose, patient satisfaction, sedation level and side effects.

Results and Discussion: No significant differences were observed in patient satisfaction with the analgesia during the 48 hr postoperative period. However, the incidences of postoperative nausea and vomiting, drowsiness of Group O were significantly higher than that of Group F

Conclusion(s): Oxycodone demonstrated similar effects for pain relief compared to fentanyl when used with potency ratio 1:50. Therefore, oxycodone may be useful as an alternative to fentanyl for IV- PCA after laparoscopic gynecological surgery.

08AP06-6**Patient Controlled Analgesia with morphine for treatment of burn injury pain: higher bolus doses and higher lockout time vs lower bolus doses and lower lockout time. There is a difference**

Ferreira C., Rego S., Marques M., Tourais I., Almeida V., Gomes P.
Coimbra Hospital and University Centre, Dept of Anaesthesiology, Coimbra, Portugal

Background and Goal of Study: Despite major advances in the treatment of severe burns with better survival rates, pain is inadequately treated globally. Pain treatment for burn patients is challenging. As previously reported, neither the total burned surface area nor the burn depth, correlates adequately with the reported pain. Pain is highly variable among patients' and opioids remain the preferred analgesic for the treatment of burn pain². We performed a study of amount of rescue analgesia administered to patients following two different analgesic schemes for Patient Controlled Analgesia (PCA) with morphine.

Materials and Methods: We studied 2 groups of 13 patients each with PCA system (PCAs) for burn pain analgesia. Each PCAs had 95mL isotonic fluid and 50mg of morphine (0.5mg/mL).

Group A had 3mg of morphine bolus dose and 15 min lockout time, Group B had 2 mg of morphine bolus dose and 10 min lockout time.

Both groups had the same basic perfusion with morphine and rescue analgesia with acetaminophen and metamizole. Rescue treatment was considered necessary at scores of ≥ 2 , using a numeric rating scale (0 = no pain and 5 = unbearable pain). The age of the patients was between 40 and 65 years, they had an ASA classification I or II and the burns were due to fire. Patients' records showed the number of days on PCAs and the number of rescue analgesic administrations.

Statistical analysis with SPSS Statistics (v.22, IBM SPSS).

Results and Discussion: Group A had 6 men and 7 women, with mean age of 53 ± 7.8 years old and average length of PCAs stay was 11 ± 17 days. Group B had 5 men and 8 women, with a mean age of 50 ± 10.2 years old and the average length of stay was 17 ± 6.5 days. The mean administration of rescue analgesia during length of PCAs stay in group A was 0.6 administrations per day whereas in group B it was 1.2. Comparing group A to group B, there was a greater need for rescue analgesia in group B with statistical significance (group A: 0.6 vs groupB:1.2;p=0.006).

Conclusion: We found that in group B there was a greater need for rescue analgesia but considering that our groups only had 13 patients we need to reevaluate our protocol so as to include a larger number of patients to show that the results may be reproducible or not with a larger population study.

References:

1. J Burn Care Res. 2011;32:166-71;
2. Burns. 2009;35:921-36

Acknowledgement: The dose of morphine and its lockout can have importance in the treatment of burn pain.

08AP06-7**Patient-controlled epidural analgesia: analysis of efficacy and complications in surgical oncology patients**

Sousa Correia J., Nunes Ferreira M., Afonso A., Gacio M.
IPO Porto, Dept of Anaesthesiology & Intensive Care, Porto, Portugal

Background and Goal of Study: Patient-controlled epidural analgesia (PCEA) is a well established technique for postoperative pain relief after major surgery but several risks have been observed. The purpose of this study is to survey the efficacy and safety of PCEA and determining incidence, type and severity of postoperative complications related to epidural analgesia and catheter insertion.

Materials and Methods: A retrospective study was conducted between May-September 2016 in a single-center. We analyzed 250 elective surgical patients who received PCEA with ropivacaine 0.1% and sufentanil 0.5 μ g/ml at a 5-15mL.h⁻¹ rate and loading dose of 5-15mL. Infusion rate was adjusted according to type of surgery and epidural level with the possibility of 3-5ml bolus (interval of 20min). Patients were assessed by an acute pain service team postoperatively. The following variables were evaluated: type of surgery, incidence of side-effects and complications and quality of analgesia (qualitative scale pain of 5 items: no pain, mild pain, moderate pain, severe pain, unbearable pain).

able pain). We have considered as good analgesia only no/mild pain situations, reasonable analgesia when presented at least one episode of moderate pain, and poor analgesia at least one episode of severe/unbearable pain. We used SPSS (PSAW Statistics 18) for statistical analysis.

Results and Discussion: Epidural catheters remained in place 4.63 days in average. Global rate of technique-related complications were 33.2%, most of them minor complications without clinical repercussion. From these 4.4% were directly related to the epidural catheter (disconnection, externalization, obstruction, leak of local anesthetic and machine fault). The most frequent complications were vomiting (9.6%) and pruritus (8%). Neurological complications represented 6.4% (6% of paresthesias and 0.4% of motor block) and cardiovascular complications represented 0.4% (hypotension). We also observed epidural failure (2.8%), urinary retention (0.8%), postdural puncture headache (0.4%) and inflammation and local infection (0.4%). Postoperative analgesia was effective in the majority of the patients. Assessment of resting/movement analgesia: good in 97.2%/76.4%; reasonable in 2%/21.2%; poor in 0.8%/2.4%, respectively.

Conclusions: PCEA was effective and safe in the postoperative period. Complications were few and not severe. A strict vigilance is recommended to achieve satisfactory analgesia and a low incidence of complications.

08AP06-8

PCA morphine for acute pain management after laparoscopic hysterectomy —> is it essential?

Hoskote H., Ijaz N., Srikantharajah I.

Luton and Dunstable Hospital, Dept of Anaesthesiology & Pain Medicine, Luton, United Kingdom

Background and Goal of Study: To propose acute pain protocol for Enhanced Recovery after Surgery (ERAS) after laparoscopic hysterectomy. ERAS got established to reduce morbidity and discomfort after operative procedures, proposing laparoscopic approaches to surgery to minimise postoperative acute pain, with the intention of minimising the use of Opioids. This would then reduce nausea and vomiting in the postoperative period and reduce the hospital stay for patients, thus improving patient satisfaction.

Materials and Methods: An audit on the Anaesthetic and postoperative pain management of laparoscopic hysterectomy at the Trust was performed by retrospectively reviewing the charts of cases of laparoscopic hysterectomies (n=21) performed over six months.

Results: There was no clinical or statistical difference in postoperative pain scores with or without Morphine PCA (Patient Controlled Analgesia).

Conclusion: Morphine PCA is not always essential after laparoscopic hysterectomy procedures.

Recommendations:

- Proposal of Standardised Anaesthetic Protocol (SAP) for Enhanced Recovery in laparoscopic hysterectomies and eventually all major gynaecological surgeries.
- Promoting the use of regional analgesia - intra operative spinal Opioids, TAP (Transverse Abdominis Plane) blocks with pre-emptive Gabapentin or Ketamine and regular use of NSAIDs, thus reducing the consumption of Opioids and their associated side effects to augment enhanced recovery.

Reference: ERAS Guidelines- Association of Surgeons of Great Britain and Ireland. Guidelines for Implementation of Enhanced Recovery Protocols. 2009. www.asgbi.org.uk (accessed 12/12/2016).

Acknowledgements:

Dr. Indra Srikantharajah, Acute Pain consultant. Luton Dunstable Hospital, who initiated this audit and guided me through it.

Dr. Nazia Ijaz, my colleague, who worked with me on this audit

08AP06-9

Perioperative intravenous ketamine for acute postoperative pain management in adult cancer patients undergoing solid tumor resection: a systematic review and metaanalysis

Bolívar-Trujillo M., Escobar B.

Universidad Nacional de Colombia, Dept of Anaesthesiology, Bogota, Colombia

Background and Goal of Study: Surgery is the principal treatment for adult oncology patients. Suboptimal acute pain management increases morbidity and chronic pain. Several analgesic drugs could have an effect on tumor progression. There is evidence that opioid drugs have the potential of decreasing innate and adaptive immune response for neoplastic processes.

The main objective is to evaluate the efficacy of perioperative intravenous ketamine for acute postoperative pain management and opioid sparing effect on adult oncology patients undergoing solid tumor resection.

Materials and Methods: Systematic review and metaanalysis of randomized controlled clinical trials searched in these databases: CENTRAL, Medline, EMBASE, LILACS, and exploring gray literature, following the Cochrane recommendations. The outcomes were the analgesic efficacy measured by analog visual scale from 0-100 during the first postoperative 24 hours and the cumulative opioid requirements in the same period. The security outcome was intended to report adverse effects of the intervention, and the implication for chronic postoperative pain and tumoral recurrence. The security outcome was intended to report adverse effects of the intervention, and the implication for chronic postoperative pain and tumoral recurrence.

The search was conducted independently by two investigators. The information was extracted using a standard template, which also evaluates the risk of bias.

Results and Discussion: We included 5 randomized clinical trials over 101 studies found. The metaanalysis of analgesic efficacy showed reduced pain intensity at rest during the 6 (MD -12.58 [-22.42, -2.73]) and 12 postoperative hours (MD -10.55 [-19.76, -1.34]) but not at 24 (MD -7.34 [-16.19, 1.52]). The opioid sparing effect was not significant at 24 hours (MD -4.67mg [-12.62, 3.28]). However, the calculated heterogeneity with I^2 was greater than 80%, even using a sensitivity analysis. There was not a clinical difference for adverse events and postoperative nausea and vomiting. One of the trials concluded a decreased postoperative chronic pain at 6 months. There was no report of oncologic recurrence.

Conclusion: Perioperative intravenous ketamine in adult oncologic patients undergoing solid tumor resection has an analgesic efficacy during the first 12 postoperative hours, without opioid sparing effect, despite significant heterogeneity between the studies. There is lack of evidence around the tumor progression.

08AP06-10

Postoperative analgesia in bariatric surgery: effect of pre-incisional single dose ketamine

Karbonskienė A.¹, Kasputytė G.²

¹Lithuanian University of Health Sciences, Dept of Anaesthesiology, Kaunas, Lithuania, ²Lithuanian University of Health Sciences, Faculty of Medicine, Kaunas, Lithuania

Background and Goal of Study: Remifentanyl infusions provide excellent intraoperative analgesia with rapid emergence in different patient groups. But postoperative analgesia is still a challenge after this type of anaesthesia. Low-dose intravenous ketamine seems promising in reducing postoperative opioid requirements and opioid induced hyperalgesia. Our aim was to evaluate an effect of pre-incisional single injection of low-dose ketamine on postoperative analgesic requirements and patient satisfaction with postoperative analgesia in laparoscopic bariatric surgery.

Materials and Methods: 22 consecutive bariatric patients were randomly assigned to receive single pre-incisional injection of ketamine (0,15 mg/kg) (K group) or saline (S group) in a double-blind manner. Standardized protocol of anaesthesia based on remifentanyl infusion (0,2-0,5 mcg/mg/kg) and sevoflurane was followed. Postoperative analgesia was provided with bupivacaine infiltration of operative ports and standardized doses of acetaminophen, ketoprofen and intravenous morphine to reach acceptable pain level. Patients' satisfaction with analgesia was recorded.

Results: Both groups were did not differ in demographic values, BMI, operative time, intraoperative remifentanyl consumption. Postoperative pain scores were similar. Morphine consumption was 9.3 ± 2.5 in S group and 7.4 ± 3.2 in K group ($p=0.126$). Both groups demonstrated equally high satisfaction with postoperative analgesia.

Conclusion: Pre-incisional single dose ketamine does not allow to escape postoperative opioids after remifentanyl infusions. High patient satisfaction is achieved if multimodal analgesia protocol is followed.

08AP07-1

Personal factors of symptom formation of anxiety and depression in patients with degenerative-dystrophic changes in patients with radicular pain syndrome

Gnezdilov A.¹, Yakovlev R.², Dolbneva E.¹, Krukov S.¹, Samoylova N.¹

¹Petrovsky National Research Centre for Surgery, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation,

²Bybnovsky Rehabilitation Center, Rehabilitation Department, Moscow, Russian Federation

Background and Goal of Study: The literature describes a wide range of possible changes in the diseased psyche, manifested in the form of depressive and anxiety disorders, neurotic and asthenia states, etc. in patients with radicular pain syndrome (RPS)[1]. The study of personality characteristics of the patients, revealing the severity of disorders of anxiety-depression spectrum in patients with acute radicular pain syndrome (ARPS).

Materials and Methods: 62 patients (men 32/ women - 30), aged 22 to 76 years with RPS were investigated. After investigation (anxiety scale and depression scale A. Beck, VAS, assessment of in-intensity pain) they were divided of two groups. Group A (30) patients were treated in Pain department (PD) with ARPS, using regional blockade. Group B (32) - after treatment in PD were rehabilitate in Special Rehabilitate Center (SRC) using fitness for one month. Statistical significance ($p<0.05$) was determined using SPSS (the descriptive statistics, correlation analysis).

Results and Discussion: In A group: VAS 6.4 ± 0.8 *at the beginning of the treatment; after 24 hours - 2.8 ± 0.9 ; to 5 day - 2.3 ± 0.7 . In B group: VAS was 3.5 ± 0.7 * at the beginning; 2.5 ± 0.7 to 5 day of a course of rehabilitation. In assessing the severity of the symptoms of depression, anxiety and distress, it was found that the indicators: depression in A- totaled M 10.4(SM6.7)* vs. M 6.1(SM7.7)* in column 2; Alarm - M 14.7 (SM10.6)* vs. M 7.9 (SM 10.1)* in column 2; distress - the M 7 (SM5)* vs. M 3.5 (SM 2.7)* in column 2 ($p<0.05$) (M - mean value, SM-standard deviation,* - the difference between patients of 2 groups). In patients of A group symptoms of depression and anxiety expressed significantly higher, then in B.

Conclusion(s): Inclusion of psychological help in the treatment program of RPS most necessary in the acute phase of the disease, because of the severity of the symptoms of disorders of anxiety-depression spectrum, symptoms of distress symptoms, require advice and should be identified as "target". Psychological correctional work should be aimed at strengthening the motivational sphere of patients, as well as working with the system of their values.

References: 1. Yakovlev R. et al. Rus.J. of Anaesth.and Rean.2016.suppl.61.90-91

08AP07-2

Acute Pain Service (APS): Population analysis and analgesic modalities used - one-year audit

Freitas Silva R., Resendes H., Lima C., Cabral T., Borges J., Simas J.

Divino Espírito Santo Hospital, Dept of Anaesthesiology, Ponta Delgada, Portugal

Background and Goal of Study: The management of acute postoperative pain is one of the major concerns of the Anesthesiologist. The increasing use of multimodal analgesia protocols, patient controlled analgesia or locoregional analgesia leads to better pain control¹.

The objective of this study was to evaluate the records of the Acute Pain Service (APS) of the Divino Espírito Santo Hospital (DESH) - Ponta Delgada

during the year 2015, in order to evaluate the following:

1. To know the demographic characteristics of the patients;
2. The number of consultations;
3. The most prescribed protocols and analgesic modalities.

Materials and Methods: Retrospective study using an Excel database of the APS records for the year 2015.

Results and Discussion:

1. During the year 2015 the Acute Pain Unit followed a total of 1123 patients, of which 765 were female (68.1%) and 358 male (31.9%). Regarding the age group, 7 patients were between 1 and 12 years old, 680 between 12 and 60 years old, 171 between 60 and 75 years old, and 83 patients over 75 years old (in 182 cases this information was not registered).

2. A total of 2934 consultations were performed, of which 256 patients required only one observation and 438 had two observations. In 429 cases, 3 or more observations were required by the APS (17 patients had 10 or more consultations).

3. Of the 1123 protocols instituted in the postoperative period it was concluded that: 307 corresponded to conventional analgesia (intravenous multimodal), 796 to epidural analgesia, 10 to patient controlled analgesia (PCA) and 10 to patient controlled epidural analgesia (PCEA).

Conclusions: Clinical audits are important tools to know the quality of health services provided to patients.¹ From the analysis performed it was possible to draw the following conclusions:

- In DESH the majority of patients followed by APS were female (68.1%) and aged between 12 and 60 years;
- In 429 cases (38.2%) 3 or more follow-up visits were required for effective pain control;
- Epidural analgesia was the most used analgesic modality of the postoperative period, corresponding to 796 (70.9%) of the cases.

References: 1. Smith T. Evans S.; Assessment and documentation in pain management, In: Colvin J. Peden C. eds. Raising the Standard; A Compendium of Audit Recipes. 3rd ed. London: Royal College of Anaesthetists 237-237, 2012

08AP07-3

The safety profile of Pentrox® treatment for emergency relief of moderate to severe pain: an examination of over 30 years of post-authorisation safety data

Middleton P¹, Coffey E², Hopp M.³, Dickerson S.⁴, Cooper A.⁵

¹Distributed Research in Emergency and Acute Medicine,

Emergency, Sydney, Australia, ²Nottingham University Hospitals

NHS Trust, UK, Emergency Department, Nottingham, United

Kingdom, ³Mundipharma Research GmbH & Co KG, Medical

Science, Limburg, Germany, ⁴Mundipharma International Limited,

Medical Affairs, Cambridge, United Kingdom, ⁵Mundipharma

Research Limited, Drug Safety and Pharmacovigilance, Cambridge, United Kingdom

Background and Goal of Study: Pentrox® is an inhalation device containing the potent analgesic methoxyflurane indicated for emergency relief of moderate to severe pain. The Pentrox product was first used by the West Australian Ambulance service and was registered for analgesic use (in Australia) in January 1993. The first Marketing Authorization of Pentrox in the EU was obtained in May 2015. The goal of the current study was to review the post-authorisation safety data to examine the occurrence of all adverse events (AEs) associated with treatment, as well as AEs specifically related to the system organ class terms of Hepatobiliary, Nervous System and Renal Disorders.

Materials and Methods: Data were derived from the Medical Developments International (MDI) database which captures and collates all adverse event information relating to Pentrox globally. AEs were coded using specific terms from the Medical Dictionary for Regulatory Activities (MedDRA) upon database entry. The database was searched for all AEs associated with treatment, as well as for specific terms corresponding to Hepatobiliary Disorders, Nervous System Disorders and Renal Disorders. The total number of AEs, and AEs by specific organ class, are presented for January 1993 through to June 2016.

Results and Discussion: The total number of AEs reported was $n=78$ in the context of 5 263 128 units of Pentrox administration, equating to 1.48 AEs per 100 000 units of administration. The total number of AEs reported by organ class, expressed per 100 000 units of administration, was 0.13 for Hepatobiliary Disorders, 0.34 for Nervous System Disorders and 0.02 for Renal Disorders. In context, the European Medicines Agency (EMA) specifies

that AEs which occur at a frequency of less than 1 per 10 000 can be defined as very rare - the rarest event frequency defined by the EMA for prescribed medicines.

Conclusion(s): The examination of over 30 years of post-authorisation safety data shows that the frequency of AEs related to the use of Pentrox for emergency relief of moderate to severe pain is very rare.

®PENTHROX is a registered trade mark of Medical Developments International Limited

08AP07-4

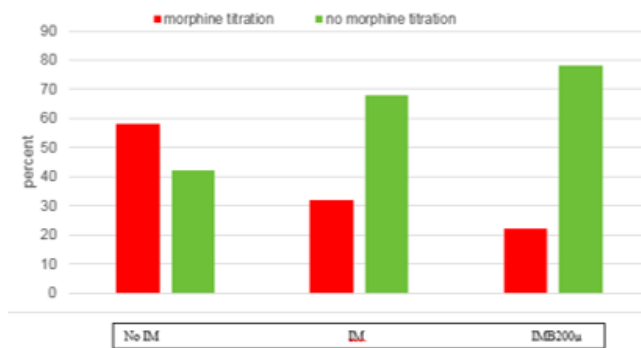
Intrathecal morphine reduces immediate pain after lumbar arthrodesis

Kamga H.¹, Lucas F.², Dudoit T.², Delassus R.¹, Gakuba C.¹, Emery E.², Hanouz J.L.¹

¹CHU Centre Hospitalier Universitaire Caen, Dept of Anaesthesiology & Intensive Care, Caen, France, ²CHU Centre Hospitalier Universitaire Caen, Dept of Surgery, Caen, France

Background and Goal of Study: Lumbar arthrodesis (LA) is a frequent procedure with high level and extended postoperative pain. Several studies have demonstrated intrathecal morphine (IM) efficacy in reducing pain after LA. None has addressed pain in the recovery room. Controversy persist on the optimal dosage of IM. The aim of this study is to evaluate its efficacy on pain in recovery room and compare the various schemas of administration.

Materials and Methods: This is a retrospective single center study. All lumbar arthrodesis between January 2012 and November 2016 were included. The patients were classified in IM group and no IM group. IM was administrated either prior or during surgery. The dose of IM and multimodal analgesia were decided by the attending anesthesiologist. The main outcome was the proportion of patient requiring morphine in recovery room. The secondary end points were the rate of adverse effect of IM. The data were compared using Chi 2 test. Adjustment conducted using the Mantel Haenszel test. SPSS was used for statistics analyses.



[Figure 1: Morphine titration in recovery room]

Results and Discussion: 431 patients have been included during the study period with 129 (30 %) in the IM group. Demographic data were comparable between the groups. The median dose of IM was 200 µg (100; 300). IM reduces the rate of morphine titration in recovery room, odds ratio (OR) 2.95 (1.92; 4.57) (figure 1). After adjustment on multimodal analgesia modalities and the prior exposure to morphine, the OR is 2.35 (1.39; 3.95).

When 200 µg IM (IMB200µg) was administrated before surgery, the OR is 5.38 (2.08; 13.90). Usually for LA, IM is administrated by the surgeon at the end of surgery with an efficiency up to four hours after surgery (1).

The median dose of IM was 200 µg with no adverse effect in recovery room. 2 patients required bladder evacuation on day 1 and 2 leakage of CSF occurred at day 2 in IM group. Boezaart has demonstrated the safety of dose up to 300µg (2).

Conclusion(s): IM may reduce the need of morphine in the recovery room after LA. IM should be administrated before surgery at the dosage of 200 µg.

References:

1. S Ziegeler and al Spine 33; 22; 2379 -2386
2. A Boezaart and al.spine 24;11; 1131-1137

08AP07-6

Experimentall study: a comparison of analgesic effect in a rat model of acute pain treated with either paracetamol or morphine

Roumelioti C.¹, Panagopoulos N.², Pagalidou E.³, Damigos D.⁴

¹University of Ioannina, Pharmacology, Ioannina, Greece, ²C H Gonesse, Dept of Anaesthesiology, Gonesse, France, ³University, Biostatistics, Florina, Greece, ⁴University of Ioannina, Medicine, Ioannina, Greece

Background and Goal of Study: Pain may have somatic and behavior effects. Antinociceptive action may be promoted with analgesics, acting centrally and peripherally. This experimental animal study was conducted to compare the analgesic activity of morphine versus paracetamol in the hot-plate test in animal model with rats.

Morphine is an opioid analgesic with central and peripheral action. Paracetamol's mechanism of action is still unknown.

Materials and Methods: Twenty- four male Wistar mice were divided in three groups, the first group (n=8) was the control (2 ml normal saline was injected intraperitoneally), the second group (n=8) was the morphine (10 mg/kg of morphine was injected intraperitoneally) and the third group (n=8) of paracetamol (200mg/kg of paracetamol was injected intraperitoneally). At 30 minutes interval and 60 minutes interval after the administration of the drugs, the animals were put on Hot-plate. Paw-lick test or bounce were used to determine pain threshold. Measurement were made at 30 minutes and at 60 minutes after the administration of the drug. All the animals were sacrificed after the experiment.

Results and Discussion: Morphine antinociceptive action did not have statistical significant difference with that of paracetamol at 60 minutes (P 0.927>0.05) but it had increased pain threshold at 30 minutes (P 0.021<0.05). Morphine had statistical significant antinociceptive action at 30 (P 0.003<0.05) and 60 (P 0.009<0.05) minutes. Paracetamol had statistical significant antinociceptive difference in 60 (P 0.011<0.05) minutes but not at 30 (P 0.316>0.05) minutes. Median of difference of measurements for paracetamol time 30 min and time 60 min was significant different (P=0.027<0.05). Paracetamol displayed an antinociceptive activity as efficacious as morphine at dose 200 mg/kg, comparable with that of 10mg/kg morphine at 60 minutes.

Conclusion(s): According to our results, paracetamol may be an alternative analgesic.

Acknowledgements: I would like to thank Professor of Pharmacology, in the University of Ioannina, Marselos Marios, who supported me in this study.

08AP07-7

Analgesic and antiinflammatory effects of preoperative and postoperative application of cannabinoid CB2 agonist (R,S)-AM1241 in a rat model of incisional pain

Stachtari C., Koraki E., Arapidou M., Katsanevaki A., Zarzava E., Trikoupi A.

General Hospital of Thessaloniki , G. Papanikolaou', Dept of Anaesthesiology, Thessaloniki, Greece

Background and Goal of Study: The aim of the present study was to evaluate the antinociceptive effect of cannabinoids, applied preoperative or postoperative, and their impact on serum intereulekin-2 (IL-2) and intereulekin-6 (IL-6) levels, in a rat model of incisional pain.

Materials and Methods: Trial was prospective and randomized and approved by Animal Research Ethics Committee of Aristotle University of Thessaloniki. After assessment of baseline responses to thermal stimulation eighteen adult male Wistar rats were randomly divided into 3 groups:

Group 1 received 1ml/kg normal saline, Group 2 1mg/kg (R,S)-AM1241 intraperitoneal (i.p) preoperatively, Group 3 1mg/kg (R,S)-AM1241i.p postoperatively. A model of post-surgical pain in rat was applied (1).

Thermal allodynia was assessed by Hot Plate Test, 30 (T30), 60 (T60) and 120 (T120) minutes after incision. Serum IL-2 and IL-6 levels were measured by enzyme-linked immunosorbent assay (ELISA) two hours post-incision. Data were analysed by Multi-Factor Repeated Measures ANOVA with one Between - Subjects and one Within - Subjects Factor. Greenhouse-Geisser correction was applied to the interaction term of all repeated factors.

Comparisons for IL-2 and IL-6 were performed using one-way ANOVA. P value

<0.05 was considered significant. Statistical Package for Social Sciences was used for all calculations.

Results and Discussion: Significant augmentation of thermal threshold was observed at all-time points in group 2 compared to group 1 ($P = 0.015$ at T30, $P = 0.002$ at T60 and $P = 0.006$ at T120), and in group 3 compared to group 1 ($P = 0.044$ at T30, $P = 0.003$ at T60 and $P = 0.017$ at T120). There was no significant difference between group 2 and 3 ($P = 0.812$). IL-6 level was significant attenuated only in group 2 compared to group 1 ($P = 0.000$). IL-2 levels remained unchanged in all experimental groups.

Conclusion(s): Preemptive administration of selective CB₂ agonist in rats in incisional pain model was superior to postoperative administration of the same dose in terms of reduction of interleukin 6, but there was no significant difference in attenuation of postoperative pain and augmentation of interleukin 2.

References: 1. Brennan, T. J., E. P. Vandermeulen, et al. (1996). "Characterization of a rat model of incisional pain." *Pain* 64(3): 493-501.

08AP07-8

Use of sublingual fentanyl in postoperative pain management

Bakalaki V.¹, Papaioannou E.², Kavezou F.¹, Bartzis K.¹, Tsinari K.¹, Lambadariou A.¹

¹'Laikon' General Hospital of Athens, Dept of Anaesthesiology, Athens, Greece, ²'Laikon' General Hospital of Athens, Dept of Anaesthesiology & Pain Medicine, Agia Paraskevi, Greece

Background and Goal of Study: Use of sublingual fentanyl is not an established method for acute postoperative pain management. Fentanyl is used though epidurally in such conditions. Goal of this study is to demonstrate sublingual fentanyl use in this setting.

Materials and Methods: We studied patients who underwent major surgical procedures, had no epidural catheter, their postoperative analgesic treatment was arranged by their surgeons, and anaesthesiologists were asked to manage their acute pain when their pain treatment was insufficient. They have been administered either morphine, tramadol, pethidine iv or sublingual fentanyl. Complications such as nausea, vomiting, respiratory depression, and oxygen desaturation were recorded.

Results and Discussion: 420 patients who were asked for rescue postoperative pain management (VAS score > 7), since their originally administered analgesia was inadequate, were randomly assigned to four groups of 105 (group A: morphine 0.1 mg/kg, group B: pethidine 0.5 mg/kg, group C: tramadol 50 mg iv in N/S 100 ml in 15 min and group D: sublingual fentanyl 67 µg). Onset of action, pain relief and side effects were recorded in all groups. Group D patients a significantly faster onset of action [$6 \pm 2, 1$ min, ($p < 0.005$)] than in other groups (A: 20 ± 3.2 min, B: 22 ± 4 min, C: 25 ± 3.8 min). Pain relief was adequate in studied groups, even though overall satisfaction was higher in group D patients, since they experienced faster pain relief and they had the feeling that they actively participated by themselves in their pain management, since their attention was distracted due to sublingual pill administration. None of any group patients demonstrated respiratory complications. 5 (4.80%) group B and 14 (13.33%) group C patients expressed nausea and received ondansetron 8 mg iv.

After rescue pain analgesic administration, postoperative analgesia instructions were modified to patients accordingly. Even though sublingual fentanyl administration is not included in the drug indications, other authors also have used it in acute postoperative management with satisfactory results and less side effects than other commonly used opioids. Our suggestion is not its use as routine postoperative analgesic, but as a rescue medicine in severe resistant pain cases.

Conclusion(s): Sublingual fentanyl use seems to be effective and harmless in acute postoperative management. More clinical investigation would be necessary to support this data.

Chronic Pain and Palliative Medicine

09AP01-1

Age-related anatomical changes of spinal nerves and its application to the neuropathic pain model in rat

Tateiwa H., Kawano T., Yokoyama M.

Kochi Medical School, Dept of Anaesthesiology & Intensive Care, Nankoku, Japan

Background and Goal of Study: Transection of the spinal nerves of L5 and L6 in a spinal nerve ligation (SNL) model is a widely used model of neuropathic pain. While in most previous studies, SNL has been conducted in young animals, it remains unknown whether SNL could be applied in aged ones. The aim of this study is to investigate how aging alters SNL procedures and to develop a novel technique for SNL model in aged rats.

Materials and Methods: Aged male Sprague-Dawley rats (19-24 months old, 650-730g) were used in 2 sets of experiments.

Experiment 1. Analysis of age-related neuroanatomic changes; After rats were sacrificed by decapitation under isoflurane anesthesia ($n = 5$), the skin, viscera, and muscle was removed to expose the nerves of the lumbosacral plexus up to the inter-vertebral foramina. The sciatic nerve was identified at its departure from the pelvis. The related the vertebral, sacral, and medial iliac bone were also dissected.

Experiment 2. Sensory testing; A total of 20 aged male rats were randomly divided into two groups. Group 1 ($n = 10$); SNL model with the usual technique in which the L6 transverse process was removed to visually identify the L4 and L5 spinal nerves. Group 2 ($n = 10$); SNL model using a novel technique that identified the L5 spinal nerve under the fascia between the L5 and L6 transverse process without removing it. Eight and 15 days after SNL surgery, sensory testing for determination of hyperalgesia were conducted by nociceptive paw withdrawal behavior. After sensory testings, autopsy was performed on all rats to confirm the accuracy of SNL procedures.

Results and Discussion: In Experiment 1, the L4 and L5 spinal nerves were identified under the fascia between the L5 and L6 transverse process in all animals. Therefore, the L5 spinal nerve is identified without removing the L6 transverse process, which is particularly a difficult procedure for aged rats.

In Experiment 2, the L4 spinal nerve were injured when the L6 transverse process was removed and developing paralysis in 2 of the 10 rats of Group 1. In contrast, in Group 2, L5 spinal nerve was successfully identified and L4 nerve was not injured in all rats. No significant difference in hyperalgesia-like behavior was found between the two groups.

Conclusion: Our novel technique for SNL model in aged rats may be a promising approach in studies regarding the age-related pathogenic changes of the neuropathic pain.

09AP01-2

An observational study of safety of low doses titration of intrathecal ziconotide for treatment of severe chronic pain syndromes

Bova G.¹, Quattrone D.¹, Barbagallo A.¹, Giacoppo C.², Cardia L.², Mondello E.²

¹San Vincenzo Hospital Taormina A.S.P. Messina, Dept of Anaesthesiology & Pain Medicine, Messina, Italy, ²University of Messina, Dept of Anaesthesiology & Pain Medicine, Messina, Italy

Background and Aims: Efficacy and safety of ziconotide have been demonstrated in three double-blind, placebo-controlled trials. However, the adverse events (AEs) were better tolerated when ziconotide was initiated for low doses at a titrated slowly over an extended period.

Patients and Methods: 158 patients with severe chronic pain, just implanted with a programmable drug delivery pump, received intrathecal (IT) ziconotide titrated over 1 to 6 week. Safety was evaluated via AEs report, the efficacy measures included pain intensity (VAS) and the clinical global impression (CGI).

Results: A significant ($p < 0.05$) median percentage improvement in VAS was seen at 3rd week and maintained through week 4; 38 patients (24.8%) reported good to excellent pain control on the CGI since the 2nd day of treatment, but

pain relief ended after 42 hours; the others patients reported a moderate pain relief only at week 6. During the 6 week observation the consumption of ATC opiates, rescue opiates and adjuvants decreased of the 41.9% of the baseline drugs amount. 36 patients (17.8%) experienced AEs (confusion and dizziness) during titration during the first two days after beginning of the treatment, but AEs last in the next days and they did not appear again.

Conclusions: Incidence of AEs related to titration of IT ziconotide may be reduced choosing to titrate slowly to the minimal analgesic dose.

References: Raffaelli W, Sarti D. et al. Italian Registry on long term intrathecal Ziconotide treatment. *Pain Physician* 2011; 14: 15-24.

09AP01-3

Earlier treatment improves the chances of complete relief from postherpetic neuralgia

Lee S.-H.¹, Kim K.-H.², Kim H.Y.³

¹Changwon Samsung Hospital, Dept of Anaesthesiology & Pain Medicine, Changwon, Korea, Republic of, ²School of Medicine, Pusan National University, Dept of Anaesthesiology & Pain Medicine, Yangsan, Korea, Republic of, ³Pusan National University Yangsan Hospital, Dept of Anaesthesiology & Pain Medicine, Yangsan, Korea, Republic of

Background and Goal of Study: Postherpetic neuralgia (PHN) is usually defined as pain persisting for more than 120 days after the onset of herpes zoster rash. Among PHN patients who commonly visit a pain physician rather than a dermatologist, complete relief from pain in response to active treatment can sometimes be observed in the clinical field. This study evaluated the incidence of relief from PHN as well as the factors influencing it.

Materials and Methods: A retrospective chart review was performed on patients with PHN at their first visit between 2008 and 2015 at a university-based pain clinic. The responders were defined as patients who had complete relief of pain after 1 year of active treatment. Age, sex, PHN duration at their first visit, and dermatomal distribution were also compared in responder and non-responder groups.

Results and Discussion: Among 117 PHN patients (M/F = 48/69), 35 patients (29.9%) had complete relief from PHN. Mean ages were 64.3 ± 10.6 and 66.9 ± 10.7 years, numbers of male to female were 11/24 and 37/45, and mean durations of PHN at their first visit were 8.5 ± 6.3 and 15.3 ± 10.7 months in the responder and non-responder groups, respectively. The most frequent involved dermatomes were the thoracic spinal, and followed by the trigeminal, cervical, and lumbosacral nerve territory in both groups.

Conclusion(s): Thirty percent of PHN patients received complete relief from pain. Those who sought treatment earlier in a pain clinic showed better results. However, statistically this study did not show significant differences according to age, sex, and dermatomal involvement.

References: 1. De Moragas JM, Kierland RR. The outcome of patients with herpes zoster. *AMA Arch Derm* 1957; 75: 193-6.

2. Dworkin RH, Gnann JW Jr, Oaklander AL, Raja SN, Schmader KE, Whitley RJ. Diagnosis and assessment of pain associated with herpes zoster and postherpetic neuralgia. *J Pain* 2008; 9: S37-44.

09AP01-4

Effects of repeated administration of amitriptyline on modulation of noradrenergic descending inhibitory system in a rat model of neuropathic pain

Hiroki T.¹, Suto T.¹, Saito S.¹, Obata H.²

¹Gunma University, Dept of Anaesthesiology, Maebashi, Japan, ²Fukushima Medical University Hospital, Center of Pain Management, Fukushima, Japan

Background and Goal of Study: The tricyclic antidepressant amitriptyline, the serotonin and noradrenaline reuptake inhibitor duloxetine, and gabapentinoids are first-line drug for treatment of neuropathic pain. The analgesic effect of these drugs relates to brainstem-spinal descending noradrenergic (NA) systems. In the present study, we investigated the difference in NA dependency of each drug. We also examined whether amitriptyline modifies the descending NA systems.

Materials and methods: Seven days after L5 spinal nerve ligation (SNL), rats received N-(2-chloroethyl)-N-ethyl-2-bromobenzylamine (DSP-4, 50 mg/kg) to degenerate NA fibers. The rats then received five daily intraperitoneal injections of amitriptyline (10 mg/kg), duloxetine (10 mg/kg), pregabalin (10 mg/kg), or gabapentin (50 mg/kg) from 21 days after SNL surgery. Paw withdrawal thresholds were determined to assess the analgesic effect of the drugs by paw pressure test.

To determine whether five daily injections of amitriptyline activated NA neurons in the locus coeruleus (LC) and spinal cord, we performed immunohistochemistry using antibodies for c-Fos and dopamine beta-hydroxylase (D β H).

Results and Discussion: Five daily injections of amitriptyline, duloxetine, pregabalin, and gabapentin exerted antihyperalgesic effects in SNL rats ($P < 0.001$). The antihyperalgesic effects of duloxetine, pregabalin, and gabapentin were reversed by pretreatment with DSP-4 ($P < 0.001$).

However, antihyperalgesia was still observed after treatment of amitriptyline in SNL rats with DSP-4 pretreatment, and this analgesic effect was not reversed by the α 2-adrenoceptor antagonist idazoxan (30 μ g).

Additionally, amitriptyline increased the ratio of c-Fos-immunoreactive (IR) cells in noradrenergic LC neurons in SNL rats with or without DSP-4 pretreatment ($P < 0.001$). Amitriptyline increased D β H-IR in the LC and the spinal dorsal horn of SNL rats ($P < 0.001$).

However, in DSP-4 pretreated groups, amitriptyline did not increase D β H-IR in both tissue ($P < 0.001$).

Conclusion(s): Five daily injections of amitriptyline produced antihyperalgesic effects against neuropathic pain despite the condition that NA descending inhibitory systems are suppressed. Amitriptyline could still produce analgesia under pathological dysfunction of the descending NA system. In patients with neuropathic pain, amitriptyline may enhance the analgesic effects of drugs that require descending NA inhibitory systems, such as duloxetine and gabapentinoids.

09AP01-5

Intrathecal administration of nicotinic agonists attenuates pain-related behavior in a rat model of trigeminal neuropathic pain

Nakai K.¹, Nakae A.², Kubo T.³, Minegishi Y.¹, Fujino Y.⁴, Hosokawa K.³

¹University of Fukui Hospital, Dept of Plastic and Reconstructive Surgery, Eiheiji-cho, Japan, ²WPI Immunology Frontier Research Center, Osaka University, Dept of Anaesthesiology & Intensive Care, Suita, Japan, ³Osaka University Graduate School of Medicine, Dept of Plastic Surgery, Suita, Japan, ⁴Osaka University Graduate School of Medicine, Dept of Anaesthesiology & Intensive Care, Suita, Japan

Background and Goal of Study: The trigeminal nerve may be damaged during maxillofacial injury or surgical procedures. Traumatic trigeminal neuropathy is particularly resistant to standard pharmacological treatment. Substantial evidences revealed that nicotinic acetylcholine receptors (nAChRs) are widely expressed in the spinal cord and modulate nociceptive transmission. Spinal administration of the nicotinic agonists has been shown to produce antinociception. The contribution of spinal nAChRs in inhibiting the trigeminal neuropathic pain remained unclear. Chronic constriction injury to the infraorbital nerve (ION-CCI) has proven a useful model for trigeminal neuropathic pain. The present study evaluated the possible role of spinal nAChRs in ION-CCI rat model.

Material and methods: Male Sprague Dawley rats underwent unilateral CCI to the right ION. Two nylon (5-0) ligatures were tied around the ION. Series of von Frey filaments were used to determine pain hypersensitivity to mechanical stimulation on day 14 after surgery. A polyethylene (PE-10) catheter was implanted for upper cervical spinal injection of drugs. The rats were allowed to recover for 7 days. The potential anti-allodynic effects of intrathecal administration of a nAChR agonist nicotine and an alpha 7 nAChR agonist PNU 282987 were examined.

In addition, the role of nAChR and alpha 7 nAChR in these effects was assessed by determine whether the anti-allodynic effects were prevented by intrathecal administration of a nAChR antagonist mecamylamine or an alpha 7 nAChR antagonist methyllycaconitine. The time course data for the dose-response effects were analyzed by two-way analysis of variance and Tukey-Kramer multiple-comparison test.

Results and Discussion: Intrathecal administration of nicotine and PNU 282987 increased mechanical thresholds in a dose dependent manner ($P < 0.05$). Mecamylamine significantly reduced the anti-allodynic effect of nicotine. Methyllycaconitine significantly reduced the anti-allodynic effect of PNU 282987.

Conclusions: The results indicated that spinal nAChRs and alpha 7 nAChRs may play an important role in a rat model of trigeminal neuropathic pain.

09AP01-6

Quality of life after pulsed radiofrequency treatment by epidural space with pulse electrode in neuropathic radicular pain: a preliminary audit

Bova G.¹, Quattrone D.¹, Siliotti R.², Giacompo C.², Cardia L.², De Pasquale M.²

¹San Vincenzo Hospital Taormina A.S.P. Messina, Dept of Anaesthesiology & Pain Medicine, Messina, Italy, ²University of Messina, Dept of Anaesthesiology & Pain Medicine, Messina, Italy

Background and aims: The Pulsetrode electrode is a multifunctional pain treatment, used to erogate pulsed radiofrequency current (PRF) on the target sensitive ganglion or nervous root, using the epidural space and not transforaminal approach. The aim is to evaluate the analgesic effectiveness of PRF treatment in radicular neuropathic pain diagnosed using the IASP grading score.

Methods: This study is a prospective, open-label, non randomized trial. Inclusion criteria: all patients affected by lumbar radicular pain limited to a single leg, for more than six months, with diagnosis of "probabile" and/or "definite" radicular neuropathic pain and non responders to selective epidural corticosteroid injections. Interventions: in all patients it has been used a PRF treatment for 500 sec. Effectiveness assessments: Numerical Rating Scale 0-10 (NRS) at rest and at movement, Italian Pain Questionary (QUID) and SF-36 at baseline, and after 1/3/6 months. Statistical analysis: Non parametric Friedman test. $P < 0.05$.

Results: From September 2012 to October 2014, 130 patients treated with epidural RFP NRS Score, QUID score and SF 36 score at 1- 3 - 6 months are all improved.

Conclusion: This audit indicates that PRF using epidural approach it's a safe and effective analgesic treatment for chronic radiculopathies.

Reference: Goophyal H., Mc Croy C, Pulsed Radiofrequency: a review of the basic science applied to pathophysiology of radicular pain: a call for clinical translation. *Reg anesthes Pain Med.* 2014; 39:149-59.

09AP01-7

Tarlov cysts occurring in the upper and lower spinal perineural nerve roots - a case report

Chen Y.H.¹, Lin C.H.², Chen J.Y.³

¹Chi Mei Medical Center, Liouying, Dept of Anaesthesiology & Pain Medicine, Tainan, Taiwan, Republic of China, ²Chi Mei Medical Center, Liouying, Department of Nursing, Tainan, Taiwan, Republic of China, ³Chi Mei Medical Center, Dept of Anaesthesiology & Pain Medicine, Tainan, Taiwan, Republic of China

Background: Tarlov cyst is a spinal nerve root disease. Most occurred in the lumbar/sacral region, and rarely in the cervical/thoracic region¹. We have experienced a case of tarlov cysts occurring both in the lumbar/sacral and cervical/thoracic regions. The purpose of this report is to raise the awareness of this rare disease.

Case report: A 47 years old female patient complained about multiple pains of the whole body for ten years. She suffered from low back pain due to multiple lumbar/sacral tarlov cysts which was diagnosed previously. However, her upper back and neck pain was diagnosed and treated as myofascial pain. The patient has visited many specialists but the pain was not completely controlled. Image study with cervical/thoracic spine MRI was performed because her pain status was getting worse. Multiple upper cervical/thoracic tarlov cysts were discovered. Pain prescription was adjusted by increasing the dosage of anticonvulsant. The patient reported that her pain had reduced a little, but was still unsatisfied with the result.

Discussion: Tarlov cyst (spinal perineural cyst) is a rare disease with an incidence rate of 5% of the general population, and only 20% of these patients show symptoms. The symptoms may vary, such as chronic back/buttocks pain, paresthesia, spasticity, and/or radiculopathy. Although tarlov cyst may occur in every region of the spinal nerve roots, previous case reports in cervical/thoracic regions are rare. The disease is usually confirmed by images of MRI or CT. There is no consensus treatment of this disease². Surgical intervention is not suggested if multiple nerve roots are involved. Upper back pain with positive trigger points may hinder physicians to discover that the disease may affect the cervical/thoracic regions. On the other hand, we had detected low level of vitamin D in this case. Although we didn't know if vitamin D plays a role or not in this disease, we had suggested the patient to take high dose of vitamin D besides analgesics.

References:

1. Voyadzis JM et al., Tarlov Cysts: A Study of 10 Cases with Review of the Literature. *J Neurosurg.* Jul 95 (1 Suppl) : 25-32, 2001.
2. Langdown AJ et al., The Clinical Relevance of Tarlov Cysts. *J Spinal Disord Tech*, Feb 18 (1): 29-33, 2005.

Learning points: Tarlov cysts may occur in the upper and lower spinal perineural nerve roots or even occur in both regions.

09AP01-8

Use of intravenous lidocaine in the treatment of complex regional pain syndrome type II: a case report

Melo e Assis W.¹, Conceição V.M.¹, Costa Filho M.M.², Modesto M.M.¹, Santana T.B.¹

¹Hospital das Clínicas da Fundação Hospital do Acre - FUNDHACRE, Dept of Anaesthesiology, Rio Branco, Brazil, ²Hospital Municipal de Paulínia, Dept of Anaesthesiology, Paulínia, Brazil

Background: Neuropathic pain (NP) is a result of an injury or disease that directly affects the somatosensitive system. The Complex Regional Pain Syndrome (CRPS), among NPs, represents a distinct entity with sympathetically mediated pain. Among the drugs available for treatment, lidocaine has been used in several ways, including intravenously. This study reported the use of intravenous lidocaine in the treatment of a patient with CRPS type II and low adherence to pharmacological treatment.

Case report: A 32-year-old chronic pain patient, female, with lumbar disc herniation L4-L5 e L5-S1, submitted to an arthrodesis. Without improvement of the algic symptoms, was submitted to a new surgical procedure associated to the sciatic nerve block in orthopedic service. Postoperative, the symptoms got worse, with significant impairment of daily activities, including loss of work capacity. In the Chronic Pain Sector of the *Hospital das Clínicas da Fundação Hospital do Acre*, the patient classified her pain as DN4 =6, S-LANSS=24 e EVA=10 and the diagnosis of definitive neuropathic pain with autonomic phenomena was confirmed. Clinical treatment was initiated with low doses of Nortriptyline and Pregabalin with slight improvement of the autonomic symptoms. After 120 days of oral treatment, lidocaine intravenous 2mg/kg in continuous infusion pump for 60 minutes and weekly intervals was associated.

Discussion: The use of lidocaine in CRPS was reported as benefic for some patients. The patient in question obtained a satisfactory result in the control of the symptoms and significant improvement of the quality of life with return to work and to the practice of physical activity. After the 8th dose her pain was classified as EVA =2, DN4=4 and S-LANSS =3, and these scores were maintained a year after the intravenous treatment, proving a prolonged analgesia.

References: Souza MF, Kraychete DC. A ação analgésica da lidocaína intravenosa no tratamento da dor crônica: uma revisão de literatura. *Revista brasileira de reumatologia.* 2014; 54(5):386-392.

Learning points:

- Although the half-life of the lidocaine is only 120 minutes, analgesia provided by systemic lidocaine is prolonged and may extend for days or even weeks.
- The dose varies between 1 to 5 mg/kg administered over a period of 30 to 60 minutes in weekly intervals.
- There is no literature report on the number of applications required per treatment. In practice, the solution is used until the pain scores decrease.

09AP02-1**Breastfeeding as a protective factor of chronic pain after cesarean. Preliminary prospective cohort study**

Vargas Berenjano C.A., Sánchez Brotons M.J., Echevarría Moreno M., Trinidad Martín-Arroyo R., Flor Parra F. *Hospital Universitario Nuestra Señora de Valme, Dept of Anaesthesiology & Pain Medicine, Sevilla, Spain*

Background and Goal of Study: Chronic post-cesarean pain (CPCP) has an incidence around 18% of mothers. In a previous study realized by members of our Anesthesia service, we observed an incidence of CPCP around 12% and that breastfeeding could be a protective factor. The goal of this study is to analyze if breastfeeding has a protective effect in the incidence of chronic pain after cesarean intervention.

Materials and Methods: Prospective cohort study based on a structural and presential interview with mothers in the first 24 and 72h after cesarean and a telephone interview at 4 months of the intervention. The main variable of this study was the presence of chronic pain in the surgical wound area at four months after cesarean, considering chronic pain if NSV ≥ 5 . The main independent variable was breastfeeding. Other variables included were surgical technique, levels of study, occupation, pain in the first 24-72h and the presence of anxiety during breastfeeding. The statistical study was performed using U of Mannwitney and chi2 ($P < 0.05$).

Results and Discussion: Actually, the study has been completed by 185 mothers. The incidence of CPCP was around 11.4%. Breastfeeding was realized by 87% of mothers. 58.4% of mothers maintained breastfeeding during more than two months and in the 31.4% of cases artificial lactation was not included. 53.8% of mothers which realized breastfeeding confirmed to suffer anxiety. 8.3% of mothers who maintained breastfeeding more than two months, presented CPCP. However mothers who only breastfeeding in the first two months had chronic pain in the 22.8% of cases. NSV at 24h after surgery was 7 and in the first 72h it was 5. 38.4% of patients had university studies of which only 6.5% had chronic pain compared to 17.2% of those with basic studies.

Conclusion(s): Preliminary results suggesting that breastfeeding for more than two months protects against the chronicity of postcesarean pain in a statistically significant way with a risk three-fold increase in CPCP if breastfeeding is maintained for only two months or less. Further, the anxiety during breastfeeding could influence the appearance of pain in the surgical zone at 4 months of the intervention.

*This study was approved by the ethics committee and the mothers signed informed consent to participate in the study.

09AP02-2**Effectiveness of multidisciplinary treatment of combine chronic pain syndrome in patients with multimorbidity**

Samoylova N.¹, Gnezdilov A.¹, Dolbneva E.¹, Chernova O.², Zhidkov I.²

¹*Petrovsky National Research Centre of Surgery, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation,*

²*Petrovsky National Research Centre of Surgery, Research and Development Department, Moscow, Russian Federation*

Background and Goal of Study: Chronic pain syndrome(CPS)- most common in elderly multimorbid patients and difficult to treat [1]. The aim of our study was to evaluate the effectiveness of treatment in patients with multimorbid pathology.

Materials and Methods: 40 patients (age 61.5 ± 8.7) with combine chronic spine-joints pain were included in the prospective study after approval by the Ethics Committee of Clinic. All of them had different main pathology: diabetes, cardiovascular diseases etc. After the observation group A (n=20) received standard pathogenic drug therapy of CPS+main pathology and exercises. Group B (n=20) in addition to the treatment received central segmental blocks at first visit, the 3th day and intra-articular injection if needed. We used corticosteroid in individual small doses in solution with local anesthetic and saline. We use 0/10(VAS), SF-36 (pain/mood), Treadmill test before and after treatment. Intensive of pain, pain-free walking (PW), mood, blood pressure, level of glucose was measured in the first three days after treatment and subsequently at 7 and 14 days. Statistical significance ($P < 0.05$) was determined using SPSS.

Results and Discussion: Before treatment in group A: VAS- 6.7 ± 0.7 ; SF-36-29.7/32.9. PW- 500 ± 100 meters (speed of 5 km/h). In group B: VAS- 7.3 ± 0.6 ; SF-36 was 32.2/56.7. PW- 300 ± 120 meters (the same speed). The type of reaction to the load was normosthenic at 8/9 patients (A/B), hypersthenic was at 7/6 (A/B). Glucose level in patients with diabetes was $6.2 \pm 0.3/6.5 \pm 0.7$ (A/B). In the next three days of treatment, we observed no significant difference in the condition of patients of A group. In patients of B group VAS showed a significant decrease at second day (4.3 ± 0.2 $p < 0.01$) and after day (2.6 ± 0.4 $p < 0.01$) and no significant difference in 7 and 14 days during treatment (1.8 ± 0.9 $p > 0.05$). After treatment: SF-36-73.1/96.5 (A/B); mood-90.3/100 ($p < 0.05$). PW was 1000 ± 100 meters (5 km/h). The type of reaction to the load was normosthenic in 11/12 (A/B), hypersthenic was in 4/3 (A/B). Pain, Mood and PW was significantly improved in patients of group B after 14 day of treatment ($p < 0.05$). During treatment, we did not notice the deterioration of the main disease. Glucose level rose after the blockade with a corticosteroid and dropped significantly after using short-acting glycemc drugs.

Conclusion(s): Our data shows that multidisciplinary approach feasible, safe and effective.

References: 1. PradosTorres,etal.PLoSOne.2012;7.

09AP02-3**Effects of combining (S+) ketamine to morphine in acute and chronic pain patients admitted to a Tertiary Hospital: a retrospective case series study**

da Costa Paiva V.¹, Terra dos Santos Rossito C.¹, Peter Coletti Ciglio A.², Slullitel A.¹, Sousa A.M.¹

¹*Santa Paula Hospital, Dept of Anaesthesiology, Sao Paulo, Brazil,*

²*Santa Paula Hospital, Nurse Department, Sao Paulo, Brazil*

Background and Goal of Study: Ketamine is a promising alternative agent for pain control that may offer some benefits over traditional strategies. Many clinical studies show reduced opioid consumption and related side effects, besides better pain management under acute or chronic pain conditions. The objective of this study was to evaluate the efficacy and safety of the addition of (S+) ketamine to morphine in the solution of Intravenous PCA for pain management in patients admitted to a tertiary hospital.

Materials and Methods: This is a retrospective case series study. All patients receiving intravenous ketamine infusion via IV-PCA, between August 2015 and May 2016 were selected for the study. Our primary outcome was the relief of pain after 5 days of observation and the secondary outcome were side effects of the intravenous solution. The intensity of pain was measured using the numerical rating score (NRS), and the worst possible pain intensity in the previous 24 hours was used for analysis. Medical records were reviewed for side effects such as nausea, vomiting, sedation, confusion and hallucinations.

Results and Discussion: A total of 64 records were found in the database. Four types of pain were identified: acute inflammatory, musculoskeletal, cancer pain and low back pain. The intensity of pain was significantly reduced in 5th the day after the introduction of ketamine, except for cancer and low back pain. At admission NRS was 7.8, 5.4, 6.9 and 7.2 for inflammatory, low back pain, cancer pain and musculoskeletal pain. After 5 days of IV ketamine, NRS was 4 ($p = 0.004$, D5 vs D1); 2.8 ($p = 0.12$ D5 vs D1); 6.4 ($p = 0.44$ D5 vs D1) and 2.7 ($p = 0.003$ D5 vs D1) for inflammatory, low back pain, cancer pain and musculoskeletal pain respectively. Six patients presented side effects (2 cases of sedation, 2 cases confusion, 1 case of agitation, 1 case of delirium). Doses of ketamine varied between 0.001 and 0.03 mg/kg/h.

Conclusion(s): Intravenous ketamine was effective in the relief of inflammatory and musculoskeletal pain after 5 days of observation. The side effects did not cause any serious damage.

References: Richebé P, Rivat C, Rivalan B, Maurette P, Simonnet G.

Acknowledgements: Lauro Yoishi Marubayashi

09AP02-4

Efficacy of pulsed-radiofrequency for suprascapular and lower subscapular nerve in chronic shoulder pain

Yoshimura N.¹, Usui Y.², Yamaguchi S.¹, Sugiyama Y.¹, Tanabe K.¹, Iida H.¹

¹Gifu University Graduate School of Medicine, Dept of Anaesthesiology & Pain Medicine, Gifu, Japan, ²Mizutani Pain Clinic, Dept of Anaesthesiology & Pain Medicine, Shizuoka, Japan

Background: Suprascapular nerve block is frequently implemented to treat chronic shoulder pain. However some cases remain pain and limited range of motion. These symptoms may be caused by the spasm of teres major or subscapularis muscle, which are innervated by lower subscapular nerve distal branches.

Objectives: In the present study, we aimed to assess the efficacy of ultrasound-guided pulsed-radiofrequency (P-RF) for lower subscapular nerve in patients who complained persisting shoulder pain after P-RF for suprascapular nerve.

Methods: This study involved 8 patients with chronic intractable shoulder pain who did not respond to P-RF for suprascapular nerve. We used ultrasound with a linear transducer. Patients were placed in the supine position and the ultrasound probe was placed over the mid-clavicular region in a sagittal plane to visualize the fascial space between teres major and subscapularis muscle. P-RF was performed 42° C for 360 seconds. Pain intensity was assessed by Numeric Rating Scale (NRS 0-10) and shoulder disability was assessed by Simple Shoulder Test (SST 0-12). Each assessment was performed before procedure (baseline) and at 2, 4 weeks after procedure. All measurement values were expressed as mean ± SD.

The t-test and Mann-Whitney test were used for statistical analyses, and the significance level was set at $p < 0.05$ in both tests.

Results: There were 4 women and 4 men. Mean age was 58 years (range, 45-84). Significant decrease in pain ($p < 0.05$) and significant increase in shoulder motion range ($p < 0.05$) were observed at 2 weeks (NRS; 7.8 to 4.3, SST; 2.0 to 4.8) and 4 weeks (NRS; to 4.6, SST; to 4.7), compared to baseline values. No serious complication was found in any patient.

Conclusions: Ultrasound-guided P-RF for lower subscapular nerve could be a useful treatment in the patients with intractable persistent shoulder pain which is not improved by P-RF for suprascapular nerve.

09AP02-5

Is the quantitative pain assessment method "Pain Degree" less susceptible to psychological factors than VAS?

Okayasu T.¹, Hasegawa Y.¹, Mera H.², Kobayashi Y.², Ichimura M.³, Otake H.³

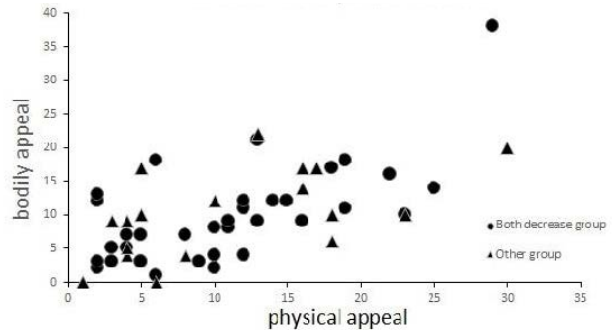
¹Showa University Fujigaoka Hospital, Dept of Anaesthesiology, Yokohama, Japan, ²Tokyo Metropolitan Health and Medical Treatment Corporation Ebara Hospital, Dept of Anaesthesiology, Tokyo, Japan, ³Showa University Hospital, Dept of Anaesthesiology, Tokyo, Japan

Background and Goal of Study: Although Visual Analogue Scale (VAS) is widely used, VAS is considered to be affected by a patient's mental state. We can use the perception/pain quantitative analytical device and obtain as values of Pain Degree (PD) in Japan. Many patients show that VAS and PD tend to decrease together post treatment (treat), but some patients do not so. We examined whether the quantitative pain assessment method "PD" is affected psychologically using the results of psychological tests.

Materials and Methods: After approval of the institutional ethics committee, 52 patients (27-90 y.o.) were candidates for this study. Subjective evaluations of pain were VAS. Objective evaluations of pain were measured by Pain vision TM (Nipro, Japan). It delivers a sinusoidal constant alternating current and measure different types of the current perception (CPT) threshold. One CPT is the minimum perception threshold (MPT). The other CPT (PET) is the current threshold which the patient perceives the equivalent strength as the chronic pain. PD was calculated: $(PET-MPT)/MPT$. We measured VAS and PD at pre- and post-treat. As psychological test, we used Kyushu Medical Index questionnaire which simplified CMI. We evaluated the number of the positive answers to KMI and compared the distribution from the number of the positive answers of the physical and the bodily appeal. T-test was used for com-

parison pre- and post-treat. Chi-square test was used for a comparison of the distribution. A value of $P < 0.05$ was considered significant.

Results and Discussion: There were significant changes of VAS (58 ± 25.4 vs. 33.7 ± 27 mm, mean \pm SD, $p < 0.00001$), and pain degree (230.6 ± 258.3 vs. 102.7 ± 175.2 , $p = 0.00012$) between pre- and post-treat in total. 35 (67%) revealed that VAS and PD tend to decrease together after treatment. There was not significant difference in total number of the positive answers between the group that VAS and PD tend to decrease together and the other group ($P = 0.88$). Graph shows distribution of the number of the positive answers.



[Number of the positive answers]

Our study reveal that PD was also affected psychologically as well as VAS.

Conclusion(s): It can not be said that PD is less affected psychologically than VAS.

09AP02-6

Level of readiness of chronic pain patients to practice self-care

Scala E.¹, Decosterd I.¹, Faouzi M.², Burnand B.², Rodondi P.-Y.²

¹Lausanne University Hospital, Dept of Anaesthesiology & Pain Medicine, Lausanne, Switzerland, ²Lausanne University Hospital, Institute for Social and Preventive Medicine, Lausanne, Switzerland

Background: Chronic pain is a challenge for public health with major socio-economic costs. Pain alleviation is often limited with conventional treatment. Self-care options might supplement conventional strategies. Here we present the first survey on the level of readiness (LOR) to practice self-care methods in a patient population of a tertiary Pain Center.

Methods: A single-center quantitative cross-sectional postal survey was conducted after Ethics Committee approval. All chronic pain patients above 18 years old seeking care at the CHUV Pain Center (June 2013-March 2015) were included. Socioeconomic data, pain characteristics (duration, frequency, intensity, location, Chronic Pain Grade (CPG) and DN4-7 items), Hospital Anxiety and Depression Scale, treatments, and LOR to practice self-care methods on a 0-10 NRS scale were investigated. Associations between the explanatory factors and the LOR to practice self-care were assessed using a multinomial logistic regression model.

Results: 639 patients were included (1537 questionnaires sent). Mean age was 59.3 (SD 15.3), 55.6% were women. Median duration of pain was 5.0 years (IQR 7.5). Most frequent locations were back (71.4%) and lower limb pain (68.4%). Use of pain killers was reported by 93.4% of the respondents and 64.6% had used opioids during the last 6 months. 65% of the respondents reported pain with high disability (CPG grade III/IV). Probable or possible mood disorder was present in 64.3% of the respondents. Most patients expressed a high (44.1%) or moderate (24.6%) LOR to practice self-care. Multivariate analysis showed that the probability to show a high LOR to practice self-care was increased by middle or advanced level of education (RRR 3.42, $p < 0.001$), unemployed status due to medical conditions (RRR 2.92, $p = 0.009$), use of herbal medicine (RRR 2.77, $p = 0.001$) and a positive DN4 score (RRR 1.80, $p = 0.036$). Older patients were less likely to show a high level of readiness (RRR 0.97, $p = 0.039$).

Conclusions: Most chronic patients in our study had a high or moderate LOR to practice self-care even if they suffered from long-term chronic pain with high disability. This suggests that motivation to use self-care is present in our chronic pain population. More studies are needed in order to recommend these methods to improve pain treatment, with priority for methods that exhibited the highest level of readiness.

Reference: Delgado, R., et al., "Assessing...", Pain Med, 2014. 15 Suppl 1: p. S9-20.

09AP02-7

Nabilonum for treatment of fibromyalgia: preliminary data

Quattrone D.¹, Bova G.¹, Barbagallo A.¹, Pedale M.², Mondello C.³, Cardia L.²

¹San Vincenzo Hospital Taormina A.S.P. Messina, Dept of Anaesthesiology & Pain Medicine, Messina, Italy, ²University of Messina, Dept of Anaesthesiology & Pain Medicine, Messina, Italy, ³University of Messina, Forensic Medicine, Messina, Italy

Background and Aim: Fibromyalgic patients represent a great challenge in the world of chronic pain management, including many unknown aspects concerned the pathology and treatment as well.

Authors' aim is to evaluate the safety, tolerability, and efficacy of nabilonum switched from a strong opioids in fibromyalgia (FM) patients experiencing inadequate clinical response to combined therapy with duloxetine (DL).

Methods: The study included 6 patients with FM who had been treated with oxycodone/naloxone 35 mg/day (mean dosage, 3 patients), tapentadol 350 mg/day (mean dosage, in 3 patients) and DL 85 mg/day (mean dosage in 6 patients) for at least 8 weeks prior to enrollment. Authors recorded a good pain relief (NRS <35.5 mean value) on DL for a 6-week period, followed by a well known progressive increase of pain (NRS 76.3). Patients who had NRS pain ≥ 70 and were dissatisfied with current treatment were treated with initial dose of Nabilonum 1 mg/day for 3-months. Nabilonum was titrated up to 2 mg/day, since the 14th day, only in 3 patients that interrupted the treatment with opioids and DL. The primary efficacy parameter was NRS Score, the percentage of patients rating themselves as "much or very much improved" on the Patient Global Impression of Change (PGIC), FIQ total, and FAS total scores. All possible adverse events were recorded.

Results: All patients switched to nabilonum alone or in combined therapy were classified as responders, and they also demonstrated improvement in NRS score pain, FIQ total, and FAS total scores (mean value changes from baseline were respectively: 58.5, -16.1, and -2.3) after 4 months of treatment. Treatment revealed an excellent adherence.

Conclusion: Nabilonum may be efficacious in monotherapy as well as in combined one in patients with unresponsive FM.

References: Lynch ME and Campbell F. Cannabinoids for treatment of chronic non cancer pain: a systematic review of randomized trials. *Br J Clin Pharmacol* 2011;72 : 735-44

09AP02-8

Neuralgic amyotrophy occurred in lower extremity

Lee H., Shin I.

Gyeongsang National University, Dept of Anaesthesiology, Jinju, Korea, Republic of

Background: Neuralgic amyotrophy (NA) is a rare disease which causes severe pain. It is usually occurred in upper extremity and is called brachial neuritis or brachial plexitis. Although the incidence rate is very low, lower extremity is also involved. so we report a case of neuralgic amyotrophy in lower extremity.

Case report: A 58-year old male patient visited pain clinic for the severe right lower extremity pain. The pain developed suddenly about 2 months ago. the pain was so intense that analgesic medication could not relieve the pain. The pain was radiating from right buttock and extended to the posterior part of thigh and knee. a disc operation was done under the impression of L5/S1 disc herniation. The pain was not controlled and two more spine operation was done without any relief of pain. Physical examination in affected side showed decrease of the motor and sensorium: ankle plantar flexion IV/V, ankle dorsiflexion III/V, big toe extension IV/V, big toe dorsiflexion III/V. Sensorium was decreased about 30% in L4 and L5 dermatome. EMG/NCV showed L5 radiculopathy (moderate axonometric state with regenerating evidence) Swelling and high signal intensity in T2 of sciatic nerve was found in pelvic MRI. Nerve block such as sciatic nerve or lumbosacral plexus block was effective only for several hours. but the medication including opioid analgesics and antidepressant had effects in relieving pain. Now 2 year since the onset of pain, severe pain is still present and patient is taking medication including a large amount of pregabalin, tramadol and amitriptyline.

Discussion: Neuralgic amyotrophy is rare disease (incidence rate 1.64-3.0/100,000) The etiology was not known exactly but immunology and infection seems to relate with NA.

There is no specific treatment modality. NA shows a self-limiting progress but one third have ongoing pain and about two thirds of patients suffers from functional limitation.

References:

1. Van Alfen N, Van Engelen BGM. The clinical spectrum of neuralgic amyotrophy in 246 cases. *Brain* 2006; 129: 438-50.
2. Gupta A, Winalski CS, Sundaram M. Neuralgic amyotrophy (Parsonage Turner syndrome). *Orthopedics* 2014; 37: 75, 130-33.

Learning points: NA is medical disease that is self-limiting which needs pain control and preserving functional ability. Medication must include strong analgesics and anticonvulsants. We have to understand the pathophysiology and avoid the unnecessary surgical interventions.

09AP02-9

Pharmacokinetics of subcutaneously given dexmedetomidine in healthy adult volunteers

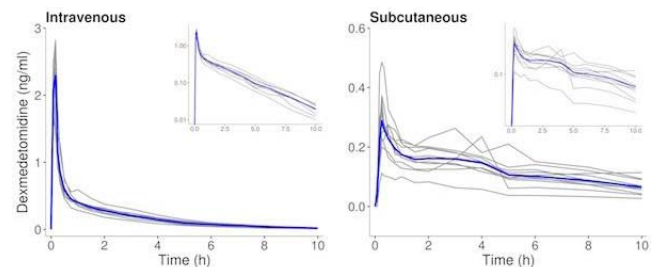
Uusalo P.¹, Tilli I.¹, Aantaa R.†.¹, Scheinin M.², Saari T.¹

¹Turku University Hospital, Dept of Anaesthesiology & Intensive Care, Turku, Finland, ²Turku University, Department of Pharmacology, Turku, Finland

Background and Goal of Study: Patients receiving palliative care often need sedation to alleviate anxiety, intractable stress and pain. Dexmedetomidine has been demonstrated to induce dose-dependent sedation without any risk of ventilatory depression. However, there is no prior information of subcutaneous administration route which could be favourable in palliative care. Our aim was to characterise the pharmacokinetics of subcutaneously administered dexmedetomidine in healthy adult volunteers.

Materials and Methods: An open two period, cross-over design with balanced randomisation was used. We recruited ten volunteers (aged 18 to 30 y) to receive 1 µg/kg dexmedetomidine either intravenously or subcutaneously on two occasions. Plasma dexmedetomidine concentrations were measured for 10 h after drug administration and pharmacokinetic variables were calculated with standard noncompartmental methods. In addition, the effects of subcutaneously administered dexmedetomidine on plasma catecholamine levels, vital signs and sedation were studied. Local and systemic safety and tolerability of subcutaneously administered dexmedetomidine was also recorded

Results and Discussion: Ten male subjects (aged 19 to 27 y) were included in the analyses. Mean C_{max} of dexmedetomidine was 2.29 ng/ml and 0.29 ng/ml, after i.v. and s.c. administration, respectively, but after 5 hours, similar plasma concentrations were measured during both phases. The mean exposure (AUC_{0-10}) was 32% lower during s.c. phase, but $t_{1/2}$ was longer compared to iv phase (2.1 h vs 6.0 h).



[Dexmedetomidine concentrations in plasma]

Conclusion(s): Dexmedetomidine is rapidly and efficiently absorbed after subcutaneous administration. Compared to intravenous administration, subcutaneous administration of dexmedetomidine may be a feasible alternative for patients requiring sedation.

† Deceased

09AP02-10**Transdermal buprenorphine in hip and knee arthroplasty patients - a randomized, double-blind, placebo-controlled trial**

Kokki H.¹, Härkänen L.², Sjövall S.³, Huopio J.⁴, Lehtonen M.⁵, Kokki M.⁶

¹University of Eastern Finland, Dept of Anaesthesiology & Intensive Care, KYS, Kuopio, Finland, ²University of Eastern Finland, Dept of Anaesthesiology & Intensive Care, Kuopio, Finland, ³Satakunta Central Hospital, Dept of Anaesthesiology, Pori, Finland, ⁴Kuopio University Hospital, Department of Orthopaedic Surgery, Kuopio, Finland, ⁵University of Eastern Finland, School of Pharmacy, Kuopio, Finland, ⁶Kuopio University Hospital, Anaesthesia and Operative Services, Kuopio, Finland

Background and Goal of Study: Persistent postoperative pain is common outcome in patients having arthroplasty (1). Low dose of buprenorphine is proposed to have an antihyperalgesic efficacy (2). We have evaluated the antihyperalgesic efficacy of transdermal buprenorphine 5 mcg/h patches started 2 weeks prior to surgery and continued for a total of 5 weeks in a placebo-controlled clinical trial.

Materials and Methods: After ethical approval 125 osteoarthritis patients scheduled for elective unilateral hip or knee arthroplasty were randomized into the buprenorphine- (n=62) or matching placebo-group (n=63). Patients had a similar spinal anaesthesia and standardized surgical techniques. Multimodal, postoperative pain management was standardized. The patients were interviewed by a phone at 12 months after surgery with a structured questionnaire.

Results and Discussion: We have outcome data for 116 patients, response rate of 93%. At 12 months 17 out of 57 patients in the buprenorphine- and 21 out of 59 patients in the placebo group had had any pain during the last 24 h. In both groups 12 patients had had pain at surgical site during the last 24 hours. Pain scores were similar in both groups, see table.

	Most pain	Least pain	Average pain	Right now
		No/Mild/Moderate/	Severe pain	
Buprenorphine (n=12)	-4/8/-	8/4/-	-/6/6/-	9/3/-
Placebo (n=12)	-/6/5/1	5/5/2/-	1/8/3/-	6/3/3/-

[Table. Pain scores among those who reported pain]

Conclusions: Persistent postoperative pain was similar to that reported earlier (1), 31% of patients with knee arthroplasty and 14% with hip arthroplasty had pain at surgical site at 12 months. Five-weeks perioperative treatment with low-dose transdermal buprenorphine did not decrease the prevalence of persistent postoperative pain.

References:

- Beswick AD, Wylde V, Gooberman-Hill R, et al. *BMJ Open* 2012; 2: e000435
- Koppert W, Ihmsen H, Körber N, et al. *Pain*. 2005; 118: 15-22

09AP02-11**Utilization of duloxetine and pregabalin in osteoarthritis patients**

Papakitsos G.¹, Kapsali A.², Roimpa A.³, Papakitsou T.⁴

¹General Hospital Arta, Dept of Anaesthesiology, Arta, Greece, ²Private Clinic, Dentist, Arta, Greece, ³General Practitioner, Private, Thessaloniki, Greece, ⁴General Hospital Mesologi, Haematology, Mesologi, Greece

Background and Goal of Study: To describe utilization patterns of duloxetine and pregabalin and subsequent opioid use among patients with osteoarthritis.

Materials and Methods: Pharmacy and medical claims were analyzed for adult osteoarthritis patients who initiated duloxetine or pregabalin. Initiation was defined as no pill coverage in the prior 90 days. Included patients had continuous enrollment for 6 months before and after the initiation and did not use opioid for 90 days before initiation. Propensity score matching was used to select patients with similar demographic and clinical characteristics for duloxetine and pregabalin cohorts. Compliance to index medication was assessed via medication possession ratio (MPR), proportion of days covered

(PDC), and proportion discontinued (no access for 60 days). Initiating dose and opioid use after the index date was assessed. A Cox proportional hazard model was estimated to compare time to first opioid use.

Results and Discussion: A total of 60 patients initiated duloxetine and 48 patients initiated pregabalin. After matching, patients were selected for the duloxetine (mean age: 64, female: 70%) and pregabalin (mean age: 63; female: 78%) cohorts, respectively. Of the duloxetine cohort 90.1% started on ≤ 60 mg/day, the recommended dose, and 71.6% of the pregabalin cohort started on ≤ 200 mg/day. The duloxetine cohort had higher MPR and PDC and a lower proportion of discontinuation than the pregabalin cohort (MPR: 0.81 vs. 0.70; PDC: 0.51 vs. 0.35; discontinuation: 57% vs. 78%; all $p < 0.001$). A lower proportion of the duloxetine cohort used opioids after the index date (47.3% vs. 65.1%, $p < 0.001$), and they started on opioids later than the pregabalin cohort (25th percentile: 67.5 vs. 31 days; median: > 182 days vs. 107 days, $p < 0.001$). After controlling for baseline characteristics, the duloxetine cohort initiated opioids later than the pregabalin cohort (hazard ratio: 0.56, 93% confidence interval: 0.57-0.72).

Conclusion(s): Osteoarthritis patients initiating duloxetine had better compliance and a lower likelihood of opioid utilization, than those initiating pregabalin. Study limitations included lack of information on reasons for medication initiation and discontinuation, severity of disease symptoms and use of over-the-counter medications.

09AP03-2**Fatty acid amide hydrolase inhibitor relieves chronic pain-induced depressive-like behaviors independent its anti-nociceptive effects in rats: involvement of hippocampal neurogenesis**

Jiang H., Zhou C., Liu J.

West China Hospital of Sichuan University, Dept of Anaesthesiology, Chengdu, China

Background and Goal of Study: Chronic pain is often associated with depression and impaired hippocampal neurogenesis may be involved in this comorbidity. Fatty acid amide hydrolase (FAAH) inhibitor of endocannabinoid (eCB) system has been used to treat both chronic pain and depression in rodents; however, it is unclear whether FAAH inhibitor can relieve chronic pain-induced depression by and not by its anti-nociceptive effects and the underlying cellular mechanisms.

Materials and Methods: In rats of chronic constriction injury (CCI) model, we investigated the therapeutic effects of systemically FAAH inhibitor URB597 and peripherally restricted FAAH inhibitor URB937 on mechanical allodynia and depressive-like behaviors. Effects of URB597 and URB937 on CCI-induced alterations of eCB signaling and hippocampal neurogenesis were explored. A combination of assays was performed including behavioral tests, qPCR, liquid chromatography, and immunohistochemistry. Data are expressed as mean \pm SD and were analyzed with SPSS 16.0. 2-way and repeated measures ANOVA were used followed by post hoc Bonferroni test for multiple comparisons.

Result: CCI significantly induced mechanical allodynia and depressive-like behaviors in rats. Both acute and sub-chronic administration of URB597 or URB937 relieved the mechanical allodynia, while only sub-chronic treatment of URB597 attenuated the depressive-like behaviors at equivalent analgesic doses. CCI also decreased the mRNA levels of CB₁ receptor and impaired adult neurogenesis in hippocampus. Sub-chronic administration of URB597 but not URB937 prevented the decrease of CB₁ mRNA level and improved the cells proliferation and survival of newborn neurons in hippocampus.

Conclusion(s): Systemically FAAH inhibitor could treat chronic pain-induced depressive-like behaviors independent of its peripheral analgesic actions. This anti-depressive effect may be via improving the impaired hippocampal neurogenesis by enhancing eCB signal.

References:

- Maione S, Costa B, Di Marzo V: Endocannabinoids: a unique opportunity to develop multitarget analgesics. *Pain* 2013; 154 Suppl 1: S87-93
- Schoenfeld TJ, Cameron HA: Adult neurogenesis and mental illness. *Neuropsychopharmacology* 2015; 40: 113-28

Acknowledgements: We thank Sisi Wu, Yi Zhong (Core Facility of West China Hospital, Sichuan University, Chengdu, China) for their technical support.

09AP03-3

Gene expression profile of spinal cord and dorsal root ganglion in rat model of cisplatin-induced peripheral neuropathic pain

Yoon M.H.¹, Park K.S.², Choi J.I.², Lee H.G.³, Kim Y.O.²

¹Chonnam National University, Medical School, and The Brain Korea 21 Project, Center for Biomedical Human Resources at Chonnam National University, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of, ²Chonnam National University, Medical School, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of, ³Chonnam National University, Medical School, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of Study: Although chemotherapy-induced neuropathic pain (CIPN) is a significant side effect of chemotherapeutic agents, there are no effective analgesics for chemotherapy-induced neuropathic pain. Microarray gene analysis on nervous system tissues holds great promise for discovering novel targets for persistent pain modulation. The aim of this study was to determine the gene expression changes in the rat model of cisplatin-induced peripheral neuropathic pain.

Materials and Methods: Rat model of cisplatin-induced peripheral neuropathic pain model was used for these studies. The authors measured mechanical allodynia with von-frey filament followed by analysis of global gene expression in the lumbar spinal cord (SC) and dorsal root ganglion (DRG) at two time points (5 days and 14 days) after final cisplatin administration. Finally, we evaluated the validity of array results using real-time reverse transcriptase polymerase chain reaction (PCR).

Results and Discussion: mRNA microarray analysis showed that the expression profiles of mRNA between cisplatin-injected and saline-injected rats were greatly changed at 5 and 14 days. In the 5 days after injection, 186 mRNAs (128 up-regulated, 58 down-regulated) were finally identified in the SC and 197 mRNAs (145 up-regulated, 52 down-regulated). In the 14days after injection, 220 mRNAs (130 up-regulated, 90 down-regulated) were finally identified in the SC and 198 mRNAs (133 up-regulated, 65 down-regulated). The expression patterns of several mRNAs were further confirmed by qPCR. Functional analysis of differentially expressed mRNAs showed that the most significant enriched biological processes of up-regulated genes in CIPN include immune response, defense response, and inflammation response.

Conclusion(s): Our findings uncovered the expression pattern of mRNAs in the rat SC and DRG under cisplatin-induced neuropathic pain condition. These mRNAs may represent new therapeutic targets for the treatment of neuropathic pain. Further studies are needed to elucidate the roles of the individual genes in cisplatin-induced neuropathic pain.

Acknowledgements: This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT and future Planning (NRF-2015R1A2A2A01004407)

All authors declare that no competing financial interests exist.

09AP03-4

Hypnotic glove analgesia: effects of hypnosis on skin temperature measured by infrared thermography

Paqueron X.¹, Musellec H.², Virot C.³, Boselli E.⁴

¹Centre Clinique, Dept of Anaesthesiology & Pain Medicine, Soyaux, France, ²Centre Hospitalier Privé Saint-Grégoire, Dept of Anaesthesiology, Saint-Grégoire, France, ³Émergences, Institut de Formation de Recherche en Hypnose et Communication Thérapeutique, Medical Hypnosis, Rennes, France, ⁴University Lyon I Claude Bernard, Dept of Anaesthesiology, Lyon, France

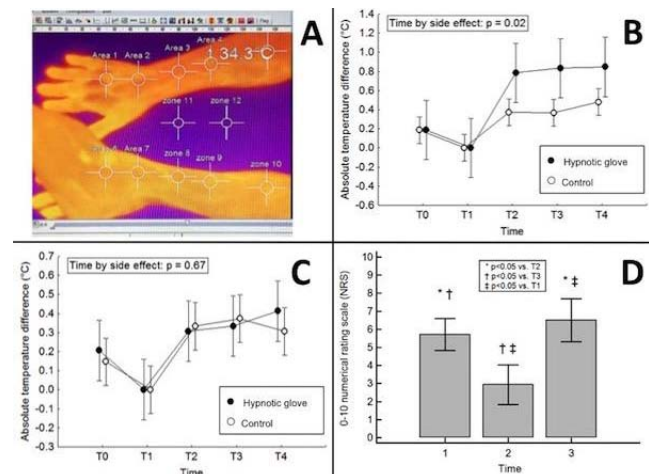
Background and Goal of Study: We investigated the effects of hypnotic glove analgesia on skin temperature measured by thermography.

Materials and Methods: After IRB approval (CPP Sud-Est L16-187) and written informed consent, 15 subjects were recruited. After 20 min installation and temperature equilibration (T0), the subject skin temperature was recorded bilaterally in the hand and distal forearm using infrared thermography (Fig. 1A). After 10 min of latency, skin temperature was recorded again in both

regions (T1). A first noxious stimulus was applied at T1 by the hypnotherapist by pinching the webbing between the thumb and index finger of the non-dominant hand. Pain intensity was assessed on a 0-10 (0 = no pain, 10 = maximal pain) numerical rating scale (NRS). The hypnotic glove was mentally created by the subject on his non-dominant hand following the suggestions of the hypnotherapist (T2). To assess its efficacy, a similar noxious stimulus was applied at T2 and NRS was recorded. The subject was then invited to mentally wear off the glove (T3). Skin temperature was recorded in both hands, and a third similar noxious stimulus was applied at T3 to verify the disappearance of analgesia. A last record of skin temperature in both regions was performed 5 min after the glove was mentally withdrawn (T4). The absolute difference in temperature between both regions during time from T0 to T4 was compared using ANOVA for repeated measures. Pain intensity from T1 to T3 was compared using ANOVA. A value of $p < 0.05$ was considered as statistically significant.

Results and Discussion: There was a significant difference in the absolute temperatures up to 0.5 °C during time between the hand wearing the hypnotic glove and the control hand (Fig. 1B). This difference was not observed on the forearm (Fig. 1C). The hypnotic glove provided a significant decrease in NRS pain scores at T2 (Fig. 1D).

Conclusion(s): Hypnotic glove analgesia provides significant changes in skin temperature in the hand but not in the forearm and a significant reduction in pain intensity in the hand. Further study is required to determine the mechanisms of these objective changes induced by hypnosis.



[Figure 1]

09AP03-5

Ivabradine inhibits LPS-stimulated inflammatory cytokine production via hyperpolarization-activated cyclic-nucleotide-gated channels in the mouse macrophage-like cell line Raw264.7

Miyake S.¹, Honda-Wakasugi Y.¹, Yabuki-Kawase A.², Higuchi H.³, Maeda S.³, Miyawaki T.¹

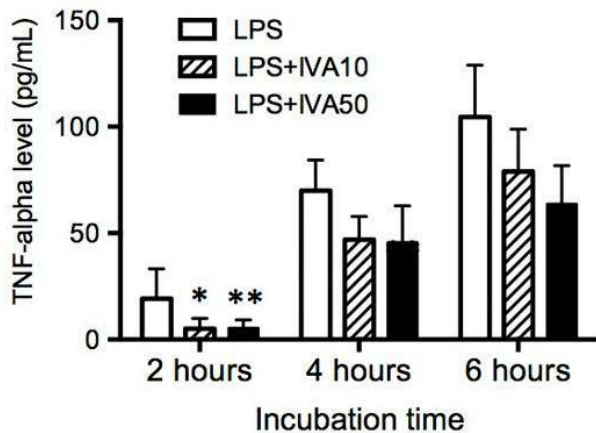
¹Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Dental Anesthesiology and Special Care Dentistry, Okayama-shi, Japan, ²Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Center for Promotion of Dental Education and International Collaboration, Okayama-shi, Japan, ³Okayama University Hospital, Dental Anesthesiology, Okayama-shi, Japan

Background and Goal of Study: Recently, attention has been paid to the role of hyperpolarization-activated cyclic-nucleotide-gated (HCN) channels in the mechanism of and as a treatment target for neuropathic pain. Ivabradine, an inhibitor of HCN channels, which is clinically used as an anti-anginal and cardiotonic agent, is also known to act on peripheral sensory neurons. However, the actions of ivabradine possibly include an anti-inflammatory effect on tissue such as immune cells. The purpose of the present study was to evaluate the anti-inflammatory effect of ivabradine using mouse macrophages.

Materials and Methods: We used the mouse macrophage-like cell line Raw264.7 (DS Pharma Biomedical). The cells were incubated with ivabradine (10 and 50 μM , Tokyo Chemical Industry Co.) and LPS (10 ng/mL) at 37°C for 2, 4, and 6 hours. The supernatants of incubated cells were collected, and TNF-alpha and IL-6 concentrations were measured using specific ELISA kits. Furthermore, ZD7288 (10 and 50 μM , Sigma-Aldrich), an inhibitor of HCN channels, was also investigated regarding its effect on IL-6 production. Difference among the values at each time point was analyzed using one-way ANOVA followed by Turkey's multiple comparisons test.

Results and Discussion: Ivabradine at 10 and 50 μM significantly inhibited LPS-stimulated TNF-alpha production on 2-hour incubation (Fig. 1), and IL-6 production on 4- and 6-hour incubation (Fig. 2). ZD7288 also significantly inhibited LPS-stimulated IL-6 production on 4- and 6-hour incubation. The results indicate that the anti-inflammatory action of ivabradine is mediated via HCN ion channels. The findings suggest that the actions of ivabradine on peripheral tissue include an anti-inflammatory effect.

Conclusion: The results indicate that ivabradine inhibits LPS-stimulated inflammatory cytokine production in mouse macrophages via HCN channels.

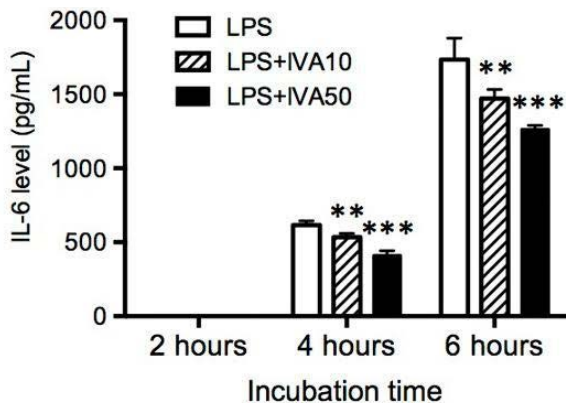


[Fig. 1: Effect of Ivabradine on TNF-alpha production in mouse macrophages]

IVA10: Ivabradine (10 μM)

IVA50: Ivabradine (50 μM)

* $P < 0.05$, ** $P < 0.001$ vs. LPS



[Fig. 2: Effect of Ivabradine on IL-6 production in mouse macrophages]

IVA10: Ivabradine (10 μM)

IVA50: Ivabradine (50 μM)

** $P < 0.001$, *** $P < 0.0001$ vs. LPS

09AP03-6

Microarray analysis of microRNA and mRNA expression profiles in the rat spinal cord under inflammatory pain

Tan P.-H., Liu C.C.

E-DA Hospital/I-Shou University, Dept of Anaesthesiology, Kaohsiung, Taiwan, Republic of China

Background and Goal of Study: Several recent studies demonstrated that microRNAs (miRNAs) are involved in pain processing pathways by using microarray-based approaches. However, a significant proportion of the computational predictions of miRNA targets are false-positive interactions. To increase the chance of identifying biologically relevant targets, we performed an integrated analysis of both miRNA and mRNA expression profiles in the rat spinal cord during complete Freund's adjuvant (CFA)-induced inflammatory pain.

Materials and Methods: We generated miRNA and mRNA arrays in the same corresponding samples on Days 5 and 14 after CFA injection. The rats were randomly assigned to different groups. (1) Expression profiles analysis at different time points: CFA 5d group, Day 5 after CFA injection; CFA 14d group, Day 14 after CFA injection; Control group, without CFA injection. After behavioral tests, the ipsilateral lumbar (L4-L5) spinal cords were quickly dissected for microarray analysis of miRNA and mRNA ($n = 3$ each group).

Results and Discussion: Five miRNAs and 1096 mRNAs in the CFA 5d group and 16 miRNAs and 647 mRNAs in the CFA 14d group were differentially expressed upon the application of a filter with at least a 1.5-fold change in either direction. The integrated analysis revealed 54 mRNA targets with an inverse correlation to the expression patterns of 3 miRNAs in the CFA 5d group. Seventy-five targets were inversely correlated to 6 miRNAs in the CFA 14d group. The miRNA-mRNA interaction networks revealed significant changes of miR-124, miR-149, miR-3584 and their target gene of IL6R, ADAM19, LAMC1 and CERS2 in the CFA 5d group. In the CFA 14d group, significant changes of miR-124, miR-29, miR-34, miR-30, miR-338 and their target gene of TIMP2, CREB5 and EFNB1 were noted. We also investigated the interaction pair, miR-124 and IL6R, and the results showed miR-124-3p could attenuate inflammatory pain and decrease IL6R expression in the spinal cord.

Conclusions: These specific miRNAs and their target genes provide possible avenues for the diagnosis and treatment of inflammatory pain.

Acknowledgements: This work was supported by National Science Council Grant MOST 103-2314-B-214-003-MY3, NSC 103-2321-B-214-001-, and E-Da Hospital Grant EDRJ 104068, EDAHP 104028 and NCKUEDA 10503 Taiwan.

09AP03-7

Potential treatment of chronic pain by uncoupling sortilin-proBDNF interaction

Gin T., Ho I., Liu X., Wu W., Chan M.

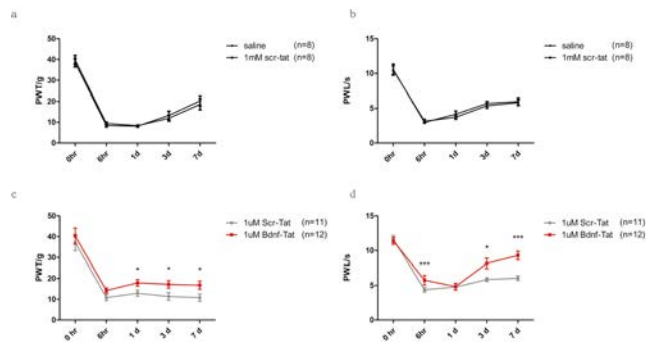
Chinese University of Hong Kong, Dept of Anaesthesiology & Intensive Care, Shatin, Hong Kong

Background and Goal of Study: Brain-derived neurotrophic factor (BDNF) is a key mediator involved in the development of chronic pain. We aimed to develop a novel blocking peptide that uncouples sortilin-BDNF interaction for reducing activity-dependent BDNF secretion as a potential treatment for chronic pain.

Materials and Methods: Domain mapping studies were conducted to determine the precise sequence of the sortilin-proBDNF interaction interface. A series of overlapping 10-amino-acid peptides for blocking sortilin-BDNF interaction were designed and subsequently tagged with a Tat domain for *in vivo* validation. The effectiveness of the synthetic peptides was assessed in a rat Complete Freund's Adjuvant (CFA) inflammatory pain model, using phosphorylated-ERK as the downstream marker of the Bdnf signaling transduction, and pain behavioural testing.

Results and Discussion: In the rat pain model, BDNF levels were markedly increased in the dorsal root ganglion (DRG) and its central terminal, consistent with previous studies. Sortilin was also upregulated and co-localized with BDNF in this pain model. The site of the interaction was mapped by co-immunoprecipitation and bimolecular fluorescence complementation assay to amino acids 71-100 in the BDNF prodomain. The blocking peptide covering amino acids 89-98 was the most promising and selected for further study. This synthetic blocking peptide reduced phosphorylated-ERK signaling in the spinal cord. Pain behavioral testing also confirmed the effectiveness of this

peptide in the CFA rat model. Intrathecal injection of the blocking peptide attenuated the decrease in the paw withdrawal threshold (PWT) and paw withdrawal latency (PWL) in the pain model (see Figure).



[Figure]

Conclusion(s): Bdnf89-98-Tat blocked CFA-induced ERK phosphorylation in spinal dorsal horn neurons and reduced inflammatory pain. A blocking peptide that uncouples the sortilin-BDNF interaction may be useful in the management of chronic pain.

09AP03-8

Pregabalin inhibition of the excitatory transmission in the nociceptive amygdala of the mice with inflammatory pain

Yamamoto S.¹, Takahashi Y.², Kato F.²

¹University of Tsukuba, Dept of Anaesthesiology, Tsukuba, Japan,

²Jikei Center for Neuroscience of Pain, Neuroscience, Tokyo, Japan

Pregabalin (PGB), a widely used centrally acting analgesics in intractable chronic pain, is a ligand for the $\alpha 2\delta$ subunit of voltage-gated calcium channels which are widely expressed in the central nervous system. However, its site and mode of action remain largely undetermined. The amygdala is a kernel site for the enhanced nociception-emotion link in the chronic pain and also is rich in PGB binding sites. As the nociceptive information is conveyed to the amygdala via the thalamocortical pathway targeting the basolateral amygdala (BLA) and via the spinoparabrachial pathway targeting the central amygdala (CeA), it is of interest how PGB affects inputs through these distinct pathways converging to the output nucleus of the CeA. We have already reported that PGB inhibits the excitatory synaptic transmission at BLA-CeA synapses only in inflammatory conditions¹. We compared the effects of PGB on the converging excitatory inputs to CeA neurons between those from the BLA and those from the lateral parabrachial nucleus (LPB) by recording the postsynaptic currents in single CeA neurons.

Methods: C57BL/6 mice (3-8 weeks-old) were used. Inflammation was induced by injecting 20 μ L of 5% formalin into the intraplantar surface of the left hind paw. Acute coronal brain slices were prepared 8 hours post-injection. The stimulation electrodes were placed:

1. on the fiber tract arising from the LPB and;
2. within the BLA.

These pathways were alternately stimulated. Excitatory postsynaptic currents in response to stimulation of LPB pathway (EPSC_{LPB}) and BLA (EPSC_{BLA}) were recorded from single neurons in the CeA using whole-cell patch-clamp technique. PGB was added to external solution and applied in the bath. Wilcoxon signed-rank test were used to compare results. All data are presented by the mean \pm SEM.

Results: PGB (100 μ M) significantly reduced the EPSC_{BLA} amplitude (to 83% \pm 6% of control; $P < 0.05$; $n = 10$) but not that of EPSC_{LPB}. This decrease in EPSC_{BLA} amplitude was accompanied by a significant increase in paired pulse ratio (to 112% \pm 5% of control; $P < 0.05$). Such significant changes was observed only 40% for EPSC_{LPB}.

Conclusion: PGB inhibits the BLA to CeA transmission, but to a lesser extent the LPB to CeA, through a mechanism involving reduced release probability, particularly in inflammation conditions. Such pathway-dependence might partly define the spectrum of PGB in treating the cognitive-affective aspect of pain.

Reference: 1. Yamamoto S et al. IASP 2016.

09AP03-10

Study in the sodium hyaluronate attenuating the functional recovery and thermal hyperalgesia by altering expressions of inflammation and collagen fibers in the osteoarthritis rats

Han J.-H., Jang M.-S., Chung J.-Y., Yi J.-W., Oh I.-D.

Graduate School, Kyung Hee University, Kyung Hee University Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Osteoarthritis (OA) is a complex disease of entire joint, affecting cartilage, bone and synovial membranes. Inflammation of articular cavity is accompanied by pathological changes that have a critical impact on pain and locomotion disorders. The sodium hyaluronate is similar to a substance that occurs naturally in the joint. It may work by acting as a lubricant and shock absorber in the joint, helping the knee to move smoothly, thereby lessening pain. However, current studies have limited information about mechanisms of this sodium hyaluronate. Therefore, we investigated the effects of sodium hyaluronate on locomotor function, hyperalgesia degree, and expressions of inflammation and collagen fibers (type I and II) in the articular cavity following osteoarthritis rats.

Materials and Methods: OA-induced rats received an intra-articular injection of monosodium iodoacetate (MIA; 3 mg/kg, volume: 60 μ l) into a right knee joint. Fourteen days after the MIA injection, sodium hyaluronate in 50 μ l containing respective dose (10, 15, and 20 mg/ml) was directly applied to the injured intra-articular only once. Functional recovery in each rat was repeatedly assessed using the weight load test and walking track analysis at 14, 28, and 42 days after starting of the MIA injection. In 43 days since the MIA injection, plantar test for pain threshold was also conducted. For histological and inflammatory analysis, hematoxylin & eosin and masson's trichrome staining were performed. The immunohistochemistry for collagen fiber type I, II in the articular cavity was also conducted.

Results and Discussion: In the present results, OA increased pain susceptibility and suppressed leg strength due to arthrogenosis and inflammation in the articular cavity. Treatment with sodium hyaluronate improved leg strength and decreased pain susceptibility. Also, it suppressed arthrogenosis and inflammation in the articular cavity. In addition, sodium hyaluronate treatment increased collagen type I expression, whereas, decreased expression of collagen type II in the articular cavity.

Conclusion(s): These results showed that sodium hyaluronate facilitates functional recovery and inhibits pain susceptibility by suppressing inflammation and modulating collagen fibers in OA. We suggest that sodium hyaluronate might be considered as a new therapeutic intervention for functional recovery and pain control in OA.

09AP03-11

Tapentadol inhibits spontaneous and miniature excitatory postsynaptic currents in rat hippocampal slices

Lin T.Y., Lu C.W., Wang S.J.

Far Eastern Memorial Hospital, Dept of Anaesthesiology, New Taipei, Taiwan, Republic of China

Background and Goal of Study: Tapentadol, a newly atypical opioid analgesic, has been approved to treat acute and chronic pain. Moreover, tapentadol has been found to alleviate neuropathic pain effectively in recent studies.^{1,2} Since neuropathic pain might be associated with excessive glutamatergic transmission in CNS,³ we hypothesized that tapentadol may affect the glutamate system in CNS.

Materials and Methods: Isolated nerve terminals (synaptosomes) purified from male Sprague-Dawley rat cerebral cortex were used to examine the effect of tapentadol on glutamate release evoked by 4-aminopyridine (4-AP). In addition, whole-cell patch-clamp recordings in hippocampal slices were used to examine the effect of tapentadol on the increased spontaneous excitatory postsynaptic currents (sEPSCs) evoked by 4-AP. The effect of tapentadol on the tetrodotoxin-resistant miniature excitatory postsynaptic currents (mEPSCs) was examined as well.

Results and Discussion: We found that tapentadol exhibited a concentration-dependent inhibition of 4-AP-evoked release of glutamate. In addition, in slice preparations, whole-cell patch-clamp experiments showed that tapentadol reduced the frequency of sEPSCs and mEPSCs without affecting their amplitude, suggesting a presynaptic mechanism.

Conclusion: Our results suggest that the alleviating effect of tapentadol on neuropathic pain may be ascribed to its presynaptic mechanism on glutamate release.

References:

1. Baron R, et al. Effectiveness and Tolerability of a Moderate Dose of Tapentadol Prolonged Release for Managing Severe, Chronic Low Back Pain with a Neuropathic Component: An Open-label Continuation Arm of a Randomized Phase 3b Study. *Pain practice : the official journal of World Institute of Pain* 2014.
2. Schwartz S, et al. A Pooled Analysis Evaluating the Efficacy and Tolerability of Tapentadol Extended Release for Chronic, Painful Diabetic Peripheral Neuropathy. *Clinical drug investigation* 2014.
3. Osikowicz M, et al. The glutamatergic system as a target for neuropathic pain relief. *Experimental physiology* 2013;98:372-84.

Acknowledgements: This work was supported by the grants from the Ministry of Science and Technology of Taiwan, Republic of China (MOST-105-2314-B-418-001 and MOST-104-2314-B-418-001).

09AP03-12

Wide-spread sensitization in inflammatory pain model is regulated by neuronal activities in the amygdala

Sugimoto M., Takahashi Y., Sugimura Y., Miyazawa Y., Watabe A., Kato F.

Jikei University School of Medicine, Center for Neuroscience of Pain, Department of Neuroscience, Tokyo, Japan

Background and Goal of Study: Lines of evidence suggest that the allodynia and hypersensitivity, the hallmarks of chronic pain, involve changes in the activity of central nervous system. As the central amygdala (CeA) is a brain nucleus that shows robust plastic changes in various pain models and patients with chronic pain, we hypothesized the pain-induced alterations in the CeA activity would lie upstream to the allodynia and hypersensitivity. For this goal, we used a "latent formalin inflammation" model in which mechanical allodynia (Carrasquillo and Gereau, 2007) and synaptic potentiation in the CeA (Miyazawa et al., 2015) appear several hours after the termination of the conventionally observed initial phases of acute nociceptive behaviors. In this study we developed a model that shows ectopic mechanical allodynia in the hind paw in animals with orofacial formalin-induced inflammation and examined an involvement of the CeA in this "face-to-hind limb" ectopic allodynia.

Materials and Methods: We subcutaneously injected 5% formalin solution into the left upper lip of the adult male Wistar rats. After the acute nociceptive behaviors (1 h), we measured mechanical paw withdrawal threshold (PWT) as an index of the ectopic mechanical allodynia. The effects of the following manipulations on the PWT were evaluated: 1) pharmacological blockade of calcitonin gene-related peptide (CGRP) receptors by local microinjections of the antagonists into the CeA and 2) chemogenetic inhibition of the GABAergic neuronal activity with clozapine-N-oxide (CNO, i.p.) in rats expressing the Designer Receptors Exclusively Activated by Designer Drugs (DREADD) in the CeA.

Results and Discussion: The PWT was significantly lowered after the orofacial formalin injection, indicating an establishment of the stable ectopic allodynia. Microinjection of a CGRP receptor antagonist in the right CeA, but not that in the left CeA, at ~5 h after formalin injection and a DREADD agonist-induced inhibition of the GABAergic neuronal activity in the CeA at ~5 and ~24 h ameliorated the ectopic allodynia transiently.

Conclusions: These results indicate that the CeA is not a passive site for pain-induced emotional changes but also a site actively controlling the sensitivity of sensory system to aversive inputs, as expressed as a "brain sensitization" in response to persistent peripheral inflammation, which would strongly complicate the pain phenotypes in chronic pain.

09AP04-1

Acupuncture analgesia in migraine treatment

Medvedeva L.¹, Zagorulko O.¹, Shevtsova G.²

¹*Petrovsky National Research Centre of Surgery, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation,*
²*I.M. Sechenov First Moscow State Medical University, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation*

Background and Goal of Study: Migraine is one of the most common causes of headaches suffered mostly by young and employable people aged 16-50 years according to generalized global data [1-3].

Materials and Methods: A randomized double-blinded placebo-controlled study, approved by local Institution Review Board, involved 48 patients with migraine, who attended the clinic in August 2015 - September 2016 and were randomized into two comparable groups (24 patients each) by the sealed envelope method. Migraine was diagnosed using the International Classification of Headache Disorders criteria. The study group completed a classic acupuncture treatment course (15 sessions every other day), the control - a sham-acupuncture course using the same characteristics but with needles placed not deep enough. The treatment effectiveness criteria included pain severity by visual analogue scale (VAS), the pain attack frequency and duration, evaluated prior to and 3 months after treatment. The data was analyzed with IBM SPSS Statistics and MS Excel software.

Results and Discussion: The mean age was 30.2±9.1 and 27.5±8.4 in the study and control group, respectively. The majority of participants were women (22 and 20, respectively). At admission the VAS score was 6.3±1.9 and 5.7±1.6 points, pain attack frequency was 6.7±2.0 and 6.2±1.9 days per month with its duration 23.8±6.7 and 19.5±7.2 hours in the study and control groups, respectively. After the 3-months treatment pain severity decreased to 2.1±0.4 points in the study group, whereas in the control group it was statistically significantly higher ($p<0.05$) - 4.6±0.7 VAS points. The pain attack frequency was also significantly lower in the study group than in control (2.4±0.6 and 5.9±1.6 attacks; $p<0.05$) as well as its duration (6.8±1.4 and 15.6±4.3 hours; $p<0.05$).

Conclusion(s): Classical acupuncture in migraine treatment helps to reduce the severity, frequency and duration of pain attacks.

References:

1. Burch R. *Headache*. 2015; 55(1):21-34.
2. Medvedeva L. *Rus Jour of Pain* 2016; 2:137-138.
3. Osipova V. *Cephalalgia*. 2016; 36(S1):72.

09AP04-2

Brain connectivity of chronic pain patients

Iijima K.¹, Inomata S.², Matsushita A.³, Matsumura A.⁴, Tanaka M.²

¹*University of Tsukuba, Dept of Anaesthesiology, Tsukuba-shi, Japan,* ²*University of Tsukuba, Dept of Anaesthesiology, Faculty of Medicine, Tsukuba-shi, Japan,* ³*University of Tsukuba, Center for Cybernetics Research, Tsukuba-shi, Japan,* ⁴*University of Tsukuba, Dept of Neurosurgery, Faculty of Medicine, Tsukuba-shi, Japan*

Background and Goal of Study: Chronic pain affects quality of life and has economic impacts. We know the etiologies of fibromyalgia (FM) and post herpetic neuralgia (PHN) is unclear. Pregabalin and some medicine has been proved to be effective for PHN, but the treatment for FM is still challenging.

The study for brain function may play an important part to investigate what occurs in the brain of such chronic pain patients. The functional connectivity from functional magnetic resonance imaging (fMRI) and/or diffusion tensor imaging (DTI) now are developed and it have revealed the novel roles in various disorders.

We performed fMRI and DTI in FM and PHN patients. Some difference of functional connectivity between FM and PHN may provide some assistance for understanding and treatment of chronic pain patients.

Materials and Methods: 23 FM and 16 PHN patients participated in this study. The diagnosis of FM or PHN was done by a specialist for pain using ACR 2010 for FM and the guidelines for pain treatment published by Japanese Society of Pain Clinicians for PHN.

The T1-weighted image, resting state functional image, FLAIR, and DTI were acquired for each patient. The normalized independent component analysis and skeletonized fractional anisotropy (FA) data were compared between the groups of FM and PHN.

Results and Discussion: All participants were completed in MRI, and no adverse event was observed. 2 patients were excluded from the following analysis.

The functional connectivity was different between FM and PHN patients in posterior cingulate cortex (PCC), precuneus, and left temporal in default mode network, and left ventral occipito-temporal in sensorimotor network. The role of PCC and precuneus are considered to be wide in visuo-spatial imagery, episodic memory, self-consciousness, and emotion.

The FA in body of corpus callosum, cerebral fornix, cingulum, arcuate fasciculus, and some fronto-temporal connection fibers were different between FM and PHN patients. But there were no differences of FA in pyramidal tract, genu and splenium of corpus callosum.

Conclusions: FM and PHN patients showed difference of the function in default mode network and sensorimotor network, and had different fractional anisotropy in various fibers. FMRI and DTI were feasible for such chronic pain patients. This study has limitation of no control group and no match of age, sex, and medication. We are going on the additional study for age and sex matched control.

09AP04-3

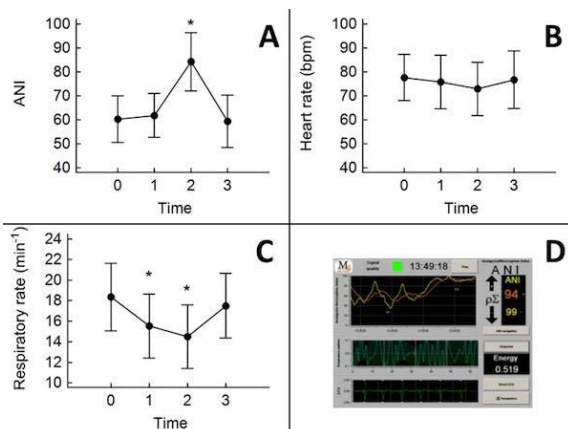
Effects of hypnosis on the relative parasympathetic tone measured by ANI (Analgesia/Nociception Index) in healthy volunteers

Boselli E.¹, Musellec H.², Martin L.², Bernard F.², Virot C.³, and the Émergences Instructors Team

¹University Lyon I Claude Bernard, Dept of Anaesthesiology, Lyon, France, ²Centre Hospitalier Privé Saint-Grégoire, Dept of Anaesthesiology, Saint-Grégoire, France, ³Émergences, Institut de Formation de Recherche en Hypnose et Communication Thérapeutique, Medical Hypnosis, Rennes, France

Background and Goal of Study: The efficacy of hypnosis has been demonstrated to reduce patients pain or anxiety and hypnosis is currently gaining interest in particular in the operating room[1]. Hypnosis induces reduced sympathetic activity and increased parasympathetic activity[2]. The Analgesia/Nociception Index (ANI) is a 0-100 index reflecting the relative parasympathetic tone [3]. We assessed the effects of hypnosis on ANI in healthy volunteers.

Materials and Methods: After IRB approval (CPP Sud-Est IV n° L16-89) and written informed consent, subjects participating to the 6th "Hypnosis and Pain" congress in Saint Malo, France (May 2016) were recruited. Exclusion criteria were history of arrhythmia or pace-maker. After comfortable installation of the subject in the sitting position and collection of accompanying theme elements from a pleasant memory such as a nice journey (T0), the hypnotherapist initiated the hypnotic trance by asking the subject to take a deep breath (T1). The theme was then returned to the subject with suggestions of comfort during 5 to 10 min. Once the subject validated his comfort by a signal such as putting a thumb up or nodding the head (T2), he was then progressively brought back to full awareness (T3). The ANI was recorded at each time point using the ANI Monitor® (MDoloris Medical Systems, Lille, France), as well as heart rate (HR) and respiratory rate (RR) counted on 15 s. The ANI, HR and RR were compared at each time point using ANOVA with $p < 0.05$ considered as statistically significant.



[Figure 1]

Results and Discussion: 40 subjects (31 women, 9 men) were included. The ANI was significantly greater at T2 than at the other time points (Fig. 1A). The HR did not vary significantly from T0 to T4 (Fig. 1B). The RR was significantly lower at T1 and T2 than at the other time points (Fig. 1C). A screenshot of variations of ANI between T1 and T2 appears in Fig. 1D.

Conclusion(s): Hypnosis induces increased relative parasympathetic tone continuously monitored using ANI and decreased RR with no variation of HR in healthy volunteers.

References:

1. Clin Psychol Rev 2013;33:623-36
2. Neuropsychobiology 2009;60:104-12
3. Prat Anesth Réanim 2015;19:78-86

09AP04-4

Pituitary hormone secretion changes after experimental pain stimulation. Are GH/TSH changes in patients with Fibromyalgia syndrome in a situation of chicken or egg?

Nakae A.¹, Sumioka H.², Yoshioka Y.³, Hiroshi I.⁴

¹Osaka University, Dept of Anaesthesiology & Intensive Care, Suita, Japan, ²Advanced Telecommunications Research Institute International, Department of Robotics, Souraku-gun, Japan, ³Osaka University, Frontier Bioscience, Suita, Japan, ⁴Osaka University Graduate School of Engineering Science, Department of Robotics, Toyonaka, Japan

Background and Goal of Study: Evidence shows that patients with Fibromyalgia Syndrome (FMS) sometimes have decreased growth hormones (GH) or/and thyroid stimulation hormones (TSH). However, the mechanisms of decreasing hormones in patients with FMS is unclear. It is equally unclear if decreased hormones comes first or if the onset of FMS does. The goal of this study is to clarify the relationship between experimental pain in normal volunteers and GH/TSH secretion after the stimulation.

Materials and Methods: After getting approval from the ethical committee of Osaka University, we got written informed consent from all 21 volunteers. Experimental heat stimulation was conducted for 1-minute periods at a time with a 1-minute rest in between. Six cycles were applied using the Pathway (Medoc Co Ltd; Israel). The temperature applied varied with each participant depending on their pain tolerance during the pre-trial not to take more than 80 on the visual analogue scale. Blood samples were collected 5 times after the series of heat stimulation: before stimulation, immediately after, 15 minutes after, 30 minutes after, and 50 minutes after. Serum GH and TSH were determined by enzyme-linked immunosorbent assay (ELISA) using commercially available kits. Assay specific for human GH was purchased from the R & D system, while TSH was purchased from the Cayman Chemical Company. The interassay coefficient variations of GH and TSH assays were 6.9% and 4.6%, respectively. The analytical sensitivities of GH and TSH assays were 0.64 pg/ml and 0.2mIU/L, respectively. The paired t-test was used for statistical analysis of the data by using JMP12.0.

Results and Discussion: The paired t-test revealed that serum GH level significantly decreased immediately after, 15min after, 30min after, and 60min after the stimulation ($p < 0.05$). TSH level significantly decreased immediately after, 15min after, 30min after, and 60min after the stimulation ($p < 0.05$). These results indicated that intermittent 6min stimulation could affect the pituitary function and prolonged at least 60min. The observed changes of GH/TSH decreasing in the patients with FMS might not be the cause of syndrome but the results of suffering from severe pain for a long time.

Conclusion(s): Even though the participants were healthy subjects, experimental heat pain could significantly affect the serum GH/TSH level and these changes could prolong at least until 60 min after the stimulation.

09AP04-5**Reflexology pain relieve in patients with temporomandibular joint disorder**Zagorulko O.¹, Medvedeva L.¹, Shevtsova G.²¹*Petrovsky National Research Centre of Surgery, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation,*²*I.M. Sechenov First Moscow State Medical University, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation***Background and Goal of Study:** Temporomandibular joint disorder (TMJD) is one of the most common causes of prosopalgia. [1-3].**Materials and Methods:** A prospective randomized comparative study of reflexology in TMJD pain treatment was approved by local Institution Review Board, involved 96 patients with TMJD, who attended the clinic in September 2015 - August 2016, and were randomized into two comparable groups (48 patients each) by the sealed envelope method. Both groups received nonsteroidal anti-inflammatory drugs (nimesulide 200 mg/day, 2 weeks) and central neuromuscular blocking agents (tizanidine 4 mg/day, 2 weeks). Study group also completed a classic acupuncture treatment course (15 sessions every other day). The treatment effectiveness criteria included pain severity by visual analogue scale (VAS) and reconstitution of the joint functional activity (interincisal distance at maximum opening up to 38 mm and over), evaluated 2 weeks and 2 months after treatment. The data was analyzed with IBM SPSS Statistics and MS Excel software.**Results and Discussion:** The mean age was 58.3±12.7 and 61.8±10.1 in the study and control group, respectively. Pain severity was 5.5±1.4 and 5.1±1.2 VAS points; interincisal distance at maximum opening was 26.2±8.3 and 24.9±8.2 mm in the study and control group, respectively. After the 2-weeks treatment, pain severity was 1.7±0.9 VAS points in the study group, statistically significantly lower o the control group results (2.5±0.7 points; p<0,05). Interincisal distance at maximum opening was reconstituted in the study group (42.6±7.1 mm), whereas in the control group it was only 28.1±7.2 mm (p<0.05). After the 2-months treatment, pain severity arose but still was significantly lower in the study group 2.4±0.8 points comparing to control - 3.6±1.1, (p<0.05). The joint functional activity was reconstituted in the study (41.0±6.2 mm) and limited in the control group (26.6±7.4 mm).**Conclusion(s):** Reflexology may be considered as promising treatment method aimed to relieve pain from TMJD as well as reconstitute the joint functional activity.**References:**

1. Gnezdilov A. J Anest Reanimatol 2013; 3:54-58.
2. Oganessian G. J Anest Reanimatol 2015; 60(4):102.
3. Zagorulko O. Rus Jour of Pain 2016; 2:67-68.

09AP05-1**A case of psoas major muscle abscess diagnosed using ultrasound-guided percutaneous puncture**Yoshida T.¹, Sakuma K.², Watanabe S.³¹*Kansai Medical University Hospital, Dept of Anaesthesiology, Hirakata, Japan,* ²*Niigata Medical Center, Dept of Anaesthesiology, Niigata, Japan,* ³*Niigata Medical Center, Dept of Orthopaedic Surgery, Niigata, Japan***Background:** Early diagnosis followed by immediate drainage is essential in the treatment of iliopsoas abscess. The utility of ultrasound guidance in percutaneous drainage of iliopsoas abscess has often been presented in neonates; however, it has rarely been reported in adults. One case report described the ultrasound-guided percutaneous drainage of an iliopsoas abscess that extended to the subcutaneous tissue in an adult patient¹. We report a case of isolated psoas major muscle abscess successfully diagnosed by its ultrasound-guided percutaneous puncture.**Case report:** An otherwise healthy 13-year-old boy presented with a one-month history of low back pain. At the initial visit, the patient had low back pain without any neurological deficits in the lower extremities. A computed tomography (CT) scan showed fluid accumulation within the right psoas major muscle near the intervertebral disc between the 4th and 5th lumbar vertebrae, accompanied by bone destruction at the inferior margin of the 4th lumbar vertebra, suggesting psoas major muscle abscess. The abscess was located more than 6 cm deep below the skin of the back. On the following day, puncture of the abscess was performed using ultrasound-guided in-plane

needle insertion, in a lateral-to-medial direction, using a technique similar to that of lumbar plexus block. Several milliliters of yellow pus were aspirated through the needle and Gram staining of the pus showed Gram-positive cocci. Subsequently, continuous percutaneous drainage of the abscess combined with antibiotic therapy was initiated. The patient was uneventfully discharged from the hospital one month later.

Discussion: Ultrasound-guided percutaneous puncture of abscesses is less invasive than surgical drainage and CT-guided puncture. However, ultrasound guidance had been previously unsuitable for deep regions because of deteriorating image quality. During the last two decades, the performance of ultrasound apparatus and knowledge of sonoanatomy have been developed remarkably and various ultrasound-guided approaches for deep nerve blocks have been reported. These technical innovations have facilitated ultrasound-guided percutaneous puncture of abscesses situated in deep regions.**Reference:** 1. J Orthop Sci 1998;3:221-4.**Learning points:** Percutaneous puncture of psoas major muscle abscess can be performed under ultrasound-guidance alone by applying a technique similar to ultrasound-guided lumbar plexus block.**09AP05-2****Extraspinal percutaneous osteoplasty for the treatment of painful bony metastasis**

Kim K.-H., Yoon J.P.

*Pusan National University Yangsan Hospital, Dept of Anaesthesiology & Pain Medicine, Yangsan, Korea, Republic of***Background and Goal of Study:** Extraspinal percutaneous osteoplasties (POPs) are novel techniques for the treatment of painful bony metastasis, which is often the cause of both persistent and incidental breakthrough pain. This retrospective study explored the efficacy and complications of extraspinal POPs.**Materials and Methods:** The origin of the cancer metastasis, performed POP sites, necessity of adjacent joint injections, pain and Karnofsky performance scale (KPS) scores, complications related to the POPs, and life expectancy were evaluated from the medical records from 2009 to 2015.**Results and Discussion:** A total of 46 (M/F = 27/19) patients had received 54 cases of POP. The most common sites for the origin of the cancer, in order of frequency, were the lung, liver, breast, colon, and kidney. All patients receiving POPs, excluding costoplasty and ischioplasty, needed adjacent joint injections before or after the POPs. Pain due to metastatic lesions was reduced significantly immediately after the POPs and sustained until the end of their lives. The median KPS was increased from 35.4% to 67.7% immediately after the POPs. There were no complications related to the procedures. The mean life expectancy after performing the POPs, for patients which died afterwards (35/46), was 99.3 days, ranging from 1 to 767 days.**Conclusion(s):** Even though pain in the isolated POP sites may be difficult to measure due to overlapping systemic pain, the POPs provided immediate local pain relief, and the patients showed better physical performance without procedure-related complications. (Clinical Trial Number (IRB): 05-2016-159)**References:**

1. Choi HR, Lee PB, Kim KH. Scapuloplasty alleviates scapular pain resulting from lung cancer metastasis. Pain Physician 2010;13:485-91.
2. KH Kim. Preoperative motion-related pain in cancer patients with extraspinal metastases treated by percutaneous osteoplasty. J Anesthe Clinic Rec 2011;S1:004.

09AP05-3**Loin pain hematuria syndrome: a case report**Alvar E., Manrique de Lara C., Campos M., De Andrés J., Gilsanz F. *Hospital Universitario La Paz, Dept of Anaesthesiology, Madrid, Spain***Background:** Loin pain hematuria syndrome is a rare disease (prevalence around 0.012%). It is characterized by severe flank pain, uni or bilateral, associated with hematuria, without primary renal cause. It affects mainly white women around the third decade of life. It generally solves spontaneously 3 to 5 years later, it does not produce renal injury nor does it affect mortality. Its etiology is unknown, and it is diagnosed by exclusion. After clinical suspicion,

renal causes have to be excluded. To complete the diagnosis, the next criteria must be fulfilled: pain, at least two negative image tests and hematuria. Treatment is symptomatic in the acute pain phase. Interventionist techniques offer temporal efficacy. Extreme situations may require renal denervation, autotransplant and nephrectomy.

Case report: We present the case of a 13 year old woman without relevant history, who, after an accidental fall, 5 years ago, presented microhematuria with a normal renal ecography, followed by loin pain. Symptoms disappeared and reappeared several times on the following years so she was diagnosed of loin pain hematuria syndrome. During 2015 she was admitted to hospital twice because of bad pain control (VAS 8/10); she was attended by the Pain Unit and tapentadol, amitriptilin, paracetamol, metamizole and tramadol were administered, in spite of which pain persisted. An epidural lumbar catheter was placed, with L-bupivacain 0.125% on PCA, with no success. Radiofrequency was performed on the Splanchnic nerves, as well as on the dorsal root ganglion of D12-L3, which was scarcely successful, and a sympathetic lumbar chain stimulation catheter was placed, partially relieving the pain. Finally a tunneled epidural catheter was placed on L1, with a ropivacaine 0.2% reservoir, with good response. At present, VAS 5, which has allowed us to lower the medication, even the local anesthetics.

Discussion: At the moment the patient is being followed by our Unit, Rehabilitation and Psychiatry, with good progress, even though an spontaneous remission cannot be discarded, as it is described in the literature.

References: Loin pain hematuria syndrome. Zubair A. Clin Kidney J. 2016 Feb;9(1):128-34. doi: 10.1093/ckj/sfv125. Epub 2015 Dec 7.

Learning Points: There is little international experience on this kind of pain syndrome. This is a case of difficult management visceral pain on a teenage patient, where everything must be done to try to control the pain during the acute phase.

09AP05-4

Oblique contralateral view for interlaminar cervical epidural access

Alvar E., Zurita S., Castillo M.P., Aguar M., De Andrés J., Gilsanz F. *Hospital Universitario La Paz, Dept of Anaesthesiology, Madrid, Spain*

Background: Epidural corticoids are frequently used as a treatment for cervicobrachialgias. The cervical epidural space may be reached through the interlaminar or transforaminal access, although the latter is not recommended because of the possible neurological complications. To perform the cervico-dorsal epidural infiltration, fluoroscopy is essential, as it enables the visualization of the needle tip in depth. The visualization of the needle tip in the lateral fluoroscopic view might be complex or even impossible in the lower cervical or cervicothoracic region because of the superposition of the shoulders.

Case report: We tried to reproduce the technique; during the cervical epidural access with an oblique contralateral tilting of the fluoroscope, a good location of the needle tip was achieved.

Discussion: Due to the limitations of the lateral view, the oblique contralateral view has been defended for the cervical epidural injection, as it allows a better visualization of the needle tip and gives us a reliable radiographic reference to locate the posterior epidural space. In the oblique contralateral view, it is essential to visualize the spinolaminar line.

References: 1. Chan Hong Park, Sang Ho Lee. Feasibility of Contralateral Oblique Fluoroscopy-guided Cervical Interlaminar Steroid Injections. Pain Practice(2015)

Learning points:

1. The oblique contralateral view offers a good visualization of the needle tip during the cervicothoracic epidural puncture. Chang Hong et al. [1] demonstrated a statistically significant difference compared with the lateral projection.
2. The spinolaminar line in the oblique contralateral view serves as a security line not to be surpassed while progressing the needle tip to avoid false losses of resistance.

09AP05-5

Pulsed Radiofrequency for chronic ankle pain: a case report

Genovese A.¹, Cardia L.², Patalano I.¹, Bombardiere M.T.¹, Costa C.³, Mondello E.²

¹ASP MESSINA, Dept of Anaesthesiology & Pain Medicine, Patti, Italy, ²University of Messina, Dept of Anaesthesiology & Intensive Care, Messina, Italy, ³Humanitas Centre Catanese Oncology, Dept of Anaesthesiology & Pain Medicine, Catania, Italy

Background: We describe a case of chronic ankle pain, that has benefited from treatment with PRF (Pulsed Radiofrequency Treatment) ganglion.

Case report: We describe a case of pulsed radiofrequency treatment for pain relief in a patient suffering for Chronic ankle pain.

In January 2016 a 53 year old woman comes to our observation complaining of pain in his left ankle. the pain was radiating to the medial and lateral side of the foot. She is suffering from rheumatoid arthritis treated with corticosteroids.

The patient can't be candidate for elective surgery and has not had a reduction in pain from the systemic opioid therapy. The NRS reported on the first visit was 9. After the initials 30 days of treatment with opioids the NRS was 8. Three US guided analgesic blocks were performed with intra-articular infiltration of local anesthetic (ropivacaine 0.3%) plus corticosteroids. After the infiltrative therapy, pain levels remains unchanged (NRS 8).

We have therefore decided to treat the pain with pulsed radiofrequency ganglion.

In the month of September 2016 we performed pulsed radiofrequency ganglion L4, L5 and S1 (42 ° 300s).

After 24 hours from procedure the NRS was <2. After 30 days later, the patient reported a reduction in pain (NRS 4). Therefore, she had improvement in the ambulation and quality of life.

Discussion: We decided to present this case because the PRF ganglion is indicated for neuropathic pain, but not for nociceptive pain. In literature there are no cases of ankle nociceptive pain treated with PRF ganglion. Similar cases are described, treated with PRF sural nerve. In the presented case, the patient has benefited from the PRF ganglion, although she was suffering from nociceptive pain.

After 30 days from the PRF ganglionic she refers pain reduction of >50% compared to the first visit, improvement in the quality of life and in ambulation, without the aid of supports, and in a reduction of opioids consumption of 50% of the dose.

Learning points: pulsed radiofrequency reduces chronic ankle pain

09AP05-6

Radiofrequency ablation of S₂ & S₃ lateral branch in sacroiliac joint pain patient: lateral approach

Lee H.W.¹, Lim H.J.¹, Lee Y.W.², Park S.², Koh J.C.¹

¹Korea University Anam Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background: Radiofrequency (RF) ablation of the lateral branch of sacral nerve is one of therapeutic interventions for sacroiliac joint (SIJ) pain. For the RF lesioning of sacral nerves, techniques using conventional, cooled or multi-electrode curved RF has been introduced. However, the larger lesion size may provide the higher success rate in ablating the target nerves, it can also increase undesired tissue damage theoretically. In this case report, we present lateral approach of conventional RF for S₂ & S₃ lateral branch to increase the success rate and minimizing the tissue damage for SIJ pain.

Case report: A 61 years old female presented to our pain clinic with severe lower back pain radiating down to the left gluteal region. The symptom was started 2 months ago. She had been treated with many other intervention procedures while SIJ injection was the only effective procedure which lasted merely 1~2 days. She underwent diagnostic block at lateral branches of the S₂ and S₃ nerve roots and it was also effective for 1 day. After 1 week, RF ablation was performed. After a guide needles were placed on each lateral border of the S₂, S₃ foramina under C-arm fluoroscopy guide, the view was rotated to the contralateral side until tip of the guide needle came into contact with mid portion of sacrum. Under that view, a 22G curved RF needle was inserted at the junction and advanced until its tip passed the guided needle in order to

place its 10 mm active tip in contact with sacrum, parallel to the lateral branch of S₂ and S₃. After sensory and motor stimulation, conventional RF was performed at 80 °C for 75 seconds. The patient's NRS score dropped dramatically from 10 to 0 without any complication for a month. After that her sacral pain was maintained NRS less than 3 without opioid medication.

Discussion: Instead of ablating all sacral nerves innervating SIJ, selective RF ablation at S₂ and S₃ lateral branch using lateral approach of conventional RF needle was sufficient for treatment of refractory pain originated from sacroiliac joint.

References: Ferrante FM, King LF, Roche EA et al. Radiofrequency sacroiliac joint denervation for sacroiliac syndrome. *Reg Anesth Pain Med.* 2001;26:137-42.

Learning points: Selective ablation at lateral branch of sacral nerve using lateral approach of conventional RF needle can be performed successfully in refractory pain originated from sacroiliac joint.

09AP05-7

The detection rate of intravascular penetration during cervical transforaminal epidural block using digital subtraction angiography, compared to real-time fluoroscopy

Kim S.¹, Kim J.-H.²

¹Kyungpook National University, Dept of Anaesthesiology & Pain Medicine, Daegu, Korea, Republic of, ²Kyungpook National University Hospital, Dept of Anaesthesiology, Daegu, South Africa

Background and Goal of Study: Transforaminal epidural block (TEB) is an effective treatment option of radiating pain. Digital subtraction angiography (DSA) is considered more reliable for detection of intravascular penetration before epidural steroid and local anesthetics injection, compared to static image of conventional fluoroscopy and real-time fluoroscopy (RTF). But, DSA has disadvantages, such as radiation exposure increasing to physician and high cost of the equipment. And, there is no report about the superiority of DSA in the detection of intravascular penetration during cervical TEB. In this study, therefore, we investigated whether DSA has the superiority in the detection of intravascular penetration during cervical TEB comparing to RTF, or not.

Materials and Methods: With approval of the Institutional Review Board and the written informed consent of the patients. We prospectively examined 137 patients who received cervical transforaminal epidural block (TEB). After the confirmation of final needle position using biplanar fluoroscopy, 2 ml of non-ionic contrast media was injected at the rate of 0.5ml/sec under RTF screening intravascular penetration. 30 seconds later, 2 ml of nonionic contrast media was injected at the rate of 0.5ml/sec under DSA.

Results and Discussion: The detection rate of intravascular penetration of DSA was not different compared to those of RTF (30.7 % vs 34.3%, $p > 0.05$).

Conclusion(s): If we use DSA during cervical TEB, we cannot statistically increase the detection rate of intravascular penetration of block needle during TEB compared to RTF

References: Visnjevac, O., et al., Digital subtraction angiography versus real-time fluoroscopy for detection of intravascular penetration prior to epidural steroid injections: meta-analysis of prospective studies. *Pain Physician*, 2015. 18(1): p. 29-36.

Acknowledgements: If we use DSA during cervical TEB, we cannot statistically increase the detection rate of intravascular penetration of block needle during TEB compared to RTF

09AP05-8

The effect of continuous epidural block into the specific segmental lesion in acute zoster pain and post herpetic neuralgia

Jung Eun K., Sang Sik C., Mi Kyoung L., Se Hee K.

Pain Clinic Center, Korea University Guro Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Severe zoster-associated pain often limits a patient's activities of daily living and may significantly lower quality of life. Over the years various attempts have been made to decrease zoster-associated

pain. However, there is currently no disease-modifying therapy for zoster-associated pain. This study was designed to quantify the effectiveness of continuous epidural block in acute zoster pain and postherpetic neuralgia (PHN).

Materials and Methods: Medical records of 227 patients with zoster associated pain in pain clinic from June 1, 2008, to June 30, 2015, were retrospectively reviewed. We divided the patients into four groups depending on the treatment time and method:

First, according to the treatment time patients were classified acute group (treatment started within 4 weeks of rash onset, $n=127$) and PHN group (treatment started after 4 weeks of rash onset, $n=100$).

Second, each group patients were divided medical treatment group and continuous epidural block group. Continuous epidural block patients received continuous infusion of 275cc, 0.068% ~ 0.11% ropivacaine at the rate of 4 cc per hour.

All patients who received continuous epidural block maintained the epidural catheter in 14 days. Response to medical treatment and continuous epidural block was evaluated by 50% or more decrease in visual analogue scale (VAS) and complete remission (VAS 2).

Results: In acute group, continuous epidural block has a higher proportion of $\geq 50\%$ decreased VAS ($P=0.001$) compared to medical treatment. In PHN group, continuous epidural block has a higher proportion of $\geq 50\%$ decreased VAS ($P=0.001$) compared to medical treatment.

In acute group, the odds ratio(OR) for VAS reduction in epidural group versus medical group was 5.17 (95% confidence interval [CI]: 1.75-15.23) and the OR for complete remission in epidural group versus medical group was 3.05 (95% CI: 1.20-7.73). In PHN group, the OR for VAS reduction in epidural group versus medical group was 5.37 (95% CI: 1.62-17.79) and the OR for complete remission in epidural group versus medical group was 4.46 (95% CI: 1.20-16.54).

Conclusions: The continuous epidural block into patients with zoster-associated pain is of value to relief the pain score effectively in both acute zoster pain and PHN. And it can increase the remission rate and possibly reduce PHN incidence. In conclusion, continuous epidural block may offer clinical advantage in managing zoster-associated pain and prevention of PHN.

09AP05-9

The invasive pain management techniques effectiveness in chronic tension-type headaches treatment

Zagorulko O.¹, Medvedeva L.¹, Shevtsova G.²

¹Petrovsky National Research Centre of Surgery, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation, ²I.M. Sechenov First Moscow State Medical University, Dept of Anaesthesiology & Pain Medicine, Moscow, Russian Federation

Background and Goal of Study: Chronic tension-type headache (CTTH) is the most prevalent headache disorder in the general population, ranging from 20% to 60% [3]. Although symptoms of CTTH are usually mild, some individuals experience disability or impaired quality of life [1,2].

Materials and Methods: Randomized double blinded placebo controlled study, approved by the Institutional Review Board, involved 58 patients with CTTH (diagnosed using International Classification of Headache Disorders), who attended the clinic in Oct. 2015 - Jul. 2016 and were divided into two groups (29 patients each) by the sealed envelope method. Both groups received fluoxetine 20 mg/day during 3 months.

The study group also received 0.5% lidocaine injections in trapezius muscle trigger points (10 injections with 2 day intervals), the control group - 0.9% NaCl solution using same characteristics (up to 5,0 ml both).

We analyzed pain attacks frequency and severity [with the Visual Analog Scale (VAS) and the McGill Pain Questionnaire (MGPPQ)].

Patients were examined prior to and 3 months after the treatment. The data was analyzed with IBM SPSS Statistics and MS Excel software.

Results and Discussion: The mean age was 48.3 ± 9.7 and 51.8 ± 10.2 years, mean disease history 6.8 ± 1.3 and 5.1 ± 1.4 years in the control and study groups respectively. Most of participants were women (75% and 68.8% respectively). The VAS score was 4.2 ± 1.1 and 4.9 ± 1.5 points and pain attack frequency - 19.2 ± 5.4 and 22.1 ± 7.2 per month in the study and control groups, respectively.

MGPPQ score in the both groups suggested that patients developed sensory and affective disorders (sensory rank pain index (RPI) 12.8 ± 4.6 ; affective 11.6 ± 4.2 ; total 24.4 ± 8.8 in the control group; and 11.2 ± 2.6 ; 12.0 ± 2.0 and 23.2 ± 4.6 points in the study group). After the 3-months treatment, pain attack severity and frequency were significantly lower in the study group (1.1 ± 0.3 ;

4.8±1.1 per month) than in control group (2.5±0.8; 9.8±2.9) ($p<0.05$). MGPQ scores also demonstrated more apparent changes in the study group (0.67±0.1 and 1.8±0.2 ($p=0.02$); 0.53±0.2 and 1.4±0.2 ($p=0.04$); 1.2±0.2 and 2.7±0.4 ($p=0.02$) - sensory, affective and total RPI in control and study groups, respectively.

Conclusion(s): 0.5% lidocaine injections in trapezius muscle trigger points help to improve CTH treatment effectiveness.

References:

1. Lozano R. *Lancet* 2013;380:2095-2128.
2. Zagorulkov O. *Europ J Anaesth* 2016;33(54):356.
3. Osipova V. *Cephalalgia*.2016;36(S1):72.

09AP05-10

Transcranial low level weberneedle laser in the management of intractable headache: a case report

Fanous S.¹, Henry B.¹, Abdelhay O.²

¹Spine Care Center, Dept of Anaesthesiology & Pain Medicine, Cairo, Egypt, ²Nasser Institute for Research and Treatment, Dept of Anaesthesiology & Pain Medicine, Cairo, Egypt

Background: Chronic headache is persisting pain located above the orbitomeatal line. Refractory headache is a devastating form. Tension type is the most common form, while 13.8% suffers from cervicogenic headache. Interventional management for these types of headaches was described. We are reporting 2 cases with refractory headache and their management by applying low level transcranial laser.

Case report: Spine Care Center in Cairo, Egypt presents 2 cases of Intractable headache from January to November 2016. Follow up was at baseline then weekly till 6 months. Both patients underwent maximized conservative management. MRI brain, Carotid duplex, EEG were normal. Pain assessed on a verbal four-point scale, visual analogue scale and pain diary. No history of previous trauma, no association with nausea nor vomiting. Upon examination, bilateral tenderness over cervical facets. Normal Upper Limb reflexes, sensory and motor examination. Diagnostic block was positive. Medial branch ablative radiofrequency(RF) of the affected facet joint with 3rd occipital nerve were done. Transcranial Weberneedle Laser (TWNL) was applied using channels of Blue, Red and Green light emitting diode, for 12 sessions on the side with highest pain intensity.

Case 1: 38-year-old female with headache for 2 years. After RF neck pain and headache disappeared, the headache relapsed 2 weeks later with negative neck pain and tenderness. Headache was increasing in intensity with failed medications, so TWNL was applied with increasing power.

Case 2: 45-year-old female with headache for 15 years, mostly at night with bilateral masseter spasm. After RF neck pain relieved, but headache decreased in intensity and duration. TWNL was applied with constant power.

Discussion: After RF, the neck pain improved by 90%, the headache improved in the 1st case for 2 weeks, while in the 2nd case by only 50%. After 3 sessions of TWNL, both patients showed 90% improvement. In 2nd week headache was fluctuating.

By the end of the 12 sessions, the headache decreased 70% on the TWNL side, and disappeared on the other side. During 6 months, case 1 experienced 3 attacks of headaches, while case 2 had infrequent attacks with minimal masseter spasm.

References:

1. Joseph R. et al., *Am Fam Physician*. 2014;89(8):642-648.
2. International Headache Society. 2013;33(9) 629-808.
3. Gonzalez-Lima F, Barrett DW. *Front Syst Neurosci*. 2014;8:36.

Learning points: TWNL can be a new noninvasive modality in resistant and mixed types of headache.

09AP05-11

Ultrasound guided pectoral nerve II block for intractable thoracic postherpetic neuralgia

Oh D.S.¹, Kang T.H.¹, Lee J.Y.¹, Kim H.J.²

¹Onnuri Pain Clinic, Dept of Anaesthesiology & Pain Medicine, Busan, Korea, Republic of, ²Pusan National University Hospital, Dept of Anaesthesiology & Pain Medicine, Busan, Korea, Republic of

Background: Postherpetic neuralgia (PHN) is a painful complication of acute herpes zoster. However, treatment of intractable PHN remains clinically challenging because both peripheral and central pathophysiological mechanisms contribute to PHN pain. Peripheral nerve block with local anesthetics have been used in the treatment of neuralgia and can provide pain relief in region supplied by blocked nerve. Recently, pectoral nerve (Pecs) II block was reported a simple interventional procedure that produces good analgesia for breast surgery.

Case report: An 79-year-old man visited our pain clinic with chronic chest pain around left nipple. Over the past few decades he had received several medications and interventional treatments, including radiofrequency ablation, epidural block and paravertebral block at other clinics. Although spontaneous pain, intensity and distribution of the pain had diminished gradually, the localized allodynia around nipple was remained. We performed ultrasound guided Pecs II block with 20 ml of 0.2% ropivacaine between pectoralis minor and serratus anterior. His pain relief scale was 70~80% reduction after the procedure. This symptom relief was maintained continuously following repeated Pecs II blocks were conducted at 1-week intervals.

Discussion: We reported a patient with intractable thoracic PHN who did not respond to various treatments, but in whom the ultrasound guided Pecs II block induced symptom improvement. Peripheral nerve block may be used as an alternative option for localized peripheral neuropathic pain treatment because irritable peripheral nociceptor contribute to pain mechanism of PHN. Pecs II block which blocks thoracic intercostal nerve from T2-T6, long thoracic nerve and thoracodorsal nerve is useful in localized pain around nipple.

References:

1. Fields HL, Rowbotham M, Baron R. Postherpetic neuralgia: irritable nociceptors and deafferentation. *Neurobiol Dis* 1998;5:209-27.
2. Bashandy GM, Abbas DN. Pectoral nerves I and II blocks in multimodal analgesia for breast cancer surgery: a randomized clinical trial. *Reg Anesth Pain Med* 2015;40:68-74.
3. Vlassakov KV, Narang S, Kissin I. Local anesthetic blockade of peripheral nerves for treatment of neuralgias: systematic analysis. *Anesth Analg*. 2011;112:1487-93.

Learning points: Ultrasound guided Pecs II block can be considered as an alternative treatment of intractable localized anterior chest wall pain associated with PHN.

Critical Emergency Medicine - Trauma and Resuscitation

10AP01-1

Bronchopleural fistula (BPF) following blunt trauma chest - the challenge in diagnosis

Teixeira J., Marques A.

Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology, Coimbra, Portugal

Background: Most tracheobronchial injuries are related to penetrating trauma. Blunt tracheobronchial injuries require a high index of suspicion for timely diagnosis. (1) We report the management of a patient with a blunt chest injury and missed diagnosis of BPF

Case report: Male, 31 years, ASA 1. Traffic accident with a motorcycle. Chest and craneoencephalic trauma. In the emergency room: Glasgow Coma Scale 8, triple fracture of the jaw, abrasions on thorax and arms. Sedation and orotracheal intubation for airway protection. Chest X-ray without lesions, physical examination reveal no alterations.

Twelve hours later went to the operating room (OR) to stabilize the jaw. Nasotracheal intubation with the aid of a Frova®. After five minutes on mechanical ventilation the patient presented cervical subcutaneous emphysema, hypotension, tachycardia, desaturation with increased FiO₂, increased airway pressures, a "tuba like" sound in the right hemithorax without hyperresonant percussion.

Tracheostomy was performed for suspected tracheal laceration, with sudden clinical improvement. After five minutes later new hemodynamic deterioration with hyperresonant percussion in the right hemithorax. Chest tube (CT) is inserted with exit of large volume of air. Axial computed tomography reveals cervical subcutaneous emphysema, right and left pneumothorax, right BPF (<5mm), pneumoperitoneum and pneumoscotum. Another CT was inserted in the left hemithorax. Gradual improvement of clinical condition. Performed the jaw's osteosynthesis and bronchoscopic treatment of BPF without complications.

On follow-up one year after discharge the patient has no evidence of recurrence.

Discussion: Blunt tracheobronchial injuries can pose a significant diagnostic challenge. The most common signs and symptoms include dyspnea, tachypnea, subcutaneous emphysema, pneumothorax and/or pneumomediastinum. (1) Often these patients will have nonspecific trauma to the chest wall that may be presumed to be the source of the pneumothorax.

Learning points: These injuries can easily mask a tracheobronchial injury and lead to delay or missed diagnosis. The management of life threatening complications such as tension pneumothorax is priority. The size of BPF (< 5mm) justify the bronchoscopic management instead of surgical approach.

References: 1. Glazer, E., Delayed presentation and treatment of tracheobronchial injuries. *J. Surg Educ*, vol 65, number 4, 302-7; 2008

10AP01-2

Effects of pre-hospital endotracheal intubation on mortality in children with severe traumatic brain injury: a systematic review

Albersen J.J.E.¹, Bossers S.M.¹, Boer C.¹, Loer S.A.¹, Schwarte L.A.², Schober P.²

¹VU University Medical Centre, Dept of Anaesthesiology, Amsterdam, Netherlands, ²Helicopter Emergency Medical Service 'Lifeline 1', VU University Medical Centre, Dept of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: Hypoxemia and hypercapnia are associated with secondary brain injury and poor outcome following traumatic brain injury (TBI). Therefore, routine prehospital endotracheal intubation has been widely advocated in patients with severe TBI. However, in the paediatric patient population, effects of prehospital intubation on outcome are unclear. Prehospital healthcare providers often have limited experience in intubating children, and adverse effects of poorly performed intubation (e.g., wrong choice and dose of medication, prolonged and failed attempts, hyper- or hypoventilation after intubation) may outweigh potential benefits. We therefore performed a systematic review and meta-analysis to determine the effects of pre-hospital endotracheal intubation on mortality in this patient population.

Materials and Methods: PubMed, Embase and Web of Science were searched using a predefined search-strategy up to June 2016. Studies comparing effects of prehospital intubation versus non-invasive airway management on mortality in paediatric patients (< 18 years) with severe TBI (Glasgow Coma Scale ≤8 or Head Abbreviated Injury Score ≥3) were eligible for inclusion. Abstracts were screened, and the full-text of all potentially eligible articles were retrieved. Random-effects meta-analysis (STATA 13) was used to pool results across studies.

Results and Discussion: The search yielded 211 studies. Six studies with a total number of 2094 patients were included in the systematic review. One randomized controlled trial did not find a significant difference in survival between intubated and non-intubated patients. (OR 0.8; 95% CI 0.6-1.1). The other studies were observational studies. Pooled results suggest a significant increase in mortality in children with TBI undergoing prehospital intubation (OR 2.5 95% CI 1.2-5.2). However, limited comparability of the intervention and control groups in the observational studies (e.g., differences in injury severity) and a high heterogeneity across studies (I² = 94%) preclude a general conclusion on the effects of prehospital intubation on mortality.

Conclusion: Current literature does not provide any evidence for beneficial effects of pre-hospital intubation on mortality. In contrast, limited evidence suggests that prehospital intubation might even be detrimental for outcome. Additional high quality studies are warranted to address the relationship between prehospital intubation and outcome in paediatric patients.

10AP01-3

Early hospital readmission after acute traumatic injury: the experience at a level-I trauma center

Vargas Muñoz A.M., Alegret Monroig N., Rabaneda E., Morales Garcia X., Masso A., Viader I.
Hospital Parc Tauli, Dept of Anaesthesiology, Sabadell, Spain

Background and Goal of Study: The incidence of repeat consults or readmissions in polytrauma patients (PTP) is between 6.6 and 7.6%, and it is associated to an increase in morbidity. The PTP who present a higher readmission rate are those initially catalogued as non-life-threatening traumas with a low injury assessment and Injury Severity Score (ISS). They receive an early discharge from the hospital. These readmissions have relevant implications for health care costs. Awareness of the predisposing factors will allow setting criteria that would diminish the hospital readmission rate and therefore the morbimortality rate especially in patients with mild to moderate polytrauma.

Methods: This observational retrospective study included all PTP between July 2014 and July 2015 who did not require admission to critical care unit. Demographic variables, trauma characteristics, ISS, initial hospital stay (HS), date and reason of the readmission and total HS were analyzed.

Results: 178 patients were included, 75% of which male, with an average age of 40.8 years. 98% presented non-intentional origin trauma, a 75% being secondary to traffic accidents. Medium ISS was 4.37 points (ED 1-18 points), initial HS 3.45 days. 17% were readmitted, 58% during the first week after the trauma. Reasons of readmission were: pain 73%, infection 3.8%, others 23%. The HS during readmission was 1.5 days. 7.7% needed surgical intervention, 7.7% antibiotic therapy and 69% analgesia.

Conclusion(s): The readmission rate in our center is higher than the one mentioned in the reviewed literature. Main reason is the lack of analgesic control at patients' home. We conclude, therefore, that we should optimize analgesic conditions when patients are discharged from hospital in order to reduce health care costs.

References: Porgo TV, Moore L, Tardif P-A. Evidence of data quality in trauma registries: A systematic review. *J Trauma Acute Care Surg*. 2016;80(4):648-58. doi:10.1097/TA.0000000000000970.

10AP01-4

Improving data quality of a trauma register

Rabaneda Romero E., Alegret Monroig N., Zancajo Torrecillas J.J., Vargas Muñoz A.M., Viader Barraca I.C., Baute Sanjuan J.
Consorci Sanitari Parc Taulí, Dept of Anaesthesiology & Intensive Care, Sabadell, Spain

Background and Goal of Study: Trauma registers (TR) are clinical databases on the management of the trauma patient. They are key elements in planning conducts of research and therapeutical attitudes. Their sensitivity and specificity is directly proportional to the quality of the data (QD). The most accepted model to measure QD is Wang and Strong's. It assesses mainly completeness, accuracy and consistency of the data. We found an important loss of information in the TR of our center after retrospective gathering of data. This led to suggesting a change of the model in order to improve the quality of our TR.

Materials and Methods: The medical residents of the unit were involved in the gathering data phase, so that it could be carried out prospectively during the initial evaluation of the trauma patient. This comparative retrospective observational study assesses the completeness in the TR data nine months before (between April 2015 and December 2015) and after (between April and December 2016) this change. The test used to analyze the data was X square.

Results and Discussion: 142 trauma patients were included. The TR data were gathered retrospectively (RP) in 69 patients and prospectively (P) in 73 patients. After changing the data collection model, an improvement has been achieved in the completeness of vital signs pre-hospital: heart rate (HR) 59% RP vs 74% P ($p < 0,05$), systolic arterial pressure (SAP) 59% RP vs 82% P ($p < 0,05$), oxygen saturation (OS) 53% RP vs 75% P ($p < 0,05$) and at the emergency department (ED) has been improved the gathering of : OS 88% RP vs 98% P ($p < 0,05$). On the other hand, it has been detected a greater lack of fulfillment in the completeness in the breath rate (BR) at the ED 73% RP vs 46% P ($p < 0,05$). They have also improved the collection of data on the time of accident 85% RP vs 100% P ($p < 0,05$) and time of prehospital assistance 82% RP vs 97% P ($p < 0,05$).

Conclusion(s): Prospective gathering of information has statistically improved the QD of our TR. Evidence only shown a lower level of completeness of BR at the ED that we should improve. Completeness of pre-hospital data is lower than ED data, which will result into contacting the Medical Emergency Unit (MEU), in charge of pre-hospital care, so that completeness of their registers improve.

References: 1. Porgo TV, Moore L, Tardif P-A. Evidence of data quality in trauma registries:

A systematic review. *J Trauma Acute Care Surg.* 2016;80(4):648-58.

10AP01-5

Triggers for prehospital transfusion of packed red blood cells: a systematic review of the literature

van Turenhout E.C., Bossers S.M., Loer S.A., Schwarte L.A., Boer C., Schober P.
VU Medical Centre, Dept of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: Early administration of blood products is increasingly advocated in the treatment of patients with life-threatening haemorrhage, and Emergency Medical Services are increasingly transfusing red blood cells (RBC) before arrival at a hospital. However, consensus about prehospital transfusion triggers is lacking. This systematic review aims to evaluate which criteria are currently used for prehospital transfusion.

Materials and Methods: PubMed and Web of Science were searched through June 2016 using a standardized search strategy. Manuscripts reporting criteria for prehospital transfusion of RBC (PTRBC) in patients with major bleeding (traumatic and non-traumatic) were eligible for inclusion. Abstracts were screened, and the full-text of all potentially eligible articles were retrieved. Reported transfusion criteria were classified as 'major criteria' or 'minor criteria', depending on whether only one criterion needed to be met to initiate PTRBC, or whether a combination of several criteria was required.

Results and Discussion: The search yielded 1616 articles. Criteria for PRBC were reported by 15 groups; 11 in civilian and 4 in military practice. Hypotension was the most common trigger for PTRBC. Eight articles used a systolic blood pressure ≤ 90 mmHg to initiate PTRBC (6 as major, 2 as minor

criterion), 3 groups used a SBP ≤ 80 mmHg (major criterion), and 1 group SBP ≤ 100 mmHg (minor criterion). A heart rate ≥ 120 /min was used by 6 groups (4 major, 2 minor criterion). Clinical signs of poor perfusion, including changes in mental status (2 major, 1 minor criterion), changes in skin colour (e.g. pallor, mottled)(2 major, 1 minor criterion), or a prolonged capillary refill time (2 major) were also common criteria. The type of injury was a transfusion trigger for 7 groups, although the exact criteria varied: penetrating wounds, proximal amputations or poor control of bleeding were used to initiate PRBC. Finally, in 8 out of 15 reports, clinicians were explicitly allowed to initiate transfusion based on their clinical judgement independently of other criteria.

Conclusion: Hypotension and tachycardia are commonly used as transfusion triggers in the prehospital setting, however, the exact criteria vary among EMS systems. Signs of poor tissue perfusion, the pattern of injuries and the clinician's judgement may also guide the decision to initiate PTRBC. The results will be used to develop a consensus based prehospital transfusion protocol.

10AP01-6

Early and late predictive factors of outcome in moderate and severe Traumatic Brain Injury: the Bergamo experience

Gritti P¹, Zangari R.², Ferri F.¹, Lanterna L.A.³, Lorini F.L.¹, Biroli F.²
¹ASST Papa Giovanni XXIII^o Bergamo, Dept of Anaesthesiology & Intensive Care, Bergamo, Italy, ²ASST Papa Giovanni XXIII^o Bergamo, Fondazione Ricerca Ospedale Maggiore, Bergamo, Italy, ³ASST Papa Giovanni XXIII^o Bergamo, Department of Neurosurgery, Bergamo, Italy

Background and Goal of Study: Outcome of traumatic brain injured (TBI) patients are related to primary and secondary insults consequent to the trauma. A large number of epidemiologic studies have focused on the primary insults and their derived early prognostic factors that involve outcomes. However, studies that brought to light as possible determinants of outcome, late brain CT features and tardive clinical variables of secondary insults as prognostic factors of head injury patients are still lacking. The purpose of this study is to compare early and late predictors of outcome in moderate and severe head injury patients and discover possible own role in the patient prognosis.

Materials and Methods: Patients with moderate and severe TBI admitted to the intensive care units (ICU) of a major trauma centre were studied in a retrospective cohort study. Data including mechanisms of injury, pre hospital and ICU interventions, clinical, biochemical, neuroradiological parameters, secondary insults and outcome assessments after 12-months post injury were collected.

Results and Discussion: Analysis concerned 193 patients, 75.6% were male, with median age of 49 years old. Intra hospital mortality was (20%), while overall mortality after one year of follow up was of 58 patients (30%). Patients with hypotension (< 90 mmHg), desaturation ($< 90\%$), GCS < 8 or a motor GCS < 3 , abnormal pupil response, glycaemic disturbances, hypernatremia or with platelets and prothrombin time coagulation altered, with the presence or a Marshall Classification score of IV^o, subdural haematoma intracranial pressure monitoring and intracranial hypertension were related to bad outcome at the univariate analysis. The presence at the late CT brain scan of posttraumatic cerebral infarction (PTCI) or posttraumatic hydrocephalus (PTH) and an Oxford Handicap Scale (OHS) of 4 and 5 at the final clinical evaluation performed at hospital discharge were related to bad outcome too. In multivariate analysis, age, OHS > 4 and the presence of PTCI and PTH were each independently associated with an increased risk of bad outcome.

Conclusions: PTCI and PTH results, with age and OHS, independent risk factors of bad outcome and could integrate the information of the early predictors as outcome measure finalized to optimize the prognosis and guide rehabilitation phase of the TBI patients.

Acknowledgements: GM. Marchesi, T Barbui, F Martorana, G. Molinero, G. Bonaldi, C. Bernucci, E. Bonanomi, C. Foresti, C. Castelli.

10AP01-7**Acute pulmonary embolism and chronic deep venous thrombosis in a polytrauma patient: role of bed-side ultrasound**

de Francisco Moreno J.¹, Marin Carcey L.¹, Espinar Garcia E.², Marrero G.N.³, Llaja Villa C.C.³, Vives Santacana M.³

¹Hospital Universitari de Bellvitge, Dept of Anaesthesiology & Intensive Care, Hospitalet de Llobregat (Barcelona), Spain,

²Hospital Universitari de Bellvitge, Angiology and Vascular Surgery, Barcelona, Spain, ³Hospital Universitari de Bellvitge, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain

Background: Pulmonary embolism (PE) often occurs in polytrauma patients due to the hypercoagulability state as well as immobilization. It is considered the third cause of mortality in a traumatic patient who survives 24 hours to the accident. It is unusual to diagnose PE immediately in the initial assessment of the patient. A case of a trauma patient with a PTE diagnosed at admission, presumably due to trauma of a thrombus in the same anatomical area where he had chronic deep vein thrombosis (DVT), is reported. The importance of early diagnosis of PE and/or DVT by bed-side ultrasound, leading to therapeutic implications, is emphasized.

Case report: A 51-year-old male patient who had a motorbike accident presented with a Glasgow Coma Scale of 15, hemodynamically stable and good gas exchange. The immediate CT scan showed an acute PE involving right lobar branches with right sacroiliac joint dislocation, and right femoral fracture. Lower limb venous doppler ultrasound showed a non-permeable and non-compressible distal right superficial femoral vein and popliteal vein, with a chronic thrombus visualised.

Pulmonary ultrasound showed a pattern of A-lines with preserved sliding. Osteotaxis of the pelvis and femoral transkeletal traction were urgently performed. An inferior vena cava (IVC) filter was inserted. Intramedullary nailing of femoral fracture and osteosynthesis with plate of pubic symphysis and sacroiliac screws was performed.

After 10 days, anticoagulation dose with tinzaparin was initiated and planned to be maintained for 6 months. Patient was transferred to a rehabilitation center.

Discussion: The diagnosis of PTE immediately after trauma is uncommon and should lead to suspicion of thrombus release. Ultrasound allows bed-side early diagnosis of several potentially fatal entities in the trauma patient. In this case it was useful for the diagnosis of DVT, whose diagnosis had therapeutic and prognostic implications. The diagnosis of DVT with contraindication for immediate anticoagulation led to IVC filter insertion.

References:

1. Rogers FB, Osler TM, Immediate pulmonary embolism after trauma: case report. *J Trauma* 2000 Jan;48(1):146-8.

2. Ruddy JM, Curry NS, Incidental pulmonary embolism identified on chest CT during initial trauma evaluation. *Am Surg.* 2008 Dec;74(12):1146-8

Learning Points: This case emphasizes the importance of performing a bed-side ultrasound to diagnose DVT in all traumatic patients with a PTE.

10AP01-8**Tracheobronchial injury - a challenge to anesthesiologists: a case report**

Azevedo J.¹, Amorim J.², Neves I.², Ormonde L.²

¹Centro Hospitalar de Setúbal, Dept of Anaesthesiology, Setúbal,

Portugal, ²Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background: Tracheobronchial injury is uncommon but life-threatening, being estimated that only 0.5% of all patients with multiple injuries have tracheobronchial injury.⁽¹⁾

Tracheal stents can be inserted through a rigid bronchoscope.⁽²⁾

Performing rigid bronchoscopy requires deep sedation or general anesthesia, whereas maintaining oxygenation and ventilation requires use of ventilation strategies. Jet ventilation uses a high-pressure gas source that is applied to an open airway in short bursts via a small-bore catheter.⁽³⁾

Case report: Female, 42 yo, ASA 2, victim of gunshot trauma with entry into the right scapular region and exit in the anterior cervical region, with right hemopneumothorax, pulmonary contusion, pneumomediastinum, extensive subcutaneous emphysema and tracheal fistula 5-6cm below the vocal chords - flexible bronchofibroscopy.

24h post-trauma sudden worsening with difficulty in ventilation with urgent need of placement of tracheal prosthesis. By rigid bronchofibroscopy and under Total Endovenous Anesthesia, by TCI - propofol and remifentanyl infusion and cisatracurium in bolus, a prosthesis was placed at fistula's level. High frequency jet ventilation with respiratory rate of 80-120 cpm, FIO₂ 1 and pressure between 2 and 2.5 bar was used. Hemodynamic stability was guaranteed with MAP - 70 mmHg and HR - 60-70 bpm. Continuous monitoring of O₂ saturation with 80-98% and EtCO₂ with 21-30 mmHg. After an hour of procedure transferred, on invasive mechanical ventilation and right thoracic drainage maintained and functioning, to the ICU. Extubated at 48h and discharged 2 months later, with the prosthesis already removed.

At 6 months after trauma, well and without sequelae.

Discussion: Because it is a rare clinical situation and with little bibliography, we consider its presentation pertinent. The importance of a rapid and interdisciplinary approach is vital.

References:

1. Riyad, K., & Douglas, E. W. (2007). Traumatic injury to the trachea and bronchus *Thorac Surg Clin*, 17, 35-46

2. Conacher, I. D. (2003). Anaesthesia and tracheobronchial stenting for central airway obstruction in adults. *Brit J Anesth*, 90(3), 367-374

3. Pathak, V., et al. (2014). Ventilation and anesthetic approaches for rigid bronchoscopy. *AATS*, 11(4), 628-634

Learning points: The approach of a patient with tracheal fistula is a challenge for the anesthesiologist due to the problems regarding the ventilation, as well as the urgency of the clinical situation.

10AP01-9**Predictive value of IL-1 and IL-6 in polytrauma patients with femoral fractures**

Lupescu D.¹, Dimitriu A.², Nagea M.³, Greabu M.⁴, Lupescu O.²

¹Buftea Hospital, Dept of Anaesthesiology & Intensive Care, Buftea, Romania, ²University of Medicine and Pharmacy, Carol Davila',

Orthopaedics and Traumatology, Bucharest, Romania, ³Clinical Emergency Hospital, Orthopaedics and Traumatology, Bucharest,

Romania, ⁴University of Medicine and Pharmacy, Carol Davila', Biochemistry, Bucharest, Romania

Background and Goal of Study: Polytrauma patients with femoral fractures are high energy injuries with significant impact upon the homeostasis. Early stabilization of the fracture is a resuscitative measure and two methods are used: Early Total Care (ETC) - primary nailing, or Damage Control (DC) - initial external fixator, then nailing, so as to avoid the second hit phenomenon. The purpose of this paper is to evaluate if using IL-1 and IL-6 as guiding markers for treatment can increase the efficacy of the orthopaedic unit in polytrauma patients

This study included 66 polytrauma patients with femoral fractures operated between 01.01.2014 - 01.01.2016 in the Clinical Emergency Hospital Bucharest, divided into group A - 38 patients, ETC and 28 patients- group B, with DC. The following inflammation tests were monitored: white blood cell count, ESR, fibrinogen, C reactive protein, IL-1 and IL-6. The evaluation criteria were: hospital stay, rates of MSOF and ARDS and local complications

Results and Discussion: The hospital stay was not influenced by the method of stabilization, but by the life threatening injuries and their evolution. Patients from DC group had a smaller rate of MSOF and ARDS even if they had higher traumatic scores. External fixation followed by intramedullary nailing was not associated with higher rate of complications than primary nailing (ETC).

The analysis of the data revealed that multidisciplinary team application of DC lead to a lower incidence of complications (although without statistical significance) Acute inflammation tests were correlated with the outcome, and IL 1 and IL 6 had the best capacity to predict complications. In patients where definitive stabilization was performed only after the remission of the inflammatory syndrome, the rate of complications was much lower.

Conclusions: ETC or DC can be used for femoral stabilisation in polytrauma patients, so as to void the second hit phenomenon. IL-1 and IL-6 can be used in choosing the less invasive pathway and to monitor the patients, so as to decrease mortality and morbidity. This study underlines the necessity of standardised use of these biochemical markers in current practice for increasing the efficacy of the multidisciplinary team in polytrauma patients

References: H. C. Pape et al, "Timing of fixation of major fractures in blunt polytrauma: role of conventional indicators in clinical decision making," *Journal of Orthopaedic Trauma*, 2005 (19): 8:551-562

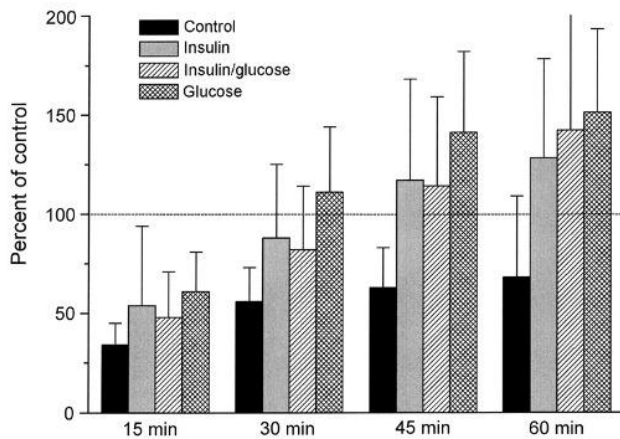
10AP02-1**Insulin does not reverse bupivacaine-induced cardiac asystole in vitro: the importance of drug elimination to be resuscitated**Park W.¹, Kim H.¹, Jung J.¹, Lynch C.²¹Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²University of Virginia Health System, Dept of Anaesthesiology, Charlottesville, United States

Background and Goal of Study: Insulin-glucose treatment effectively reverses severe BPV-induced myocardial depression or cardiovascular collapse in vivo. However, the mechanisms for the recovery are poorly defined.

Materials and Methods: After achieving asystole by 500 μ M BPV, different concentrations of insulin or insulin and 33 mM glucose were applied to determine the recovery of stimulated contractile responses and contractions in the right ventricular papillary muscles of guinea pigs. These experiments were performed under either recirculating or non-recirculating (washout) condition for 60 min. In the washout condition, the Tyrode solution containing insulin or insulin and 33 mM glucose (insulin/glucose) as well as glucose alone was superfused for 60 min. After achieving asystole, BPV concentrations in the Tyrode solution in the presence or absence of insulin were measured.

Results and Discussion: In the recirculation condition, there was a concentration-dependent decrease in contractility in both insulin and insulin/glucose groups. Neither insulin nor insulin/glucose restored the stimulated contractile responses from conduction disturbance or asystole induced by BPV. In the BPV-washout condition, while superfusion with a control solution for 60 min after achieving asystole by BPV restored contractility to approximately 60% of the baseline, complete as well as time-dependent recovery was observed in the insulin-, insulin/glucose-, and glucose-treated groups (Fig.1). BPV concentrations gradually decreased similarly in both the control and insulin-treated groups over 60 min.

Conclusion(s): Neither insulin nor insulin and 33 mM glucose application reversed BPV-induced cardiac asystole under recirculation conditions in vitro. However, insulin or insulin and 33 mM glucose can replenish the metabolic energy supply to the myocardium by facilitating glucose uptake. In vivo, immediate external or internal cardiac massage (to improve cardiac output) upon the onset of BPV-induced cardiac arrest appears to be exceedingly important and should be accompanied by insulin administration.



[Fig.1]

10AP02-2**Preliminary evaluation of intralipid vs. amiodarone for the prevention of bupivacaine induced ventricular arrhythmias in an experimental porcine model**

Melone A., López-Menchaca R., Callejo D., Sevilla R., Varela O., Zaballos M.

Gregorio Marañon General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: The current management of local anaesthetics (LA) induced arrhythmias remains uncertain. A survey of the practice among anaesthesiologists showed that they would choose amiodarone for the treatment LA induced ventricular arrhythmias (VA). Currently, lipid emulsions are considered the main treatment for bupivacaine (B) toxicity, including VA. However there is limited information regarding their efficacy on B induced VA. Our aim was to develop a model to study VA in the setting of a B intoxication, and evaluate if either intralipid or amiodarone have protective effect on these arrhythmias.

Materials and Methods: Sixteen Large-White pigs were premedicated with ketamine and anesthetized with intravenous sodium thiopental 5mg/kg and maintained with sevoflurane (2.6%). Femoral vessels were cannulated for invasive monitoring, analytical blood gas samples and B levels determinations. Two quadripolar catheters were used for stimulation and intracardiac recordings of the high right atrium and the right ventricular apex.

After instrumentation, the animals were randomized into three treatment groups that received saline (n=6), intralipid (n=5) or amiodarone (n=5) three minutes after B administration (4 mg.kg⁻¹ followed by an infusion of 100 μ g.kg⁻¹.min⁻¹). A modified programmed ventricular stimulation protocol (PVSP) was performed (at baseline and after 15 min of B perfusion). Ventricular pacing was set on maximal current strength at three basic cycle lengths (350, 400 and 600 ms).

After an 8-beat pacing train, PVSP was initiated with coupling intervals of 290, 280, 270, and 260 ms for the first through fourth extrastimuli.

Results: At baseline, only one animal developed VA after the PVSP. Following B administration, sustained ventricular tachydysrhythmias occurred with PVSP in 5 out of 6 animals in the saline group. In the intralipid group, one animal developed asystole, and the rest (4) presented paced-induced VA during B infusion. In amiodarone group, one animal was excluded due to technical problems; the rest of the animals (4) developed B-paced-induced VA. The arrhythmias observed were mainly ventricular flutter, ventricular fibrillation and polymorphic ventricular tachycardia.

Conclusions: This study shows a novel and reliable experimental model useful to evaluate B-pace-induced VA. Our preliminary data shows that neither intralipid nor amiodarone prevented paced-induced VA in the context of a porcine experimental model of B intoxication.

10AP02-3**Cardiac arrest after bilateral ankle fracture**

Arevalo J., Calvete Alvarez I., Alvarez Remetería R., Arcas Bellas J.J.

University Hospital Fundacion Jimenez Diaz, Dept of Anaesthesiology, Madrid, Spain

Background: Lower limb immobilization after bone fractures is a well-known cause of venous thromboembolism (VTE), and low-molecular-weight heparin (LMWH) treatment has shown to be an effective therapy in reducing the risk of VTE^{1,2}.

Case report: A 44 years old man suffered bilateral ankle fracture after car accident. Immobilization was performed on the emergency room and he was discharged with LMWH therapy until the day before surgery, scheduled 8 days later.

The day of surgery the patient received spinal anesthesia with bupivacaine 11 mg and fentanyl 20 mgr. Thirty minutes after the beginning of surgery he suffered dyspnea and a sudden cardiac arrest with pulseless electrical activity refractory to conventional treatment. Advanced cardiovascular life support (ACLS) maneuvers were then started. Transesophageal echocardiograph showed severe right ventricle dysfunction and a hyperechoic image in pulmonary artery suggesting pulmonary thromboembolism.

Taking into account the clinical situation the decision was made to proceed with emergent surgery with extracorporeal cardiopulmonary resuscitation

(ECPR) for trying to remove the pulmonary thrombus. A 29 cms thrombus from the pulmonary artery was removed.

The patient was taken to the Intensive Care Unit (ICU) where he died 72 h later.

Discussion: Physical examination showed lack of thromboprophylaxis as no signs of abdominal puncture secondary to LMWH treatment were observed. On the other hand, the decision of performing ECPR was based on the latest updated guidelines of the American Heart Association for ACLS³.

References:

1. Braithwaite I, et al. Lower limb immobilisation and venous thromboembolism risk: combined case-control studies. *Postgrad Med J.* 2016 Oct 26.
2. Chapelle C, et al. Prevention of venous thromboembolic events with low-molecular-weight heparin in the non-major orthopaedic setting: meta-analysis of randomized controlled trials. *Arthroscopy.* 2014 Aug;30(8):987-96.
3. Link MS, et al. Part 7: adult advanced cardiovascular life support: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation.* 2015; 132(suppl 2):S444-S464.

Learning points: LMWH therapy is mandatory after lower limb immobilization to prevent VTE.

Ultrasound may be considered as soon as available during the management of cardiac arrest.

ECPR may be considered if the suspected etiology of the cardiac arrest is potentially reversible.

10AP02-4

In-flight cardiopulmonary resuscitation during commercial air transport: consensus statement and supplementary guideline from the German society of aerospace medicine (DGLRM)

Hinkelbein J.¹, Cirillo F.², Hohn A.¹, Jansen S.³, De Robertis E.², Neuhaus C.⁴

¹University of Cologne, Dept of Anaesthesiology & Intensive Care, Cologne, Germany, ²University of Naples „Federico II“, Department of Neurosciences, Reproductive and Odontostomatological Sciences, Napoli, Italy, ³University Hospital of Cologne, ENT, Cologne, Germany, ⁴University of Heidelberg, Dept of Anaesthesiology, Heidelberg, Germany

Background and Goal of Study: Approximately 3 billion people worldwide will travel by commercial air transport in 2016. A calculation based on the number of passengers transported shows that between 1 out of 14,000 to 1 out of 50,000 passengers will experience acute medical problems during a flight. Cardiac arrest accounts for 0.3% of all in-flight medical emergencies, yet it is responsible for 86% of in-flight events resulting in death. So far, no guideline for in-flight cardiac arrest (IFCA) does exist providing specific treatment recommendations.

Materials and Methods: A task force was created to develop a guideline for the treatment of in-flight cardiac arrest based on clinical and investigational expertise in this area. By using a systematic literature search including GRADE, RAND, and DELPHI methods, specific recommendations for the treatment of IFCA have been created.

Results and Discussion: Several main recommendations have been developed: emergency equipment location as well as content should be mentioned in the pre-flight safety announcement; ECG should be available for patients with cardiac arrest, it is very important to request help by an on-board announcement after identification of a patient with cardiac arrest; two-person CPR is considered optimum and should be performed if possible; the crew should be trained regularly in basic life support - ideally with a focus on CPR in aircraft; a diversion should immediately be performed if the patient has a return of spontaneous circulation.

Conclusion(s): This is the first guideline providing specific treatment recommendations for in-flight medical emergencies during commercial air travel.

10AP02-5

Autonomy: patient centered decision making regarding cardiopulmonary resuscitation (CPR)

Élő G.¹, Zubek L.¹, Dobos M.², Gál J.¹

¹Semmelweis University, Dept of Anaesthesiology & Intensive Care, Budapest, Hungary, ²Zuglói Egészségügyi Szolgálat, General Practitioner, Budapest, Hungary

Background and Goal of Study: Patient's decisions concerning Do Not Attempt Resuscitation (DNAR) orders are influenced by physician's attitudes according to several previous investigations. These attitudes are based partly on physician's education as we have indicated previously. We have also pointed paternalistic attitudes of Hungarian medical practice out concerning Cardiopulmonary Resuscitation (CPR). Patient's attempts are inferior compared to medical opinion during DNAR decision in Hungary according to our assumption. Goals of this study were to measure patient's attitudes towards invasive procedures especially to CPR compared to a better educated control group.

Materials and Methods: 61 hospitalized patients and 39 control person (medical students) were asked to fill in a questionnaire about theoretically refused or accepted recommended procedures in a case-control study. These procedures were renal replacement therapy, intensive care, mechanical ventilation, artificial nutrition, amputation, transfusion, major analgetic administration and CPR respectively. Data were analysed using Fisher's exact test and Odds ratios were calculated.

Results and Discussion: Patients should have refused CPR more frequently as it was found in the control group (OR: 12.4, p<0.001). Also dialysis was refused in a greater extent among patients than it was found in control group (OR: 2.6, p<0.05). Patient's greater intent to refuse major analgetic drug administration were found unexpectedly compared to control group (OR: 4.2, p<0.001). Result could be explained by the misinformation of patients therefore it could show the bias of study. There were no additional significant differences found concerning all other procedures in two groups.

Conclusion(s): Patients tend to refuse CPR more frequently compared to better educated control group according to our findings. While Hungarian law supports patients autonomy, detailed regulations block the emergence of DNAR orders in medical practice. Our activity to change the Hungarian Patient's Rights Act one hand and bioethically influenced medical education on the other can improve patients autonomy concerning CPR. European Resuscitation Council detected significant variability in the approach to CPR all over Europe, and declared ERC's mission to contribute to harmonisation in legislation, jurisdiction, terminology and practice. This effort could help improving patient's autonomy concerning DNAR orders in Hungary.

10AP02-6

Usefulness of the Bispectral Index (BIS) in patients treated by extra corporeal life support (ECLS) for refractory cardiac arrest

Jouffroy R., Idialisoa R., Philippe P., Baud F., Carli P., Vivien B.
APHP - Hôpital Necker Enfants Malades, Dept of Anaesthesiology & Intensive Care, Paris, France

Background and Goal of Study: Despite increasing use of extracorporeal-life-support (ECLS) for treatment of refractory cardiac arrest (CA) patients, prognosis remains dismal, often resulting in brain-death. BIS is a tool that allow early brain death detection in severely comatose patients [1].

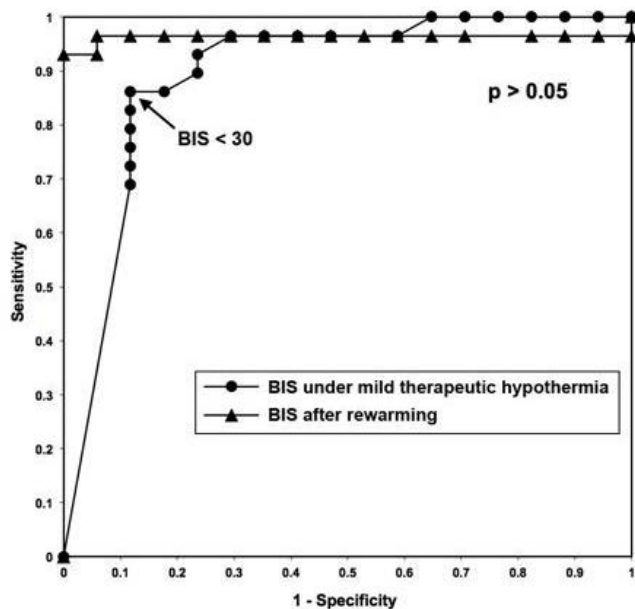
However, clinical assessment of brain-death onset is difficult in post-CA patients, sedated, paralyzed and under mild therapeutic hypothermia (MTH).

The objective of this study was to assess usefulness of Bispectral Index (BIS) monitoring for detection of brain-death onset in refractory CA patients treated by ECLS.

Materials and Methods: We performed a retrospective study in an intensive care unit. Forty-six patients suffering from refractory CA treated by ECLS were included. BIS was continuously recorded during ICU hospitalization. MTH was induced after ICU admission and prolonged up to 24hours. Clinical brain-death onset was confirmed when appropriate by EEG and/or cerebral CT scan.

Results and Discussion: Twenty-nine patients evolved into brain-death and had average BIS values under MTH and after rewarming (temperature $\geq 35^{\circ}\text{C}$) of 4 (0-47) and 0 (0-82), respectively. Among these, 11 (38%) entered into a

procedure of organs donation. Among the 17 non-brain-dead patients, the average BIS values at admission and after rewarming were 39 (0-65) and 59 (22-82), respectively. Two patients had an admission BIS value equal to zero and evolved to a poor prognostic (Cerebral Performance Category scale of 4) and died after care limitations. In both groups, no difference was observed between the AUCs of ROC curves for BIS values under MTH and after rewarming (respectively 0.85-0.96, $p > 0.05$).



[ROC curves BIS ECLS during MH and after rewarming]

Conclusion(s): Despite mild hypothermia a lower BIS value, in CA patients treated by ECLS, is associated with a poor neurological outcome. Since BIS monitoring is non invasive and its interpretation requires a limited training, it could be used in refractory patients under ECLS and mild therapeutic hypothermia in ICU, in order to reduce time to organ harvesting and reducing waste of health resources in futile resuscitation.

References: 1. Vivien et al. Intensive Care Med. 2002

10AP02-7

The presence of status epilepticus (SE) and the use of BIS for prognostication after out-of-hospital cardiac arrest (OHCA)

Vanderspikken X.¹, Eertmans W.², De Deyne C.¹, Heylen R.¹, Vander Laenen M.¹, Jans F.¹

¹ZOL Genk, Dept of Anaesthesiology & Intensive Care, Genk, Belgium, ²University Hasselt, Faculty of medicine, Diepenbeek, Belgium

Background and goal of Study: Prognostication during the post-cardiac arrest period remains challenging, but is frequently requested by family members. Low BIS values and zero BIS values at certain time-points after OHCA are suggested to predict poor neurological outcome or death (1,2,3). In one study a BIS value of 45 at 24h was suggested as cut-off value for good neurological outcome (2). SE frequently occurs in this patient population and since epileptic activity influences the BIS signal, we hypothesized that the occurrence of SE in this population may influence the value of BIS for prognostication.

Materials and Methods: With ethics committee approval, we prospectively applied bilateral BIS- monitoring (BIS VISTA™, Aspect Medical System) in all consecutive post OHCA patients at ICU admission. They were all treated with therapeutic hypothermia (TH, 33°C for 24h). Continuous BIS monitoring was performed during a 36h period. Full EEG was obtained at day 1. The dosing of sedative agents was collected for each patient. Data are reported as mean ± SEM. Means were compared using ANOVA.

Results and Discussion: BIS data obtained from 77 OHCA patients were analyzed (figure 1). Patients were divided in 3 groups: survivors without SE (n=37), non-survivors without SE (n=21) and patients with SE (n=19). All patients with SE, except one, were non-survivors. Data from the survivor with

SE were not used for further analysis. Analysis of BIS values at time 24h (after start TH) revealed BIS values of 59 ± 4 in the survivor-group without SE; 45 ± 4 in the non-survivors with SE and 34 ± 7 in the non-survivors without SE.

Mean BIS values at 24h were different between the survivors without SE and the non-survivors without SE ($p = 0.001$). The difference between the survivors without SE and the non-survivors with SE was not statistically significant ($p = 0.089$).

Conclusion(s): When using BIS values for prognostication, the presence of SE and its influence on BIS values should be taken into account.

References:

1. Stamat P et al. Resuscitation 2009; 80:437-442.
2. Leary M. et al. Resuscitation 2010; 81:1133-7.
3. Selig C. et al. Resuscitation 2014; 85:221-6.

10AP03-1

Anesthesia and critical care at sea? Spanish medical experience on board in the Indian Ocean (July-October 2015)

Navarro-Suay R.¹, Tamburri-Bariain R.², López-Soberón E.³, Castillejo-Pérez S.¹, Hernández-Abadía de Barbará A.⁴, García-Aroca M.A.³

¹Hospital Central de la Defensa Gómez Ulla / IMIDEF, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Hospital Central de la Defensa Gómez Ulla / IMIDEF, Dept of Surgery, Madrid, Spain, ³Hospital Central de la Defensa Gómez Ulla, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ⁴Hospital Central de la Defensa Gómez Ulla / IMIDEF, Dept of Intensive Care, Madrid, Spain

Background and Goal of Study: To describe medical capabilities and surgical and critical activity carried out in the Amphibious L-51 "Galicia" Assault Ship during Operation European Union "Atalanta" developed at Indian Ocean from July 26 to October 5, 2015.

Materials and Methods: Observational, descriptive, retrospective study carried out in the hospital of the L-51 Galicia Ship (Spanish Navy) from July 26 to October 5, 2015. Inclusion criteria: patients admitted to the resuscitation unit. Exclusion criteria: none. There are three types of variables: independent (disease, accident, attack), dependents (mortality -yes/no-, need for surgical intervention -yes/no-, need for anesthesia -yes/no-, need for blood components -yes/no-, need for telemedicine -yes/no-) and sociodemographic and control (sex, age, civil / military). The material used to measure these variables was a data collection sheet. Variables were evaluated by reviewing medical records. Finally health care is described based on the capabilities of the vessel. The corresponding military authorization has been obtained.

Results and Discussion: During the study period, 1778 medical assistance was carried out on the ship. Of these, 27 patients were admitted to the critical care unit (24 disease, 3 accident, 0 attack), 2 surgical procedures were performed, 8 anesthetic techniques. One patient was evacuated to the Central Hospital of Defense "Gómez Ulla" of Madrid (Spain) employing a Spanish Air Force medicalized airplane, 4 civilians (Spanish fishermen) were taken care of - one of them evacuated until the Civil Hospital of the Seychelles. Of the patients admitted, 25 were males and 2 females. Three units of packed red blood cells were transfused and 2 telemedicine consultations were performed. None of the patients died on board during the study period.

Conclusion(s): Anesthesia and critical care at sea is a challenge due to the peculiarities of the environment, isolation and the scarcity of resources. In this area of operations, anesthesiological and resuscitation standards were similar to those provided in Europe.

10AP03-2**Spontaneous hepatic rupture after revascularization during liver transplantation**

Albajar Bobes A., López M., Casado M., Abdallah N., Azcoitia J., García J.

Hospital Universitario Puerta de Hierro, Majadahonda, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Introduction: Spontaneous hepatic rupture has been describe before in as-ociation with some conditions but there is only few cases in which a sponta-neous liver rupture during transplantation has been reported(1). We present one of these cases, requiring total hepatectomy and portocaval shunt, fol-lowed by retransplantation.

Case report: A 65 year-old man HVC positive with chronic hepatopathy,was admitted for a liver transplantation. The donor had a history of Chagas dis-ease with normal liver function tests. After completing the caval and portal anastomosis, the liver was revascularized. Within minutes it developed mul-tiple large subcapsular haematomas that spontaneously ruptured leading to an uncontrollable hemorrhage. Despite all the efforts to stop the bleeding the liver continue to rupture, forcing the surgeons to perform an hepatectomy of the implanted liver and a portocaval anastomosis. The patient was taken to the ICU and was retransplanted 14 hours later.

Discussion: Spontaneous hepatic rupture is rare. The exact aetiology is not well understood(1). Because of this rare condition, no single institution has accumulated enough experience to make recommendations about treat-ment(2). In an unstable patient with rupture of the liver, operation is necc-essary. Sometimes perihepatic packing, segmentectomy or hemihepatectomy are enough. In others the only treatment is total hepatectomy followed by trasplantation. Over the last years, the technique of venovenous bypass is become more selective. However it has been use in most of the cases during the anaepathic phase if the trasplantation was carried out in two phases(3). Our patient was not placed in bypass. The most common complications that could occur with this technique are those related with venous hypertension.

References:

1. Mistry,B.Spontaneous rupture of the liver upon revascularization during transplantation. *Transplantation* 2000;69:2214.
2. Mascarenhas,R.Spontaneous hepatic rupture: a report of five cases. *HPB* 2002;4(4):167-170.
3. Sanabria,R. Total hepatectomy and liver transplantation as a two-stage pro-cedure for fulminant hepatic failure: A safe procedure in exceptional circum-stances. *World J Hepatol.* 2016,8(4):226.

Learning points: Selection of a suitable donor is one of the most important factors for a succesful outcome after trasplantation. Eventhough in our case a venovenous bypass was not used, it could be useful in order to decompress the systemic and portal venous systems and, reduce this way, the possible complications.

10AP03-3**The use of hydroxyethyl starch130/0.4 in major burns: a retrospective study**

Guilabert P., Usúa G., Abarca L., Martín N., Salazar K., Sharp A.

Hospital Universitari Vall d'Hebron, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain

Background and Goal of Study: Major burns require a huge resuscitation with more fluids than any other traumatic patient. The use of Hydroxyethyl Starches (HES) in these patients was a normal clinical practise until 2013, when the PRAC issued an alert about the use of HES in septic, critical care pa-tients and burns¹, but the studies in which the recommendations were based did not include major burn patients².

After reviewing the evidence in burns there were no studies showing bad out-comes whit the use of HES in burns^{2,3}. We carried on a retrospective study in our burn unit to determinate if the use of HES 130/0.4 in Burns is related to an increased mortality.

Material and methods: A retrospective cohort study on mortality associ-ated to volume replacement with HEA 130/0.4 during the period 2012-2015 in patients older than 18 years who were admitted in Vall d'Hebron University Hospital Burn Unit with burns in more than 20% of the Body Surface Area. The main objective is to determine whether the use of HEA 130 / 0.4 is associated with increased mortality in the large burned patient at 28 days.

The secondary objective is to see if the use of HEA 130 / 0.4 is also related to an increase in mortality at 90 days.

Results and Discussion: Of the 113 patients initially selected through cod-ing in the database, 17 were excluded due to coding errors, 5 were follow-up losses due to relocation to other centers in the study period 32 were excluded due to lack of information, and 2 because of a limitation of therapeutic effort from admission. Of the 57 remaining, 30 received HEA and 27 did not receive it. In the HEA group the mean score of the ABSI severity scale was 9.40 where-as in the No-HEA group it was 9.07 (non statistically significant differences). Mortality at 28 days was 10% in the HEA group and 29.6% in the No HEA and at 90 days 32.1% in the HEA and 32.0% in the HEA, in neither case the results were statistically significant.

Conclusion(s): There were no significant differences in mortality at day 28 and 90 with the use of HES 130/0.4 in major burns. More prospective random-ized studies about this issue are needed.

References:

1. European Medicines Agency. *Ema/640658/2013* 2013; 44:1-3
2. Guilabert P, Usúa G, Martín N, et al. *Br. J. Anaesth.* 2016; 117:284-96
3. Vlachou E, Gosling P, Moiemens NS. *Burns* 2010; 36:984-91

Acknowledgements: To MJ Colomina

10AP03-4**Validation of a delocalized measurement method of lactate for septic patients**

Jouffroy R.¹, Leguillier T.², Boisson M.², Nivet Antoine V.²,

Beaudeux J.², Benoit V.¹

¹APHP - Hôpital Necker Enfants Malades, Dept of Anaesthesiology & Intensive Care, Paris, France, ²APHP - Hôpital Necker Enfants Malades, Biochemistry, Paris, France

Background and Goal of Study: Septic shock is defined as a sepsis with hyperlactaemia greater than 2mM after correction of hypovolemia requiring vasopressors to maintain MBP>65mmHg [1]. It can be observed in pre-hos-pital emergency medicine (PHEM). The use of a reliable portable device for measuring lactate in PHEM would allow a better evaluation of septic patient facilitating their orientation towards intensive care unit (ICU) or emergency department (ED). This portable delocalized biology device must be validated against the laboratory reference method (NFEN ISO 22870) [2]. The aim of this study was to clarify the validity of a delocalized measure of lactatemia.

Materials and Methods: We performed a prospective study including 47 patients admitted into ICU for septic shock (CPP number 2015-08-03 SC). Lactate was measured in parallel on 2 samples: one capillary with the portable device (Lactate StatStrip Xpress, Nova Biomedical) and the other venous on a centrifuge tube for plasma analysis (Architect C16000 Abbott Diagnostics). We evaluated the analytical performance (coefficients of variation (CV) for repeatability and reproducibility evaluated at 2 levels of quality control (QC): 1.6 and 3.6mM) and then the concordance between lactate levels measured by the devices and lactate levels measured by laboratory analyzer.

Results and Discussion: At the QC concentrations tested, the CVs were in agreement with the limits set by the French Society of Clinical Biology: CV <3% for repeatability and <5% for reproducibility. An excellent correlation was observed between the 2 measurements: correlation coefficient R2=0.98, slope=0.95 and ordered at the origin=0.1. The latter suggested a low positive bias of the device not confirmed by Bland-Altman graph analysis and graph of the differences.

Conclusion(s): We verified the analytical performance of the device and showed an excellent correlation with the laboratory measurement. The de-localized measure can be used in PHEM in patients with suspected sepsis syndrome. This measure should allow a more accurate and early assessment of their severity in order to improve triage and hospital orientation between ED and ICU.

References: 1. M. Singer *et al. JAMA.* 2016.

2. COFRAC SHGTA01-Guide technique d'accréditation en Biologie Médicale

10AP03-5

Body temperature retrieved/collected during the SAMU regulation call: a link with ICU admission of severe septic patients

Jouffroy R., Durand S., Pascal P., Michaloux M., Carli P., Vivien B.
APHP - Hôpital Necker Enfants Malades, Dept of Anaesthesiology & Intensive Care, Paris, France

Background and Goal of Study: Seventy four per cent of cases of fever is due to sepsis in hospitalized patients [1] and it has been observed that fever occurring in sepsis may be associated with a survival benefit [2]. The aim of this study was to specify whether a relation exist between the body temperature collected during the regulation call to the SAMU center 15 and the ICU admission of severe septic patients.

Materials and Methods: We conducted a retrospective observational study between April 01 and May 31 2011 based on the reports collected during the regulation call to the SAMU center in Paris. All patients presenting sepsis criteria, as defined by the common consensus conference SFAR-SRLF 2005 [3], were included in the study. The primary outcome was the admission in intensive care unit (ICU).

Results and Discussion: Over the study period and among the 30 642 reports received, one hundred sixty-three patients fulfilled severe sepsis criteria were included. Fifteen patients (9%) were admitted in an ICU and 3 (20%) died at D28. The median body temperature collected during the regulation call was $37.9 \pm 1.2^\circ\text{C}$ for patients admitted in an ICU and $38.5 \pm 1.1^\circ\text{C}$ ($p < 0.014$) for those non-admitted in an ICU.

A significant association between the temperature retrieved during the regulation call and the ICU admission, was observed, $\text{OR} = 0.52$ [0.38-0.70], $p = 4.10 \times 10^{-4}$. Fever (temperature above 38.2°C) was negatively associated with ICU admission, $\text{OR} = 0.15$ [0.04-0.54], $p = 0.004$. Hypothermia (temperature below 36.4°C) was positively associated with ICU admission, $\text{OR} = 4.05$ [1.29-12.67], $p = 0.02$.

Conclusion(s): Sepsis is a complex multifactorial entity with individual and collective clinical and biological involvement for organizational and economic concerns. In this retrospective monocentric study, we observed an association between the body temperature collected during the regulation call of the SAMU center 15-Paris and ICU admissions. Fever, a frequently used criterion in the screening and the diagnosis of sepsis is not associated with ICU admissions unlikely to hypothermia.

Further studies should be performed to further clarify these preliminary results.

References:

1. Kaul et al. J Gen Intern Med. 2006
2. Walter et al. Critical Care
3. Pottecher et al. Crit Care. 2006.

10AP03-6

Massive cerebral air embolism after retrograde endoscopic cholangiopancreatography (ERCP)

Hinojal Blanco I., Batalla A., Bainac Albadalejo A., Parrilla Quiles L., Moral García V.
Hospital de la Santa Creu i Sant Pau, Dept of Anaesthesiology & Pain Medicine, Barcelona, Spain

Background: Retrograde endoscopic cholangiopancreatography (ERCP) is the reference technique in the diagnosis and treatment of pancreatic duct and biliary tree pathology. It is a complex technique with possible complications, which have been widely described, such as pancreatitis, cholangitis, hemorrhage or perforation. But there are other potentially lethal complications, such as air embolism, which need to be identified and treated as soon as possible (1).

Case report: 32-year-old woman who underwent ERCP due to choledocholithiasis. Sedation was performed with midazolam and propofol. After the sphincterotomy, the patient suffered from desaturation, bradycardia and livers in the right hemithorax, so that resuscitation maneuvers were initiated and the patient was intubated. The patient regains rhythm in 1 minute, but low level of consciousness persisted with deviation gaze to the left. A complete CT was ordered, which showed massive cerebral air embolism and an important amount of air in the periportal space.

The patient was transferred to ICU, transthoracic echography is performed, which did not reveal permeable ovale foramen (POF). The patient progresses to brain death within 24 hours. The autopsy found the existence of POF

Discussion: Aerial embolism is a rare complication, and more so, in the brain territory. For this to happen, a right-left communication is necessary. Due to the high mortality rate, air embolism should be detected as soon as possible and immediate treatment must be initiated: stopping the procedure, administering O₂ at 100%, left lateral *decubitus* or trendelenburg position, performing an urgent echocardiogram, attempting to aspirate the air if possible, and considering hyperbaric chamber, if possible. (2)

References:

1. Adverse events associated with ERCP ASGE STANDARDS OF PRACTICE COMMITTEE, American Society for Gastrointestinal Endoscopy. August 2016.
2. Air Embolism after ERCP in a Patient with Budd Chiari Syndrome. Wills-Sanin, B. Et al. Case Reports in Critical Care. Volume 2014, Article ID 205081.

Learning points:

1. Air embolism is an unusual but possible complication while ERCP
2. It should be considered if a patient suddenly develops hypotension, hypoxia or new neurologic symptoms after the procedure.
3. If suspected, early treatment is mandatory.

10AP03-7

Scoring systems for mortality in patients with intestinal perforation

Tsuuchi Y.¹, Hijikata T.¹, Miyazaki M.¹, Mihara T.²
¹Itabashi Chuo Medical Center, Dept of Anaesthesiology,
Tokyo, Japan, ²Kanagawa Children's Medical Center, Dept of Anaesthesiology, Yokohama, Japan

Background: Intestinal perforation is a life-threatening condition that is associated with high morbidity and mortality. Reliable methods to predict its associated mortality have not been established.

The goal of this study was to develop a scoring system for mortality in patients with intestinal perforation.

Methods: This study evaluated data from 677 patients who were diagnosed with intestinal perforation in our hospital from January 2005 to March 2016. A total of 75 parameters were selected and assessed for multicollinearity, of which 23 parameters were determined to be predictive factors.

We performed a logistic regression using stepwise selection with Akaike's information criterion and determined the best predictive model for mortality within 28 days of hospital admission. The odds ratio was determined for each predictive factor, and the calculation for the mortality risk score was the sum of the odds ratios.

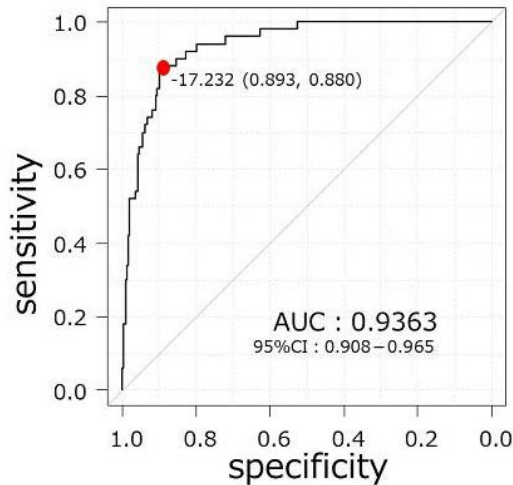
The predictive ability of the risk score was examined by generating the receiver operating characteristic (ROC) curve and the grey zone (defined as the range without >90% sensitivity or specificity) approach.

Results: The mortality risk score included nine parameters: age, sex, mean blood pressure, body temperature, heart rate, board-like rigidity, haemodialysis, serum albumin level, and C-reactive protein value.

Values	Score
Demographic Data	
sex (female)	-1
age (years)	x0.1
Vital sign and physical findings	
mean blood pressure (mmHg)	x - 0.02
body temperature ($^\circ\text{C}$)	x - 0.4
heart rate (bpm)	x0.02
board like rigidity	-1
Blood exam	
serum albumin level (g/dl)	x - 3
C-reactive protein value (mg/dl)	x - 0.04
Past history	
Hemodialysis	3
Total	The mortality risk score

[Fig. 1: The mortality risk score]

The best cutoff point was -17.232 (sensitivity: 89.3%; specificity: 88.0%), the area under the ROC was 0.936 (95% confidence interval: 0.908-0.965)



[Fig. 2: ROC curve]

and the grey zone ranged from -17.77 to -17 points, which included 4.8% of the patients.

Conclusion: We established a mortality risk score for patients with intestinal perforation. The score could predict mortality with >90% accuracy in approximately 95% of the patients. Further prospective observational studies are needed to evaluate the validity of this mortality risk score.

10AP03-8

Development and validation of scoring systems for the risk of cerebral infarction

Hijkata T.¹, Ito T.¹, Nishizaka M.¹, Mihara T.²

¹Itabashi Chuo Medical Center, Dept of Anaesthesiology & Intensive Care, Itabashi, Japan, ²Kanagawa Children's Medical Center, Dept of Anaesthesiology, Yokohama, Japan

Background: Patients with cerebral infarction (CI) often present at the emergency room; however, it is difficult to make a correct diagnosis of CI when the patient does not show apparent symptoms. This study aimed to develop and validate a new scoring system for the risk of CI.

Methods: Data used in this study were from 1,553 patients who were suspected of having CI and were examined using computed tomography (CT) and magnetic resonance imaging (MRI) the same day. In our hospital, all patients with suspected CI were examined using CT and MRI, and CI was diagnosed by a radiologist using MRI imaging. We randomly divided the data into 2 groups [development phase (n=777) and validation phase (n=776)]. Using logistic regression analysis with Akaike information criterion stepwise selection, we determined the best predictive model for CI. The scores of the selected predictors were determined using their odds ratio, and the CI risk score was calculated by adding them together. We examined the predictive ability of the score by generating a receiver operating characteristic (ROC) curve for both the development and validation phases. We calculated the area under the curve (AUC) of the ROC, as well as the sensitivity and specificity at the best cut-off point.

Results: The CI risk score included the following 12 factors: acute onset (<24h), mean blood pressure, smoking, Barre's sign, visual field loss, motor disorder of the extremities, headache, seizures, history of cerebral stroke, acute low density area of CT, activated partial thromboplastin time, and prothrombin time.

In the validation phase, the AUC was 0.75 (95% CI: 0.71-0.79) and the best cut-off point was 10.45 (sensitivity: 88%, specificity: 56%).

Conclusion: We established and validated the CI risk score with relatively high accuracy. We consider that the risk score is useful for not only predicting CI but also deciding on early treatment in clinical settings.

Values	Score
Onset (<24h)	2
Vital sign and physical findings	
Mean blood pressure (mmHg)	x 0.05
Abnormal Barre	2
Paralysis of limbs	2
Visual defect	9
Headache	-2
Past history	
Smoking	1
Epilepsy	-10
Stroke	-1
Blood exam	
APTT	x -0.1
PT-INR	x 3
Acute low density area of CT	8
Total	The CI risk score

CI: cerebral infarction APTT: activated partial thromboplastin time

PT: prothrombin time CT: computed tomography

[Fig. 1: CI risk score]

10AP03-9

Pediatric Contacts to a Danish Emergency Medical Dispatch Center: what can we learn about pediatric emergencies?

Andersen K., Mikkelsen S., Jørgensen G., Zwisler S.

Odense University Hospital, Dept of Anaesthesiology, Odense, Denmark

Background and Goal of Study: Little is known about pediatric emergency contacts made to Danish Emergency Medical Dispatch Centers (EMDCs). Thus, this study aimed to collect epidemiological and emergency response data on pediatric contacts.

Materials and Methods: In this retrospective, descriptive study, data was extracted from the EMDC in the region of Southern Denmark - an area covering approx. 1.200.000 inhabitants.

Audio recordings of all emergency calls made in February 2016 were collected from the EMDC's records. Calls concerning pediatric patients (age ≤ 15 years) were analyzed to establish epidemiological data and the emergency response, as well as the medical classification code (the "Danish Index-code") assigned by the medically trained EMDC-respondents. The Danish Index is the medical classification system used in Danish EMDCs. It consists of 32 categories (e.g. convulsions), each with multiple specific codes (e.g. fever and convulsions or epilepsy and convulsions).

Permission to access the data was granted by The Danish Data Protection Agency. Case number: 16/8773.

Results and Discussion: The EMDC received a total of 7052 emergency calls in February 2016. Approx. 7.0% (n = 490) concerned pediatric patients, 24 of these being re-dials. Thus, 466 individual pediatric contacts were analyzed.

The most frequent Danish Index-categories assigned to the contacts were "convulsions" (21.9%) and "sick child" (19.1%). In the "convulsions" category, the most frequent code was "febrile convulsions for the first time" (49.0%). In the "sick child" category, the most frequent code was "breathing difficulties and seems exhausted" (31.4%).

The most common emergency response was level A (immediate dispatch of an ambulance with sirens and lights on) with additional emergency physician support (56.2%). Level A without emergency physician support accounted for 13.5% of the contacts and level B (immediate dispatch of an ambulance, but with sirens and lights off) also accounted for 13.5%. In 13.3% of the cases no response was sent or the call was diverted to another authority (e.g. the patient's primary care physician).

Conclusion: Pediatric calls accounted for almost 7% of the EMDC's contacts. The children were typically categorized as being critically ill, often with convulsions or breathing difficulties, and assigned a level A-response. In most cases, additional support from an emergency physician was also sent.

Respiration and Airway Management

11AP01-1

A comparison of the i-gel™ with the self-pressurised air-Q™ intubating laryngeal airway in the elderly patients: a randomized controlled trial

Lee J.S.¹, Ha S.H.¹, Lee K.-Y.², Kim M.-S.³

¹Gangnam Severance Hospital, Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Yonsei Cancer Center, Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ³Severance Hospital, Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Supraglottic airway devices with noninflatable cuff have advantages in omitting the cuff pressure monitoring and reducing potential pharyngolaryngeal complications. Typical devices without cuff inflation are the i-gel™ and the self-pressurised air-Q™ intubating laryngeal airway (air-Q SP). The purpose of this randomized study was to compare the i-gel™ and the self-pressurised air-Q™ intubating laryngeal airway (air-Q SP) in elderly patients undergoing general anesthesia.

Materials and Methods: This prospective, randomized controlled trial study was approved by the Institutional Review Board (NCT02260427). One hundred patients, 65-90 years of age and scheduled for elective surgery in which supraglottic airway devices would be suitable for airway management, were randomly assigned to either the i-gel or the air-Q SP. Oropharyngeal leak pressure and fiberoptic view (from 1; vocal cord not visible, to 5; vocal cords fully visible) were assessed three times as follows: after insertion and fixation of the device, 10 min after initial assessment. We also assessed insertion parameters and complications.

Results and Discussion: Insertion of the i-gel was regarded as significantly easier compared to the air-Q SP (Table 1).

	i-gel (n=48)	air-Q SP (n=48)	p value
Successful insertion at first attempt	40 (83.3%)	32 (66.7%)	0.099
Overall insertion success	48 (100.0%)	46 (93.8%)	0.475
Insertion time (s)	17.5 (15.4-25.0) [12.0-40.6]	20.3 (14.8-28.0) [12.0-105.0]	0.658

[Table 1. Insertion characteristics]

Compared to the air-Q SP group, the i-gel group had significantly higher oropharyngeal leak pressures at all measurement points (Table 2).

		i-gel (n=48)	air-Q SP (n=46)	p value
Oropharyngeal leak pressure (cmH ₂ O)	Initial assessment	23.2 (5.9)	17.8 (4.8)	<0.001
	10 min after initial assessment	23.0 (6.3)	18.6 (4.8)	<0.001
Fiberoptic view through device (1/2/3/4/5)	Initial assessment	1/3/8/10/26	1/3/1/10/31	0.211
	10 min after initial assessment	1/3/7/15/22	1/4/3/5/32	0.075

[Table 2. Sealing function and fiberoptic view]

Given these findings, time for molding of the air-Q SP to the posterior pharyngeal wall may be required to improve airway sealing. The air-Q SP group had better fiberoptic views than the i-gel group at all measurement points. Considering its better glottis view, the air-Q SP may be more beneficial for a conduit to insert the tracheal tube in difficult intubation situation.

Conclusion(s): Our results showed that the i-gel had easier insertion and better sealing function, and the air-Q SP provided improved fiberoptic views in elderly requiring general anesthesia.

11AP01-3

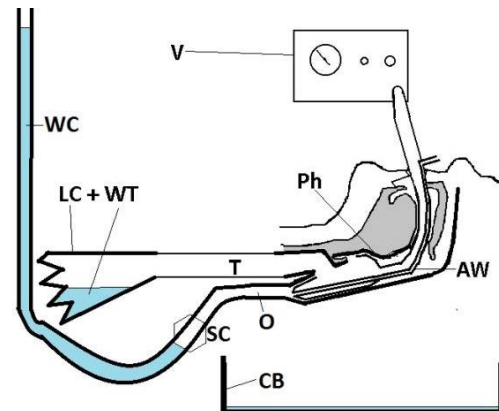
Comparison of aspiration protection by extraglottic airways in an anatomically-correct regurgitation model

Hofmeyr R.¹, Miller D.²

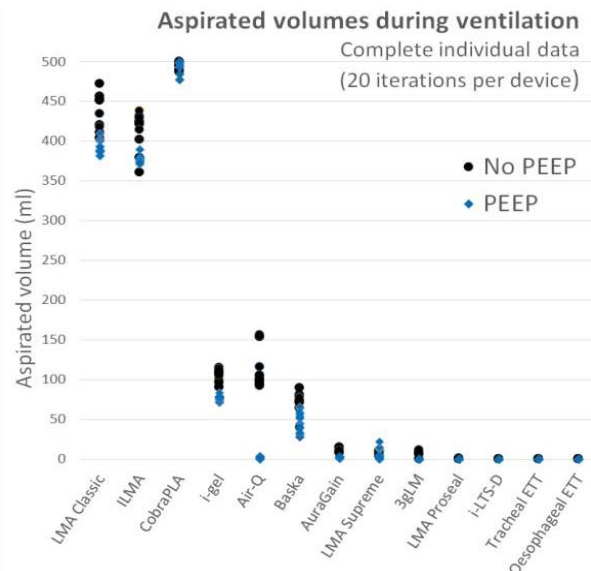
¹University of Cape Town, Department of Anaesthesia and Perioperative Medicine, Cape Town, South Africa, ²Guy's & St Thomas' NHS Foundation Trust, Dept of Anaesthesiology, London, United Kingdom

Background and Goal of Study: The most common cause of airway morbidity/mortality during anaesthesia or resuscitation is aspiration of gastric contents. Even the traditional gold standard (a cuffed endotracheal tube) does not guarantee protection. Extraglottic airway device (EAD; supraglottic airway; SGA) use has steadily increased, playing vital roles in routine and difficult airway management. However, EADs may be associated with increased aspiration, and employ many design features to reduce risk. *In vivo* heterogeneity has led to limited literature robustly comparing devices. We developed a laboratory model to allow repeated, accurate and direct testing.

Materials and Methods: An airway model was created using latex moulds of cadavers in combination with normal three-dimensional computed tomography scans. An elastomer with compliance similar to human tissue was selected. The trachea was connected to a test lung, and oesophagus via a stopcock to a water column, allowing simulated passive regurgitation. A ventilator delivered intermittent positive pressure ventilation with and without positive end-expiratory pressure (PEEP). Water entering the test lung during each iteration was measured. Thirteen SGA/EAD configurations were tested, each with 20 iterations.



[Figure 1 - Model]



[Figure 2 - Results]

Results and Discussion: See Figure 2. Devices could be grouped into those providing complete (or near-complete), partial, and no protection. Those designed to provide aspiration protection outperformed basic devices when confronted with passive regurgitation.

Conclusions: We report repeatable, direct comparison of EADs in an anatomically accurate model, demonstrating the utility of laboratory comparison. Combination with prospective registry/study data on aspiration associated with EAD use *in vivo* will guide future design.

Acknowledgements: Drs Ashok Nair and Imran Ahmad for invaluable assistance with the pilot testing.

11AP01-4

Comparison of intubating laryngeal mask (Fastrach™) and intubating laryngeal tube (iLTS-D) in normal and simulated difficult airways - a prospective manikin study

Andreenko A., Faizov I., Grachev I.

Military Medical Academy, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation

Background: The intubating laryngeal tube (iLTS-D®) and the intubating laryngeal mask (Fastrach™) are devices that offer supraglottic ventilation and secondary blind and endoscopic tracheal intubation.

Goal of Study: To compare the effectiveness of using Fastrach™ and iLTS-D® on a mannequin by novices resident anesthesiologists in the conditions of normal and simulated difficult airways.

Materials and Methods: A total of 15 participants were enrolled. At the first stage the participants conducted four consecutive trials on a manikin. Participants inserted iLTS-D® and Fastrach™ and ventilated the manikin. 'Time to ventilation', success rates were recorded. Then participants performed blind intubation of the manikin through the previously inserted device. 'Time to tracheal ventilation', success rate of intubation were recorded. At the second stage participants performed the same actions in the conditions simulated difficult airways. The primary endpoint was the difference between the devices in 'time to ventilation' and 'time to tracheal ventilation' after trial 4 and at the second stage.

Results and Discussion: All of the participants successfully inserted both devices on their first attempt in trial 4 and successfully intubated through iLTS-D® in trial 4; it was 2 case of second attempt intubation through Fastrach™. There was no difference in 'time to ventilation' between either device in trial 4 (median 'time to ventilation': Fastrach: 14.7 s., iLTS-D: 13.2 s., $p = 0.14$). Also there was no difference in 'time to tracheal ventilation' by tracheal intubation between either device in trial 4 (median 'time to tracheal ventilation': Fastrach: 15.4 s., iLTS-D: 13.9 s., $p = 0.55$). Both devices were equally effective in a simulated difficult airway, ventilation and intubation at the first attempt was successful in all cases, there was no significant difference in 'time to ventilation' (Fastrach: 12.3 s., iLTS-D: 13.5 s., $p = 0.14$) and 'time to tracheal ventilation' (Fastrach: 12.6 s., iLTS-D: 12.5 s., $p = 0.77$).

Conclusion(s): The iLTS-D® performed similarly to the iLMA Fastrach™ in insertion and intubation times in a manikin setting in normal and simulated difficult airways.

References: 1. Thomas Ott, Matthias Fischer, Tobias Limbach, et al. The novel intubating laryngeal tube (iLTS-D®) is comparable to the intubating laryngeal mask (Fastrach) - a prospective randomised manikin study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*; 2015; 23:44.

11AP01-5

Multicenter assessment of the Ambu AuraGain laryngeal mask: preliminary results

Montero Tinnirello J.¹, Zaballos M.², Lopez S.³, Zaballos J.⁴, Escriba F.⁵, Lopez A.⁶

¹*Hospital Clinic i Provincial, Dept of Anaesthesiology, Barcelona, Spain*, ²*Hospital Universitario Gregorio Marañón, Dept of Anaesthesiology, Madrid, Spain*, ³*Complexo Hospitalario Universitario A Coruña, Dept of Anaesthesiology, Coruña, Spain*, ⁴*Policlinico Guipuzcoa, Dept of Anaesthesiology, San Sebastian, Spain*, ⁵*Hospital Universitario La Fe, Dept of Anaesthesiology, Valencia, Spain*, ⁶*Hospital Clinic de Barcelona, Dept of Anaesthesiology, Barcelona, Spain*

Background and Goal of Study: The new Ambu AuraGain is a second-generation supra-glottic airway device (SGAD) that combines the ability to evacuate gastric contents, deliver high seal pressure and facilitate tracheal intubation. However the evidence on its clinical use is limited. We are conducting a prospective observational study to assess the AuraGain performance in adult patients in 5 of Ambulatory Surgery Centers in Spain.

Materials and Methods: Each local Ethics Committee approved the study. Exclusion criteria were: predicted difficult airway, high risk of regurgitation and morbid obesity. Expert investigators performed all insertions. Endpoints were success rate of insertion, time and number of insertion attempts, Oropharyngeal leak pressure (OLP), ventilation quality, ease of gastric tube passage and airway morbidity.

A flexible scope was used to assess the anatomical alignment of the device with the larynx in 60 cases. Data was analyzed using the statistical software PASW Statistics 20.

Results and Discussion: Data from 100 patients was analyzed. The median age was 52 ± 14 years, 52% were female and body mass index (IMC) was 25.7 ± 4.14 kg/m². Insertion was successful in 99% of the cases, with 95% succeeding at first attempt and the median time to insertion was 16 ± 7 seconds, although, 46% of patients required additional maneuvers. Ventilation was optimal in 98% of the patients, requiring adjusting maneuvers in 8 cases. Persistent minor leaks were detected in two patients. The OLP was 32.4 ± 5 cm H₂O. Insertion of a size 16 French gastric tube was easy in all cases. Endoscopic view showed complete vocal cords in 12 patients (20%) and non-obstructing epiglottitis in 48 (80%). Complications were reported in 10 patients: 4 cases of blood stain on the device, 4 cases of hiccup, 3 cases of mild sore throat and 2 cases of pain on swallowing.

Conclusion(s): Preliminary results of this multicenter study suggest that, in expert hands, the Ambu AuraGain achieves a consistent high seal pressure resulting in an effective ventilation in most patients and provides an easy gastric access. Success rate of insertion was high although adjusting maneuvers are frequently needed.

11AP01-6

Pulmonary effect of laryngeal mask airway compare to tracheal tube during the early postoperative period in lower leg vascular surgery patient

Lee J.H.

Wonkwang University, Dept of Anaesthesiology & Pain Medicine, Iksan, Korea, Republic of

Background and Goal of Study: The tracheal tube (TT) produces reversible bronchoconstriction and increases pulmonary airway resistance and wide hemodynamic change compared to the laryngeal mask airway (LMA). This trend can have an effect in pulmonary function during the postoperative period specially vascular surgery patient. The aim of this study was to compare early pulmonary effect in patients undergoing lower leg vascular surgery with the LMA or with the TT.

Materials and Methods: Sixty patients scheduled for lower leg vascular surgery under general anesthesia were randomized to receive the LMA or the TT. Before anesthesia and 1 hour after tube removal, pulse oximetry values (SpO₂) were recorded and patients performed forced spirometry in the supine position. And pneumonia and atelectasis was recorded during a weak after operation.

Results and Discussion: Preoperative pulmonary function was normal in both groups. There were no differences between groups in the preoperative respiratory function test and SpO₂. Following surgery forced expiratory volume in the first second (FEV₁), forced vital capacity (FVC) and peak expiratory flow (PEFR) decreased in TT groups. The FEV₁/FVC did not change in either of the groups. In the TT group, compared to patients using the LMA, there was a greater relative decrease of SpO₂ and increase early postoperative pulmonary complications.

Conclusion(s): The use of LMA instead of TT for airway management during lower leg vascular surgeries causes stable hemodynamics during induction and reduce the postoperative pulmonary complication during early postoperative period.

11AP01-8

Incidence of morbidities associated with the use of endotracheal intubation or ProSeal® in laparoscopic cholecystectomies

Gonçalves C.¹, Gigante A.R.², Hipólito C.¹, Vieira A.¹

¹Hospital Braga, Dept of Anaesthesiology, Braga, Portugal,

²Universidade do Minho, Student, Braga, Portugal

Background and Goal of Study: Laparoscopic cholecystectomy is one of the most commonly performed surgical procedures, where tracheal intubation is recommended for airway management. However, studies have suggested that laryngeal mask airway, such as ProSeal (PLMA®), may be a suitable alternative^{1,2}. The aim of this study was to compare the incidence of postoperative morbidities using endotracheal tube (ETT) or PLMA® for airway management in patients undergoing laparoscopic cholecystectomy.

Materials and Methods: Prospective observational study in patients submitted to ambulatory laparoscopic cholecystectomy under general anesthesia with ETT or PLMA®, in Hospital of Braga. The surgical and anesthetic procedures were recorded, namely, airway device, airway device insertion attempts and complications, intraoperative drugs, anesthesia duration and a gastric distension score. Postoperatively, the patients were inquired about the presence of sore throat, dysphagia, dysphonia, laryngospasm or stridor, heartburn, postoperative nausea and vomiting (PONV) at 1, 2, 4 and 24 hours after the surgery.

Results and Discussion: 31 patients were included: in 22 the airway was secure with ETT and in 9 with PLMA®. All devices were inserted at the first attempt and the gastric distension score was similar in both groups. Postoperative dysphonia was significantly higher with ETT when compared to PLMA® (p=0.032). There were no differences in the others morbidities studied. The incidence of dysphonia was higher in patients with normal body mass index (p=0.044) and those who received lower dosage of rocuronium in the intraoperative period (p=0.031).

Conclusion(s): This is a groundbreaking study about a controversial topic providing new data which has not been submitted before. The incidence of dysphonia is lower using the PLMA®. There is an association between intraoperative rocuronium dosage and dysphonia. The incidence of sore throat, dysphagia, heartburn, PONV and analgesia requirements are similar with PLMA® and ETT.

References:

- Maltby, JR et al; Can J Anesth 2002; 47(7): 622-26
- Saraswat, N et al; Indian Journal of Anaesthesia 2011, 55(2):129-34

11AP01-9

Comparison of the optimal end-tidal sevoflurane concentration for the insertion of the LMA Supreme® versus the LMA ProSeal® during target-controlled infusion of remifentanyl

Monteserín Matesanz C., González T., Etulain J., Canal M., Melone A., Zaballos M.

Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: The laryngeal mask airway (LMA) represents an authentic innovation for patients undergoing ambulatory surgery. Previous works on LMA Supreme® and LMA ProSeal® have compared different aspects of their use but none of them has evaluated the difference in an-

aesthetic requirements for their insertion. We aimed to compare the required end-tidal sevoflurane concentration for the insertion of LMA Supreme® versus LMA ProSeal® during target-controlled infusion of remifentanyl.

Materials and Methods: After the ethics committee's approval, we enrolled 45 patients ASA I-II aged 20-60 years. We excluded patients with a known difficult airway. Patients were randomly allocated to receive either LMA Supreme® (n=22) or LMA ProSeal® (n=23). Midazolam 1 mg was given. The sevoflurane induction started in coadministration with remifentanyl at an effect-site concentration of 4 ng/ml. Sevoflurane target was determined with a modified Dixon's up-and-down method. Predetermined sevoflurane concentration kept constant during at least 10 minutes in order to reach equilibration between blood and effect site concentration. After that, LMA insertion was attempted without neuromuscular blocking agents. Main outcome was patient's response to LMA insertion, classified as either "movement" or "no movement". Statistical test: Six crossovers' mean of concentration, from "movement" to "no movement" yields the estimated mean end-tidal concentration in 50% of adult patients for successful LMA insertion (ED₅₀). A logistic regression curve was done to obtain ET₅₀ and ET₉₅. We used an unpaired Student T-test and ANOVA for repeated measures (p<0.05).

Results and Discussion: Patient characteristics were similar in both groups. The ED₅₀ for LMA Supreme® was 0.55±0.38% (95% CI, 0.14-0.95%) and for LMA ProSeal® was 1.20±0.41% (95% CI, 0.76-1.63%); p=0.019. The values of the ET₅₀ and ET₉₅ were 0.43%-1.5% for LMA Supreme® and 1.15%-2.43% for LMA ProSeal® respectively. The haemodynamic, respiratory and the BIS values were comparable in both groups. There were no differences in the proportion of patients that required atropine or ephedrine between both groups. **Conclusion(s):** Anaesthetic requirements of sevoflurane, in association with remifentanyl, needed for the insertion of LMA Supreme® were 54% lower than for LMA ProSeal®. Both LMA were effective for positive pressure ventilation in patients undergoing ambulatory surgery with minimal adverse effects.

11AP01-10

Tracheal intubation in morbidly obese: a comparison of Airtraq and intubating laryngeal mask airway

Turna C., Arslan Z.I., Alparslan V., Okyay K., Solak M.

Kocaeli University Medical Faculty, Dept of Anaesthesiology & Intensive Care, Kocaeli, Turkey

Background and Goal of Study: In morbid obesity, various difficulties in intubation and ventilation are confronted due to increased fat tissue in the upper airway and diminished compliance in the chest wall. Airtraq, a disposable video laryngoscope, is used for both normal and difficult intubations without the need for the same level of oral, pharyngeal, and laryngeal axis.¹ ILMA is a preferred blind airway device in difficult airway and ventilation, used for ventilation during intubation.² We aimed to compare ILMA and Airtraq in terms of placement and intubation times, trial counts, intubation success rates, maneuvering requirements, haemodynamic parameters and complications in morbidly obese patients with a BMI>35.

Materials and Methods: After receiving ethics committee approval and informed consent, 80 patients were included in the study, between ASA 1-3 and 18-60 years of age, who required intubation to undergo elective surgery. The patient was premedicated with intravenous midazolam at a dose of 0.03 mg/kg. Demographic data of the patients were recorded. Anesthesia was induced with propofol and fentanyl following standard anesthesia monitoring. Rocuronium was used as muscle relaxant. Anesthesia was continued with 2% sevoflurane in a mixture of 60% N₂O + O₂. The patients were randomly divided into two groups, Airtraq and ILMA.

Results and Discussion: The demographic data and airway characteristics of the patients were similar. There was no difference between the placement times of Airtraq and ILMA. Intubation with Airtraq was accomplished in a shorter time than ILMA group (29.9±22.1 vs 50.7±21.2 s; p<0.01). A significant difference was found when total intubation times were compared (29.9±22.1 vs 97.4±42.7 s; p<0.001). There was no statistically significant increase in mean arterial pressure when the heart rate increased in the Airtraq group after placement. In the ILMA group, mean arterial pressure increased while heart rate did not increase. Airtraq and ILMA were similar in terms of postoperative complications.

Conclusion(s): Airtraq seems superior to ILMA in morbidly obese patients with low oxygen reserve and rapid desaturation, with a total intubation time of less than 60 seconds compared to ILMA.

11AP02-1**Patient with juvenile rheumatoid arthritis submitted to cornea transplant - solution for the difficult airway**

Czajkowska K., Germanova L., Bela M.L.

Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology, Coimbra, Portugal

Background: Juvenile rheumatoid arthritis (RA) is a chronic autoimmune multisystemic inflammatory disease which affects many organs but predominantly attacks joints. In many patients it can cause movement limitations of the neck and the temporomandibular joint leading to a difficult airway. The use of supraglottic airway devices (SADs) presents many advantages in patients with RA scheduled for an elective ophthalmic surgery[1].

Case report: 51 years old female, (40kg, 1.3m, BMI 23.4m²/kg), with advanced juvenile RA, completely dependent on activities of daily living, due to cornea transplant failure was scheduled for a re-intervention. Preoperative evaluation revealed multiple osteoarticular deformities of upper and lower limbs, severe kyphoscoliosis, reduced cervical mobility, thyromental distance <6cm, mouth opening around 3cm and Mallampati class IV. Previous procedure was performed under general anaesthesia and fiberoptic was necessary for the endotracheal intubation.

We proceeded with the induction of anaesthesia with Sevoflurane and when the loss of consciousness was achieved, we secured the airway with a SAD. I-gel device n°3 was inserted with no difficulties and a good seal was obtained. During the induction phase, fiberoptic was immediately accessible and could be used if necessary. Maintenance of anaesthesia was continued with Sevoflurane, patient was mechanically ventilated and we reported no complications during the surgery nor during the extubation.

Discussion: Due to severe deformities, anaesthesia management of that patient was challenging. With a predicted difficult airway, in the context of ophthalmic surgery, SAD may be indicated. MLA may help to avoid the increase of the intra-ocular pressure related to endotracheal intubation or coughing during the extubation, it also provides a smoother recovery².

References:

1. Rheumatoid arthritis and anaesthesia. R. Samanta, K. Shoukrey and R. Griffiths Anaesthesia, Volume 66, Issue 12, pages 1146-1159, December 2011
2. Intraocular pressure and haemodynamic responses to insertion of the i-gel, laryngeal mask airway or endotracheal tube. Ismail SA1, Bisher NA, Kandil HW, Mowafi HA, Atawia HA. Eur J Anaesthesiol. 2011 Jun;28(6):443-8.

Learning points: SAD may be used as a primary approach in patients with predicted difficult airway due to juvenile RA, scheduled for an ophthalmic surgery but access to fiberoptic should be secured.

11AP02-2**Airway management in Arnold-Chiari malformation type I**

Melo e Assis W.A.L., Santana T.B., Lucena G.D., Cabral F.M., Callado A.N., Santos G.B.M.

Hospital das Clínicas da Fundação Hospital do Acre - FUNDHACRE, Dept of Anaesthesiology, Rio Branco, Brazil

Background: Arnold Chiari malformations (ACMs) are a group of rare and congenital neurological conditions that consist of an anatomic defect of the skull base, leading to protrusion of neural structures. These patients, due to compression risk of herniated neural structures, should be intubated without cervical mobilization, thus, among the available techniques, videolaryngoscopy is well indicated⁽¹⁾.

Case report: This case deals with the airway management in a male patient, 26 years old, 72kg, ASA I, with Chiari malformation type I in a tertiary hospital in the Amazon region, complaining of cervicalgia, hypoesthesia, hemiparesis and gradual loss of pain and thermal sensation in right half-body. After anesthetic induction, it was conducted orotracheal intubation with a videolaryngo device (trueview[®]).

Discussion: Patients with ACM type I should always be considered as having a difficult airway, since it is necessary to immobilize the cervical, making it impossible to apply the sniff position. It is a mandatory condition to establish an approach plan, following the devices at hand. In the present case, trueview[®] was used because it was readily available and because videolaryngoscopy improves Cormack-Lehane and offers a lower risk of hemodynamic repercussions/intracranial hypertension⁽²⁾. Other airway management devices can be used successfully, as long as they allow stability of the cervical spine.

References:

1. Farag E. Airway management for cervical spine surgery. Best Practice & Research Clinical Anaesthesiology, 2016; 30:13-25.
2. Rodriguez-Zepeda JM et al. Manejo anestésico en una mujer con malformación de Arnold-Chiari tipo II residual. Revista Mexicana de Anestesiología, 2015; 38(3):195-198.

Learning points:

- Patients with ACM type I should always be considered as having a difficult airway, thus, it is a mandatory condition to establish an approach plan, following the devices available in each service;
- Due to the risk of neural structures compression, intubation must occur without cervical mobilization;
- Among the available techniques, videolaryngoscopy is well indicated because it offers good view of the airway and lower risk of hemodynamic repercussions/intracranial hypertension;
- Knowing the disease, especially regarding the limitations involving the cervical spine, is the success for an adequate management of the airway to avoid iatrogenesis.

11AP02-3**Airway management of a patient with stridor and an advanced sub-glottic tumour with the assistance of Transnasal Humidified Rapid-Insufflation Ventilatory Exchange (THRIVE)**

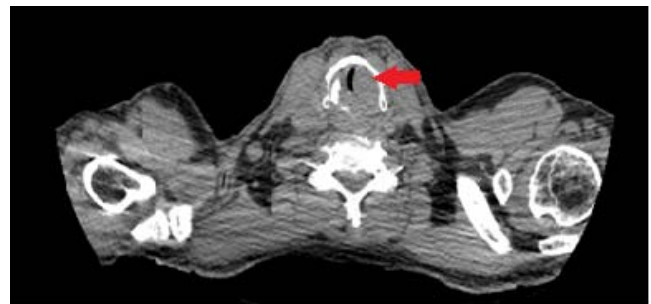
Wijesuriya S., Kajekar P, Kannan T.

Luton and Dunstable University Hospital, Dept of Anaesthesiology & Intensive Care, Luton, United Kingdom

Background: THRIVE has been cited in the management of patients with predicted difficult airways. It prolongs apnoea time and avoids the trauma of repeated laryngoscopy by preventing hypoxaemia before a first optimised intubation attempt.

We report the use of THRIVE and high frequency jet ventilation in a patient with critical sub-glottic airway narrowing.

Case report: A 68-year-old man with stridor required biopsy of a laryngeal lesion. CT scans (Figure 1) demonstrated a sub-glottic tumour extending 5 cm caudally from the larynx with tracheal narrowing to 3.8 mm. Bronchoscopy with even the narrowest scope was unsuccessful. Jet ventilation using a 3.4mm external diameter laser jet catheter was planned for airway management.



[Fig 1: Sub-glottic tumour with tracheal narrowing]

The patient was sat up and pre-oxygenated for 5 minutes with 100% humidified oxygen at 70L/min via Optiflow nasal cannulae. Induction was with Target Controlled Infusions of Remifentanyl and Propofol and 50mg of Rocuronium. A jaw thrust maintained patency of the airway. After 3 minutes, a C-MAC video laryngoscope provided a Grade 1 view. A laser jet catheter was inserted and connected to a Monsoon ventilator. Apnoea time was 5 minutes with no desaturation allowing smooth airway placement to be undertaken. Appropriate driving pressure, frequency and airway pressure alarms were set. The first end-tidal carbon-dioxide was 4.7kPa.

The surgeons performed tumour biopsy and debulking. The patient was extubated uneventfully on to THRIVE.

Discussion: In this case the degree and site of narrowing excluded awake fibre-optic intubation or inhalational induction as a technique of choice. In the absence of metastases, the ENT surgeons preferred not to seed tumour by performing a tracheostomy. The Difficult Airway Guidelines 2015 refer to apnoeic oxygenation in high risk patients as a means of ventilatory mass flow of oxygen.

Our experience suggests that using THRIVE alleviates anxiety over time to establish an airway.

Learning Points: THRIVE may provide vital time in scenarios of anticipated difficult airway and where Plan A of the difficult airway algorithm fails. It has wider potential roles in high BMI and obstetric patients.

11AP02-4

Airway management of patient with traumatic cricotracheal transection

Nunes R.R.¹, Lopes C.G.², Fernandes M.B.C.¹, Cavalcante S.L.F.¹, Pontes D.M.¹, Nunes Filho R.R.¹

¹Hospital Geral de Fortaleza, Dept of Anaesthesiology, Fortaleza, Brazil, ²Hospital Sao Carlos, Dept of Anaesthesiology, Fortaleza, Brazil

Background: Cricotracheal transection due to cervical trauma is a rare and usually fatal event. Fast and efficient airway management is essential to prevent acute ventilatory obstruction.

Case report: A 23-year-old patient without comorbidities experienced cervical trauma from a kitesurf line, with total section of the trachea between the cricoid cartilage and the first tracheal ring (Fig.1), but no injury to the esophagus, marrow or large vessels. Upon admission, the patient was awake, oriented and without hemodynamic compromise, communicating by gestures and breathing spontaneously by the tracheal orifice (SpO₂=97%). Exploratory cervicotomy under general anesthesia was indicated. The patient was preoxygenated via the sectioned trachea, followed by direct esophageal compression and orotracheal intubation, with the extremity of the tube guided into the trachea with Magill forceps. After tracheoplasty, tracheostomy was performed between the third and fourth tracheal rings. When transferred to post-anesthesia recovery care, the patient was breathing spontaneously.

Discussion: In view of the patient's good hemodynamic and ventilatory status, conventional anesthesia and orotracheal intubation were adopted, facilitating tracheoplasty.

References:

1. Singh GB, Kummar R, Verma N et al. A Rare Case of Survival after Complete Traumatic Cricotracheal Separation. Case Reports in Otolaryngology. 2012;1-3.
2. Valerio P, Ivan M, Francisco R et al. Survival after traumatic complete laryngotracheal transection. Am j emerg med. 2008;26:837.e3-837.e4

Learning points: A rapid and effective approach to the airway is essential for patient safety and procedure success.



[Fig.1]



[Fig.2]

11AP02-5

Difficult airway in a neonatal patient with giant occipital encephalocele setting subjected to surgical correction

Haddad Silveira C., Mateus Marcelino Serzedo P.S., Felloni Tsuha G., Tadeu Bueno Costa C., dos Santos Tarquinio G., Helfenstein E. CARP, Dept of Anaesthesiology, Ribeirão Preto, Brazil

Background: Patients with encephalocele makes anesthesia a challenge. Encephalocele is the neural tube defect characterized by protrusion of the brain and meninges through a defect in the skull. In addition to the care inherent in pediatric anesthesia, the anesthetist has to deal with the unusual positioning, intubation difficulty and anomalies during the perioperative course. The occurrence of congenital anomalies may indicate the potential for difficult intubation.

Case report: A 12-days-old female neonate, P2 by the ASA classification, 2260 kg, cardiological evaluation class I, with great encephalocele frame in occipital fully associated with microcephaly region, underwent surgery giant posterior encephalocele. Monitored with SpO₂, NIBP, ECG (DII and V5), ETCO₂, esophageal temperature and diuresis. Performed anesthetic induction with fentanyl (0.7 mcg / kg) and propofol (2.7 mg / kg). Endotracheal intubation in the left lateral decubitus with endotracheal tube number 2.5 and maintenance with sevoflurane and nitrous oxide uneventfully. The manual ventilation under mask was easy and monitorized by capnography. As rescue devices, had supraglottic device type laryngeal mask, videolaringoscópio Airtraq Neonatal and prompt surgical team to perform cricothyroidotomy puncture or tracheostomy if necessary. The surgical procedure was uneventful, was referred to neonate ICU hemodynamically stable and intubated, being extubated in the late postoperative period was uneventful.

Discussion: The management of children with giant encephalocele requires updated knowledge about the possible difficulties encountered during the perioperative period. They need specialized anesthesia care to deal with difficult intubation, associated congenital anomalies, unusual positioning, electrolyte disturbances, hypothermia and cardiopulmonary disorders.

References: Mahajan C, Rath GP, Bithal PK, Mahapatra AK. Perioperative Management of Children With Giant Encephalocele: A Clinical Report of 29 Cases. J Neurosurg Anesthesiol. 2016 Feb 2.

Freck CM, Mitchell VS, McNarry AF, et al. Difficult Airway Society 2015 guidelines for the management of unanticipated difficult intubation in adults. *Br J Anaesth* 2015; 115: 827-48.

Learning points: The anticipation of possible complicating events, a multi-disciplinary comprehensive care during the perioperative period as well as a good relationship with the surgical team are key factors for achieving a safe procedure

11AP02-6

Difficult intubation in head and neck laser surgery

Rodrigues H.¹, Aguiar Pereira I.¹, Gouveia F.¹, Panzina A.¹, Rodrigues F.², Rocha C.³

¹Centro Hospitalar de Vila Nova de Gaia/Espinho, Dept of Anaesthesiology, Vila Nova de Gaia, Portugal, ²Hospital do Divino Espírito Santo, Dept of Anaesthesiology, Ponta Delgada, Portugal, ³Instituto Português de Oncologia Francisco Gentil, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Laser techniques are increasingly used in head and neck surgery, offering several advantages to the patient, the surgeon and the anesthesiologist. Patients selected cover all ages, and usually have tumors in the early stages. However, as airway tumors they might always compromise it. This study aims to evaluate the incidence of difficult intubation in patients submitted to laser techniques in head and neck surgery, as well as to evaluate the association of different variables with difficult intubation.

Materials and Methods: A retrospective study was conducted by analyzing the clinical processes of 90 patients submitted to laser techniques for head and neck surgery at the IPO-Porto in 2014. The incidence of difficult intubation was calculated and the association of this variable with 29 other variables related to patient characteristics (indicative of probable difficulty in approaching the airway) and tumor characteristics was evaluated. Statistical analysis of the categorical variables was done with the Pearson χ^2 test, with significance level $p < 0.05$.

Results and Discussion: The incidence of difficult intubation in our study was 12.5%, similar to that described in the literature on head and neck surgery. After the variables were studied, the presence of difficult intubation was statistically significant in patients presenting with relapse / complication ($p = 0.034$), patients with mouth opening limitation ($p = 0.014$) and patients with previous radiotherapy ($p = 0.007$).

Conclusion(s): Our study showed that the incidence of difficult intubation is similar to that found in other studies that are not limited to laser surgery of the airway and that were not performed in cancer centers. There was also an increased incidence of difficult intubation in the presence of recurrence / complication, limitation of the mouth opening or previous radiotherapy. Such factors are traditionally associated with a possible difficult airway in the general population, which is in agreement with the type of patients selected for this procedure.

References:

1. Benumof and Hagber's Airway Management, 3rd Edition, 2013
2. P Wong, S Parrington. Difficult intubation in ENT and maxillofacial surgical patients: a prospective survey., *The Internet Journal of Anesthesiology*. 2008 Vol. 21, No. 1

11AP02-7

Difficult ventilation after successful intubation in the emergency - case of tracheal stenosis

Kalamkar Y, Mehta V, Jeeji R., Sundara Rajan R.
University Hospitals of North Midlands, Dept of Anaesthesiology, Stoke on Trent, United Kingdom

Introduction: The American Society of Anesthesiologists defines a difficult airway as the inability of a trained anesthesiologist to mask ventilate the patient, perform tracheal intubation, or both.[1] However, a difficult airway is not always defined by patient anatomy nor does airway management necessarily end with successful placement of an endotracheal tube (ETT).

Case: A 65 year woman underwent planned rigid bronchoscopy with biopsy for intrinsic endotracheal lesion under TIVA and jet ventilation. Post-procedure, she acutely developed type 2 respiratory failure needing immediate emergent

intubation on ward. The trachea was intubated using Size 7 ETT with a slight resistance beyond the glottis, but ventilation was not possible with high inspiratory pressures and no passive expiration even after changing patient's position. Hyperinflation caused cardiovascular instability. Ventilation was achieved only after intentional right endobronchial intubation and one lung ventilation. Fiberoptic bronchoscopy revealed no obstruction, collapse and it was not possible to reposition ETT to achieve bilateral lung ventilation. Subsequent CT scan revealed no pathology to explain the mechanics. The patient underwent successful insertion of tracheal stent above carina using rigid bronchoscope under TIVA.

Discussion: The inability to ventilate a patient after successful intubation is a rare but emergent situation and may be caused by obstruction of the endotracheal tube, bilateral tension pneumothorax, oesophageal intubation, severe bronchospasm, or mainstem bronchus intubation. We hypothesized that after successful intubation, a ball valve mechanism due to tumour allowed ingress of gas into the lungs but prevented egress and caused hyperinflation of the patient's chest. The resultant increased intrathoracic pressure impeded venous blood return and ultimately led to cardiovascular collapse. Prompt diagnosis and correction of this emergency is of utmost importance.

Learning Points: In our patient conventional ventilation technique was not suitable, or even was catastrophic and tracheotomy was not an option. We opted for modified endobronchial rescue intubation technique for ventilation to maintain the cardiorespiratory stability until definitive surgical intervention.

References: American Society of Anesthesiologists Practice guidelines for management of the difficult airway: an updated report. *Anesthesiology* 2003;98:1269-77.1

11AP02-8

Failed intubation due to tracheal stenosis

Pereira C., Tavares E, Cardoso C., Rego J., Marinheiro L., Teixeira M.J.
Centro Hospitalar Tâmega e Sousa, Dept of Anaesthesiology, Penafiel, Portugal

Background: Airway management is one of the most relevant skills in anesthesiology. Difficult intubations are challenging and guidelines from multiple Anaesthesiology Societies provide algorithms to ensure patient safety¹.

Case report: We present a case of failed intubation due to undiagnosed tracheal stenosis. A 33 year old man was scheduled for exploratory laparoscopy for the diagnosis and treatment of impalpable testis. He had history of tetraparesis at C6 level, cervical surgery and subsequent 6-month hospitalization in an intensive care unit with need of

tracheostomy, following a motorbike accident 10 years ago. Due to the various difficult airway predictors, we decided to perform awake fiberoptic intubation. A tracheal stenosis was visualized 1-2cm distal to the glottis (see fig. 1). The fiberscope loaded with a 7.0 mm endotracheal tube (ETT) was advanced under videoscreen visualization through the stenosis, but the ETT could not progress due to resistance. We repeated the procedure using a 6.0 mm ETT unsuccessfully. After discussing the case with the surgical team and the patient, a change in the surgical approach was decided. Exploration of the inguinal canal under local anesthesia was performed. A testicular torsion was diagnosed followed by orchiectomy. No intra or postoperative intercurrents were reported. The patient was discharged home 2 days after surgery and scheduled for otorhinolaryngology consultation.

Discussion: Few cases on failed intubation due to tracheal stenosis were published, presenting different management strategies². In this case, we discussed various alternative plans including to cancel the procedure, reattempt intubation with a narrower diameter ETT, use a supraglottic device, perform neuroaxial blockade or invasive airway access. Yet, we considered that a less invasive procedure under local anesthesia was the best and safest option for this patient.

References:

1. American Society of Anesthesiology. Practice guidelines for management of the difficult airway: an updated report. *Anesthesiol*. 2013 Feb;118(2):251-70.
2. Youn AM, et al. Failed intubation of an unanticipated postintubation tracheal stenosis: a case report. *Korean J Anesthesiol*. 2016;69(2):167-170

Learning points: Anesthesiologists should be familiarized with the existing guidelines, that help in decision making and therefore improve the outcomes. It is important to discuss the best surgical and anesthetic approach with the surgical team as well as the patient.

11AP02-9**Impossible intubation: interest of superior laryngeal block**

Azale M.¹, Kamga H.², Doppia M.-A.², Viquesnel G.³, Hanouz J.-L.¹

¹CHU Centre Hospitalier Universitaire Caen, Dept of Anaesthesiology & Intensive Care, Caen, France, ²CHU Centre Hospitalier Universitaire Caen, Dept of Anaesthesiology, Caen, France, ³CHU Centre Hospitalier Universitaire Caen, Dept of Intensive Care, Caen, France

Background and Goal of Study: Awake fiberoptic intubation (AFOI) is the reference technique in case of planned impossible intubation but it is a source of discomfort for both patient and practitioner, results in a difficult learning. This study aims at assessing the interest of the superior laryngeal nerve block (SLB) in realization of AFOI.

Materials and Methods: This prospective observational study concerns patients with impossible intubation criteria. The SLB was performed by bilateral infiltration of 1 ml of lidocaine 1% in contact with greater horn of the hyoid bone and in thyrohyoid membrane and 5 ml of lidocaine 1% in transtracheal. A sedation by intravenous remifentanyl was associated. The main endpoint was the time to intubation. Secondary endpoints were success rate and adverse events (table 1). quantitative data are median (interquartile).

Results and Discussion: From 5/1/2015 to 10/30/2016, 73 patients (12 to 88 years old, 64% of men) benefited from AFOI. The median age was 52 (34-64) years. 51% were ASA I and II, 45% ASA III and IV, 4% ASA V. The difficult intubation criteria were: mouth opening <3cm (86%) A class of Mallampati 4 (81%). Median time to intubation was 193 (141-300) seconds. The success rate was 100% of which 80% at the first attempt. 49% of AFOI were carried out by supervised novice operators.

rate of success	100%	(93;100)
undesirable side effects %	cough	28 (41;70)
	hypoxemia spO ₂ < 95%	22 (30;59)
	laryngeal spasm	2 (0;14)
	haemodynamic instability	0 (0;7)
number of attempts	1	80 (66;90)
	≥2	20 (10;34)
operator level	experimented	51 (45;74)
	supervised novice	49 (28;57)

[Table 1]

The time is short, as it may exceed 260 seconds in some studies of ASA I and II patients(1). 44% of our patients are ASA III and up. To acquire the AFOI technique, it is recommended to do 10 intubations attempts on patients under general anaesthesia(2). In our work, 49% of the operators are novices with no AFOI experience. Some authors describe up to 53% of cough episodes, twice what we observed(3).

Conclusion(s): SLB may facilitate AFOI. It may provide better intubating conditions, less complications than the standard techniques. It improves the curve learning.

References:

1. Chinese Medical Journal 12.5.2015 vol 128 Issue 23
2. Respiratory Care 06.2014 Vol. 59 No 6
3. Anesth Analg 2009; 108: 536-43

11AP02-10**The anesthetic management of a patient with myasthenia gravis and tracheal obstruction**

Kamoun L., Mhiri L., Hannachi Z., Dridi A., Ouerghi S., Mestiri T.
Faculty of Medicine of Tunis, Dept of Anaesthesiology & Intensive Care, Tunis, Tunisia

Background: Tracheal obstruction complicating myasthenia gravis (MG) makes anesthetic management difficult. Thymectomy can improve MG.

Case report: A 40-year-old woman with MG, required resection of a critical tracheal stenosis. She needed a tracheostomy for a respiratory distress syndrome. She developed a critical tracheal stenosis.

The patient was under anticholinesteratic medication and immunosuppressive therapy (Azathioprine and corticosteroids). We planned two sessions of Plasmapheresis.

Surgery was done under general anesthesia, with low and effective dose of drugs.

First, the ventilation has been achieved through the cuffed-tracheostomy tube. After the induction, the surgeon replaced the tracheostomy tube by an armored endotracheal tube. Then, an orotracheal tube has been placed below the cords just above the stenosis.

After the tracheal resection, a small jet ventilation catheter (CH12) was inserted through the orotracheal tube. We used High Frequency Jet Ventilation (HFJV) delivering pulses of small jet of gas derived from a high pressure source, 3 bars at a rate of 130, Ti/Ttotal = 30%, FIO₂ = 100%.

Partial thymectomy, through the same cervicotomy, was practiced.

Extubation was carried out carefully after a systematic aspiration with fiberoptic. Cholinesterase inhibitors were resumed again six hours after extubation and Azathioprine the next day.

In the postoperative course, *Pseudomonas aeruginosa* was identified. The outcome was favorable with targeted antibiotics.

Discussion: The combination of MG and tracheal obstruction presents some difficulties. Treatment involves immune suppression with steroids or azathioprine, boosting neuromuscular transmission with anticholinesteratic drugs, plasmapheresis, and thymectomy. It is essential to avoid drugs interfering with the neuromuscular junction and control the side effects of immunosuppressive and anticholinesteratic drugs. Intraoperatively, the challenge of the anaesthetist is to accomplish safe management of the airway that is shared with the surgeon.

The main concerns for anaesthetists are perioperative respiratory and bulbar muscle strength. The patient is at high risk of aspiration and respiratory distress. Besides, he is already vulnerable to infections.

Reference:

Jennifer Froelich, Anesthetic management of a patient with myasthenia gravis and tracheal stenosis, Canadian Journal of Anesthesia 1996.

Learning points: Thymectomy may produce improvement in MG. Anesthetic management is a real challenge.

11AP02-11**Evaluation of the factors and the management of the airway in urgent debridements by odontogenic abscess during 32 months**

Rovira Lazaro E.

Bellvitge Hospital (ICS), Dept of Anaesthesiology & Intensive Care, Hospitalet de Llobregat, Spain

Background and Goal of Study: Developed odontogenic abscesses are life-threatening diseases. Complications include mediastinitis or septic shock. Their airway management represents a deal for the anaesthesiologist in emergencies. Analysis of the characteristics, the management of the airway and the evolution of adult patients operated by debridement of odontogenic abscesses, registered in emergency theatres of the Bellvitge University Hospital (Barcelona).

Materials and Methods: Observational, descriptive, retrospective study, during 32 months. Several variables are included: predictive factors of difficult airway, resources for intubation, related background, type of abscess, time of extubation and associated complications. The data are analysed with SPSS version 15.

Results and Discussion: We collected datum from 87 patients. Smoking is the most relevant background. All patients underwent imaging (cervical CT) as well as intravenous drugs in the emergency room prior to the intervention. In 55% of the cases, intubation was performed using a fiberoptic bronchoscope; orotracheal intubation using conventional Macintosh laryngoscope in 21%, blind nasotracheal intubation in 17%; Intubation using Airtraq videolaryngoscope in 5% of patients. 85% of the patients were extubated in the operating room.

13% of the patients required resuscitation units for postoperative control. There were 5% of reinterventions.

A statistically significant correlation was observed between the type of abscess and the time of extubation (89% of the patients with submandibular abscesses - more frequent location - were extubated in the operating room). There was no statistically significant correlation in our sample between the pathological history with the type of abscess and type of intubation; neither with the time of extubation.

Conclusion(s): Videolaryngoscopy is a useful tool to take into account in the management of the airway in oropharyngeal abscesses despite trismus. However, the fiberoptic bronchoscope remains the most widely used device. As for pathological antecedents, smoking (being the most relevant pathological antecedent) is not related to a higher rate of complications in the immediate postoperative period.

The database obtained is useful as a guide for a future prospective study. The paper was presented at the SCARTD (Catalan Anaesthesiology Society) Congress in 2016 as a communication. No potential conflict of interest reported.

11AP03-1

New device enabling a smartphone to use as a bronchoscope monitor: the i-NTER LENS™ (Micronet Corporation)

Umezaki K., Inomata S.

Tsukuba University Hospital, Dept of Anaesthesiology, Tsukuba, Japan

Background: Bronchoscopes are used to check the position of the double lumen tube and a monitor is used to share the image. However, such monitors are expensive and require a long set-up time. We speculated that a bronchoscope with a small monitor like those included with video laryngoscopes could be very useful. We thus created the i-NTER LENS™ (Micronet Corp.) device to serve this purpose. We also made an application that improves the performance of the i-NTER LENS™ (Micronet Corp.), named the Endoscope™ (Micronet Corp.)

Description: The i-NTER LENS™ (Micronet Corp.) is an optical device with six internal lenses that serve to make the image clearer. It weighs 210 g and is 720 mm long. A smartphone, the i-NTER LENS™ and a bronchoscope can be connected very easily. The Endoscope™ (Micronet Corp.) application has many features. The operator can take pictures by moving his/her hand in front of the smartphone without touching it, and can erase the picture by breathing on the smartphone. The application can change the brightness of the image, zoom the image, and invert the image. A smartphone is used as the bronchoscope monitor, and the image or movie taken by smartphone can be sent to another monitor in another country. The i-NTER LENS™ (Micronet Corp.) will thus be very useful in the fields of distance medicine and disaster medical care.

Discussion: The i-NTER LENS™ and the Endoscope™ are very useful, but there are four improvements.

1. We want to create a speech-recognition system that can be used to take the pictures and videos. Although pictures and videos can be taken by hand movements in front of the smartphone, the operator must release his/her hand from the bronchoscope to do so, and speech recognition would make that unnecessary.
2. Since bronchoscopes are fiberscopes, a honeycomb grid appears on every image taken. We want to erase the honeycomb grid that appears on the bronchoscope's images.
3. We want to be able to save the images in the anesthesia chart.
4. Because the frame rate of video phones is low, we want to improve the quality of the video images.

Learning points: We can prepare a bronchoscope faster by using the i-NTER LENS™. We can save clearer images by using the Endoscope™. This device and application will be helpful in the fields of distance medicine and disaster medical care.

11AP03-2

Reinforced laryngeal mask airway in ENT Surgery: a 15 years experience

Torres S., Sousa M., Pacheco M., Afonso D., Gomes L., Leão P.
Centro Hospitalar de Entre o Douro e Vouga, Dept of Anaesthesiology, Santa Maria da Feira, Portugal

Background and Goal of Study: The use of the reinforced laryngeal mask airway (rLMA) for ENT surgery has grown in the last decades. Several studies have reported a low incidence of respiratory complications and a smoother emergency with the use of this supraglottic device. However, there is still some concerns regarding the risk of an unprotected airway shared with a surgeon. Given the experience of our department, the authors propose to review the casuistry of the last 15 years.

Materials and Methods: We retrospectively analyzed 19000 anesthetic records of elective ENT surgeries performed between January 2001 and December 2015. The procedures in which rLMA was used as the first choice for airway device were selected. We recorded the type and duration of surgery as well as the perioperative complications.

Results and Discussion: rLMA was the airway device used in 47.8% of surgeries. The use of rLMA was more frequent for short-term surgeries as compared with long-term procedures, namely oropharynx and nose versus ear surgery. Adenotonsillectomy and septoplasty made up for 19,2% and 16,7% of the surgical procedures, respectively.

The incidence of perioperative complications was similar to that reported in literature (1,2). Airway obstruction by the Boyle-Davis gag was the most frequent complication (4,5%), which, in most cases, was solved by switching to a large blade opener. Cough (1,7%), laryngospasm (0,5%) and airway soiling (0,5%) were also observed. There was a low incidence of cases in which it was necessary to replace the rLMA for a tracheal tube (0,9%). There were no reports of pulmonary aspiration.

Conclusion(s): This retrospective study shows that rLMA could be a safe and effective alternative to orotracheal tube in ENT surgery. Its use requires a thorough perioperative approach of the airway, an accurate selection of patients and a close cooperation between the anesthetic and surgical team (3).

References:

1. *Eur J Anesthesiol* 2008;25:261-266
2. *Surgery Curr Res* 2015;5:223
3. *Laryngoscope* 2011;121:1620-1626

11AP03-3

Upside (Down Mask Ventilation UDMV) for paediatric patients: a pilot study

Shainaaz Dooply S.S.L., Esen A., Gul K., Calim M., Karaaslan K.
Bezmialem Vakif University, Dept of Anaesthesiology & Intensive Care, Istanbul, Turkey

Background and Goal of Study: Oropharyngeal intubation or LMA insertion is not necessary for anaesthesia practice at some short periorbital surgical procedures. Usage of face mask instead of these, with classical holding method (CHM), can block the surgical area and it can be too hard or impossible for the surgeons to work (For example: nasolacrimal duct probing, corneal suture removal, chalazion surgery etc.). To overcome this problem, we defined a new method for face mask holding and planned this pilot study.

Materials and Methods: Between October-December 2016 we included 46 patients to this study

(23 in CHM (Group1) and 23 in UDMV (Group2)). We recorded demographic details, ASA status, surgical procedures, anaesthesia and surgery times, surgeons' satisfaction, atropine necessitation and complications. We also recorded the if we had to hold the mask from the face.

Anaesthesia induction started with CHM for all patients, using %50 O₂-%50 air and %6-8 sevoflurane. After 2-3 minute ventilation we changed over to UDMV method, if the patient belongs to Group 2. Otherwise, continued with CHM.

For UDMV technique anaesthetist stands behind the head and the opposite side of the surgical area. Oral airway should be placed before changing the mask position, a face mask with a cuff should be up-sided down and placed as covering only the mouth. By the way nose side closes the chin totally and prevents air leakage. Mask's cuff at the mandible side, totally blocks nares and prevents air leakage. Thus, ventilation is provided only by oral airway. It is held with one hand against the face, applying downward pressure on the mask body exerted by the thumb and the index finger (the thumb and the index finger have a "C" shape) while the other fingers grasp the mandible to facilitate extension of the neck.

Results and Discussion: There were only 2 statistically significant parameters at the comparison of the groups. We had to hold the mask at 22 patients in Group 1 to avoid interruption of surgical procedure, whereas there was only 1 patient in group 2 (p<0,001). The other was the satisfaction of the surgeon (p<0,001). While 21 surgeons were very satisfied in group UDMV it was 3 for CHM group. While holding the face mask with classical method can be a disrupting factor for surgeons during face mask ventilation, by this method surgeon satisfaction can be increased.

Conclusion(s): The new method is feasible for short periorbital surgical procedures.

11AP03-4**A mandatory mask ventilation trial before neuromuscular block: a qualitative study of its conceptual and practical significance for registrars and junior anaesthetists**Saastamoinen M.¹, Frykholm P.¹, Larsson J.²¹Uppsala University, Dept of Anaesthesiology & Intensive Care, Uppsala, Sweden, ²Uppsala University, Department of Public Health and Caring Sciences, Uppsala, Sweden

Background and Goal of Study: Ensuring adequate bag-and-mask ventilation before the administration of a neuromuscular blocking (NMB) agent has become a generally accepted practice among many anaesthetists, despite lack of evidence of any benefits for patient safety. In contrast, the recently published DAS guideline for the management of the difficult airway promotes the use of NMB to resolve difficult mask ventilation. This study aimed to investigate the implementation, rationale for and effects of a mandatory mask ventilation trial before routine intubation.

Methods: Adult patients of ASA class I-II scheduled for elective surgery under general anaesthesia with intubation were recruited. The anaesthetic team consisted of an anaesthetist (<10 years of experience), a nurse anaesthetist, and a nurse assistant. Video-assisted observations were made by an observer alongside one of two senior consultants taking detailed notes. Subsequently, participating anaesthetists were interviewed concerning their practice as well as the perceived departmental policy and the teaching of testing mask ventilation before NMB.

Results: Preliminary data from 29 patients showed that, a test of mask ventilation was performed before the administration of NMB in 21 cases. In 8 cases the anaesthetist was not satisfied with initial ventilation, in 4 of these 8 cases the first response was to administer NMB, while in 3 cases mask ventilation was improved before administering NMB. In 1 case improvement was attempted but proved impossible, leading to decreasing SpO₂. During the interviews the concept of testing mask ventilation before NMB was known to all 13 anaesthetists and was regularly used by 10. All 13 agreed that chest movements and/or CO₂-wave formation was required for the test to be satisfactory. However, the perceived next step in case of a failed test varied. So did their understanding of the policy held by the department.

Conclusions: Mask ventilation before NMB is a prevalent practice of varying importance for the junior anaesthetist in our centre. Cases where the test was successful, partially successful, futile, or even potentially harmful were observed. The method of video recording real live anaesthetic team performance combined with observation notes and interviews may be useful for understanding mental models of best practice in anaesthesia. The concept of mandatory mask ventilation before NMB administration needs further study.

11AP03-5**A novel approach to difficult airway management in Thoracic surgery with Totaltrack® videolaryngoscope and bronchial blockers**Granel M.¹, Pereira F.², Broseta A.M.¹, Biosca E.¹, Nieto S.¹, De Andrés J.¹¹Consorcio Hospital General Universitario de Valencia, Dept of Anaesthesiology & Intensive Care, València, Spain, ²Centro Hospitalar do Porto, Dept of Anaesthesiology & Intensive Care, Porto, Portugal

Background: TotalTrack® Video Laryngeal Mask (VLM) is a new generation of supraglottic devices which combine the facility of a laryngeal mask and of a videolaryngoscope (1).

Patients who undergo thoracic surgery often have impaired pulmonary function which decreases the apnea time available for airway management (2). One of the main multi-functions of this device is to ventilate and oxygenate the patient while managing the airway (3).

Case report: We describe the use of TotalTrack® VLM in two cases of high risk thoracic surgery patients with predicted difficult airways: a 65-year-old male with Mallampati IV and discrete neck extension limitation and a 71-year-old male with documented Cormack-Lehane III laryngoscopy, proposed for a high-risk thoracic surgery with lung isolation. The first intubation attempt failed in both situations and an upwards and backwards traction maneuver and a bougie were necessary. However, this device allowed continuous successful

ventilation in laryngeal mask mode during intubation attempts and, also during bronchial blocker placement.

Discussion: TotalTrack® VLM has potential advantages in thoracic patients with predictable difficult airways. This device offers the possibility to ventilate through all the airway management process and avoid hypoxemia, which gives the clinician more time to achieve his goal. However, with this device the glottic view is impaired once the endotracheal tube is advanced. More studies need to be undertaken to establish its role in the difficult airway patient and in high risk thoracic surgery.

References: 1. Br J Anaesth. 2015;115(5):798-799. 2. Anesthesiol Clin . 2012 December; 30(4): 759-784 3. Rev Esp Anestesiol Reanim. 2016;63(1):1-2

Learning points:

- Lung isolation may be technically difficult and time demanding, so having the possibility to ventilate during the process and avoid hypoxemia offers the clinician more time to achieve his goal. - TotalTrack® "rescues itself": laryngeal mask ventilation can be restored and another intubating attempt planned without having to change to a rescue device.

- When using TotalTrack® VLM it seems good practice to help intubation with a bougie in cases of predicted or confirmed difficult airway.

11AP03-6**Comparison of intubation success rates of metallic reusable laryngoscope blades and metallic/plastic laryngoscope blades in morbidly obese patients**Kara A.¹, Bilgin H.¹, Bayraktar S.¹, Rahimi P.¹, Soyulu N.B.¹, Kirac Ogun F.²¹Uludag University, Dept of Anaesthesiology & Intensive Care, Bursa, Turkey, ²Inegol Devlet Hospital, Dept of Anaesthesiology & Intensive Care, Bursa, Turkey

Background: Reusable laryngoscope blades, which are the most commonly used devices for airway management, have been reported to be frequently contaminated and possible source of infection. Although disposable laryngoscope blades are recommended to reduce the risk of infection, there are studies suggesting increased failed intubation attempt rates (1).

The major cause of anesthesia-related mortality is the failure of airway management (2). The incidence of difficult airway is reported 1-4% in normal population while it ranges up to 12-20% in obese patients (3). Following the introduction of disposable blades and considering the increased rate of failed intubation in obese patients, we aimed to make a comparison of successful intubation rates of plastic and metallic disposable blades in morbidly obese patients.

Methods: Aged between 18-60 years with BMI >40 and classified as ASA I-III, 150 patients were enrolled in the study (Ethics committee approval ID:2014-13/13.26.06.2014). Patients were divided into three groups considering the blade type used for laryngoscopy. Group MR; patients intubated with metallic reusable, Group MD; patients intubated with metallic disposable and Group PD; patients intubated with plastic disposable laryngoscope blades. Data regarding intubation success rate, duration of intubation, complications and hemodynamics of patients were recorded. One-way ANOVA test and Kruskal Wallis test were used for statistical analyses. P value < 0.05 was considered statistically significant.

Results: No significant difference was detected between the groups for the first-attempt intubation success (p>0.05). The duration of laryngeal visualization and intubation were shorter in the MD group (6,5±4,6 sec. and 13,4±7,3 sec. respectively) (p<0.05). In the PD group, there were less Cormack-Lehane grade 1 patients (p<0.05), also patients with higher IDS score and need more lifting power applied (p<0.05).

Conclusion: We found that the PD blades were not as successful as the MD and MR blades in morbidly obese patients. Even though there was no difference between the MR and MD blades in intubation success rate, intubation time was shorter in the MD blade group. Therefore, concluded that the MD blades that possibly reduced infection rates, can be safely used in morbidly obese patients.

References:

1. Buléon C. EJA 2013;30:163.
2. Braz LG. Clinics. 2009;64:999.
3. Sheff RS. Surg Obes Relat Dis 2013;9:344.

11AP03-7**Comparison of the intracuff pressure of tapered-cuff endotracheal tube and classic cylindrical-cuff endotracheal tube after lateral rotation of head during middle ear surgery: a prospective, single-blind randomized, controlled trial**

Jeon Y., Lee H., Kim S.

Kyungpook National University Hospital, Dept of Anaesthesiology & Pain Medicine, Daegu, Korea, Republic of

Background and Goal of Study: Positional change after intubation can change intracuff pressure, which can increase airway complications.¹ We compared the change of intracuff pressure of tapered-cuff endotracheal tube (ETT) and cylindrical-cuff ETT after lateral rotation of head during middle ear surgery.

Materials and Methods: Fifty two patients aged 18-70 years underwent tympanomastoidectomy under general anesthesia were randomly allocated to receive endotracheal intubation with classic cylindrical (Group C, n=26) or tapered cuff ETT (Group T, n=26). After intubation, the cuff pressure was set to 22 cmH₂O in the neutral position of head.

After lateral rotation of head the cuff pressure was measured again and re-adjusted to 22 cm H₂O. In addition, the change of distance from the carina to the tip of ETT was measured before and after positional change of head. The incidence of cough, sore throat, and hoarseness was assessed at 30 min, 6 hr, and 24 hr after surgery.

Results and Discussion: There was no difference in demographic data between groups. After lateral rotation of head an increase of cuff pressure was greater in the group T (12.4 ± 2.9 cmH₂O) than in the group C (6.4 ± 2.1 cmH₂O) (P<0.001). The degree of displacement of endotracheal tube after lateral rotation of head was 11.0 ± 2.1 mm in the group T and 7.5 ± 2.4 mm in the group C (P<0.001). The incidence of cuff pressure more than 30 cmH₂O was higher in the group T than the group C (P<0.001). The overall incidence of postoperative sore throat, hoarseness, and cough at the designated time point (30 min, 6 h, and 24 h) was comparable between two groups.

Conclusion(s): The head movement from neutral to lateral rotation increased the cuff pressure and displaced the position of cuff tip in both TaperGuard and cylindrical ETT. The cuff pressure was higher in the TaperGuard ETT than the cylindrical ETT. In addition, the extent of displacement of ETT tip was greater in the TaperGuard ETT than the cylindrical ETT.

References:

1. Kim JT, Kim HJ, Ahn W, et al. Head rotation, flexion, and extension alter endotracheal tube position in adults and children. *Can J Anesth* 2009; 56: 751-756.

Acknowledgements: This research was supported by Kyungpook National University Bokhyeon Research Fund, 2015

11AP03-8**Insertion depths of RAE tracheal tubes for orotracheal intubation according to fixation site and head position changes**

Kang J.-M., Jung H.-M.

Kangdong Kyunghee University Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: The use of RAE tubes in head and neck surgery has many advantages. The tubes lay along the chin without obstructing the view of the surgical field. We compared the insertion depth of the RAE tube for orotracheal intubation by using flexible fiberoptic bronchoscope when fixed at the midline and right angle of the mouth in the simple supine position and again following extension of the neck.

Materials and Methods: One hundred adults (50 males, 50 females) presenting for routine elective surgery under general anesthesia were studied. The tracheal tube tip to carina distance was measured with the tube fixed at upper incisor and then at the right canine in both neutral and extended head positions using a fiberoptic bronchoscope.

Results and Discussion: In males, the tip to carina distances increased from 4.5 cm to 6.4 cm in the neutral head position, and from 5.8 cm to 7.4 cm in the extended head position with moving the fixation site from right canine to upper incisor. In females, the tip to carina distances increased from 3.4 cm to 4.6 cm and from 4.9 cm to 6.2 cm in each position respectively with the same action (P<0.001).

Conclusion(s): There was a significant increase in the tip to carina distance of the RAE tubes with changing the fixation site of endotracheal tube from right canine to upper incisor in both neutral and extended head positions of the adults.

References:

1. Cheng CH, Wong CS, Hsu CH, Ho ST. Airway length in adults: estimation of the optimal endotracheal tube length for orotracheal intubation. *J Clin Anesth* 2002; 14: 271-4.

2. Sharma K, Varshney M, Kumar R. Tracheal tube fixation: the effect on depth of insertion of midline fixation compared to the angle of the mouth. *Anaesthesia* 2009; 64: 383-6.

3. Conrardy PA, Goodman LR, Lainge F, Singer MM. Alteration of endotracheal tube position. Flexion and extension of the neck. *Crit Care Med* 1976; 4: 7-12.

11AP03-9**Is epidural catheter the best choice to anesthetize a partially obstructed airway for an awake fiberoptic tracheal intubation?**

Pimenta M., Andrade D., Rodrigues M., Gonçalves M., Canas M., Matos F

Centro Hospitalar de Lisboa Central, Dept of Anaesthesiology, Lisboa, Portugal

Background: The usefulness of epidural catheter to anaesthetize the airway in preparation to awake fiberoptic tracheal intubation is well established^[1]. We present a case of retropharyngeal abscess in which the epidural catheter proved to be an effective and secure approach to anesthetize the larynx and trachea.

Case report: A 71-year old male with history of hypertension and hypercholesterolemia was proposed for emergency surgical drainage of retropharyngeal abscess. In the emergency department, he presented himself with altered mental status and mild hypoxemia (oxygen saturation 89%) despite face mask oxygen therapy (15 L/min). Since this was an anticipated difficult airway with partial obstruction, we decided for an awake fiberoptic intubation. The nose and pharynx were anesthetized with topical lidocaine. The fiberscope was introduced through the nostril and progressed until the oropharynx, where a bulking mass displaced the epiglottis posteriorly. A narrow column of air was identified and the epidural catheter, placed in the working channel of the fiberscope, advanced through it. Additional 40mg of lidocaine 2% were injected in the epidural catheter to atomize the local anaesthetic in the larynx and trachea. Then, the fiberscope progressed until the trachea and the patient was intubated with a nasotracheal tube (6.0") without complications.

Discussion: Among the various techniques described to anesthetize the larynx, local anaesthetic spray through epidural catheter provides several advantages: availability, non-invasive, reliably and safely reaching areas beyond airway obstruction. Local anaesthetic nebulization or spray through the fiberscope would probably be ineffective due to the airway obstruction. In case of infection, invasive procedures, such as nerve blocks or trans-tracheal injection, pose the risk of significant complications: in the event of abscess perforation, leakage of pus to the airway may have catastrophic consequences.

References: 1. *Anesthesiology* 11 2004, Vol.101, 1253

Learning Points: This case reflects on anaesthesia of the airway for awake fiberoptic tracheal intubation, a much discussed issue, in a quite challenging situation. In a difficult airway management due to a retropharyngeal abscess, the epidural catheter proved to be a successful and safe method to anesthetize the larynx and trachea beyond the obstruction.

11AP03-10**Low skill fiberoptic intubation through classic LMA: comparison of performance between senior and junior anaesthetists - a pilot study**

Chow S.Y., Tan Y., Ho V.K., Matthews A., Wong T., Wong P
Singapore General Hospital, Dept of Anaesthesiology, Singapore, Singapore

Background: Fiberoptic intubation (FOI) through a supraglottic airway device (SAD) is part of the Difficult Airway Society unanticipated difficult intubation algorithm. The SAD acts as a guide for the fiberoptic bronchoscope (FOB) to

reach the glottis and thus, a low skill level is required to perform FOI through an SAD. All anaesthetists should be able to perform this in an unanticipated difficult intubation scenario.

Hypothesis: There is no time difference between senior and junior anaesthetists performing FOI through Classic LMA.

Method: Direct method: tracheal tube (TT) is pre-loaded on FOB; Indirect method: Aintree Intubation Catheter (AIC) is pre-loaded on FOB. In both methods, FOB is passed through SAD into trachea.

Direct method: TT rail-rodged over FOB through SAD into trachea.

Indirect method: FOB removed, leaving AIC in trachea, TT rail-rodged over AIC into trachea.

4 senior and 4 junior anaesthetists were recruited to participate.

The order in which direct and indirect FOI was performed was randomised. It was not practical to blind participants to the method they used. 1 independent person inserted the same size 3 Classic LMA into the same manikin for all attempts to standardise intubating conditions.

Duration of experience, time to visualise carina, and time to intubate were recorded by another independent assessor. We calculated the mean time taken to visualisation of carina and intubation of both groups with both methods and used the two-tailed T test to assess for significant difference between the means at $p < 0.05$.

Results and Discussion: Average duration of anaesthesia experience: seniors = 14.25 yrs, juniors = 7.75 mths.

Mean time to view carina (direct): seniors 39.2s juniors 38.8s with $p = 0.98$.

Mean time to view carina (indirect): seniors 23.7s juniors 24.4s with $p = 0.92$.

Mean time to intubate (direct): seniors 64.3s juniors 103.6s, with $p = 0.28$.

Mean time to intubate (indirect): seniors 71.5s juniors 67.5s with $p = 0.78$.

There was no significant difference in mean time to visualisation of carina and intubation using either method between seniors and juniors.

Conclusion: Our pilot study suggests FOI through a size 3 Classic LMA is achievable by any anaesthesia practitioner, with no significant difference in time taken regardless of level of experience.

The longest time taken to intubate was 160.1s, which is still acceptable to avoid hypoxia if patient was adequately preoxygenated. A larger study is needed to test this hypothesis.

11AP04-1

Resurgence of blind nasal intubation with videolaryngoscopy as a guide for head maneuvers in the course of nasotracheal intubation in panfacial fracture patients with severely restricted mouth opening

Kumar K., Singh P.M.

All India Institute of Medical Sciences, Dept of Anaesthesiology & Intensive Care, New Delhi, India

Background: Majority of the patients with pan facial fractures have severe limitation of mouth opening, particularly involving the zygoma and the angle of mandible. Airway management is challenging in these cases, especially if mouth opening is less than 20 mm¹. Awake nasal fiberoptic intubation is the standard technique of airway management in these patients posted for reduction of faciomaxillary and mandibular fractures.

However, in case of failed fiberoptic due to bleeding, particularly in panfacial trauma, the only option of securing the airway left is the surgical one.

Blind nasal intubation can act as a bridge between a failed fiberscope attempt and a surgical airway, but it has become a dying art in present scenario².

Case report: In this report, we describe a series of five cases of panfacial fractures with severe restriction of mouth opening where fiberoptic intubation was not possible due to bleeding or logistical issues.

Moreover, a videolaryngoscope blade could be just introduced into the oral cavity but manipulation with a Magill forceps was not possible. In all these cases, we successfully secured the airway with a Macintosh-shaped C-Mac videolaryngoscope showing the laryngeal view and the head maneuvers done similar to the blind nasal intubation technique to guide the endotracheal tube past the vocal cords.

Discussion: In all the cases, it was possible to introduce the slim Macintosh type of C-Mac blade (maximum height 14 mm), but any maneuvering with Magill forceps was not possible, therefore head maneuvering similar to the blind nasal technique was complemented with the videolaryngoscope and the airway secured with much more ease than the blind nasal intubation due to objective means of guiding the maneuvers.

This technique can serve as bridge between failed intubation and a surgical airway.

Moreover, it could replace the standard nasal fiberoptic technique as plan A of airway management with patients of panfacial trauma with high risk of bleeding.

References:

1. Hagberg CA. Benumof and Hagberg's airway management. 3rd ed. Philadelphia, Elsevier Inc. 2013, pp 403-41.

2. Zhang J, Lamb A, Hung O, Hung C, Hung D. Blind nasal intubation: teaching a dying art. Can J Anaesth 2014; 61: 1055-6.

Learning points: Videolaryngoscopy can an important tool for head maneuvering during blind nasal intubation in severely restricted mouth opening in panfacial fracture patients.

11AP04-2

Stereoscopic laryngoscope with 3D video headset: technical feasibility

Dingley J., Williams D.

ABM University Health Board, Swansea, Dept of Anaesthesiology, Swansea, United Kingdom

Background and Goal of Study: Direct or video laryngoscopy provides a two dimensional view with no depth perception. Some endoscopic surgery devices e.g. the Da Vinci robot provide a three dimensional (3D) view using specialised monitors to facilitate manipulation of instruments in 3D space.[1] This might be advantageous in the context of video laryngoscopy for potentially difficult airways.

Materials and Methods: Two 6mm diameter video cameras with light sources were mounted side by side in a custom 3D printed housing located on a Macintosh laryngoscope blade. The video feed from each camera was sent to a heavily modified virtual reality headset incorporating right and left video screens mounted with adjustable lenses over each eye (Fig 1).[2]



[Figure 1. 2-camera laryngoscope and video headset.]

Results and Discussion: The geometry of stereoscopic images requires two different horizontally separated viewpoints. Human eyes are ~61mm apart, however for practicality on a laryngoscope blade the two cameras were located 10 mm apart. Despite this we were able to obtain good quality real time 3D video which provided depth perception to aid simulated intubation of a manikin (Fig 2. Example still stereoscopic image. By deliberately crossing one's eyes a three dimensional image may be seen)*.



[Figure 2. Example of stereoscopic still image.]

Potential future improvements: wireless link between laryngoscope and headset; smaller high definition cameras and screens; flip up screens on headset to allow observation of whole patient when not concentrating on laryngoscopy.

Conclusion(s): 3D video laryngoscopy is a feasible and potentially useful innovation, worthy of further research and development.

References:

1. Int J Med Robot 2013;9(3):e34-8
2. Full build instructions here with non-objection from ESA: <http://www.instructables.com/id/3D-Laryngoscope-With-VR-Headset>
Footnote: *A 3D anaglyph (red/green) video will run in the e-poster if accepted: glasses will be distributed.

11AP04-3

The effects of endotracheal intubation via Mc-Grath Videolaryngoscope on intraocular pressure

Ozkan A.S.¹, Akbas S.¹, Polat N.², Yalin M.R.¹

¹Inonu University, Dept of Anaesthesiology, Malatya, Turkey, ²Inonu University, Dept of Ophthalmology, Malatya, Turkey

Background and Goal of Study: In this study; we aimed to compare the effects of endotracheal intubation via direct laryngoscope(DLS) and Mc-Grath Videolaryngoscope(VL) on intraocular pressure.

Materials and Methods: Total of 50 ASA (American Society of Anesthesiologist) Grade 1-2, Mallampati score 1 or 2, age between 18 to 65 patient planned to undergo nonophthalmic surgery included to study. Patients with glaucoma, diabetes mellitus, cardiovascular and pulmonary diseases, ASA Grade III and IV, BMI more than 35, difficult intubation, undergo obstetrical surgery and propofol, fentanyl, rocuronium contraindicated were excluded from the study. Patients divided randomly into 2 groups as direct laryngoscopic and videolaryngoscopic intubation group. Patients were preoxygenated with %100 O₂ for 3 minutes then anesthesia was induced using propofol 2 mg / kg, fentanyl 1 mcg/kg, and rocuronium 0,5 mg / kg in both groups. After 3 minutes mask ventilation, patients were intubated (women with No:7-7,5, men with No:8-8,5 intubation tube) by oral route. SBP, DBP, MAP, SpO₂, PI recorded and IOP (intraocular pressure) measured by ophthalmologist by tonopen were recorded pre-induction (basal), after induction, 1,2,3,5 minutes after intubation, respectively. Period between handling of laryngoscope or videolaryngoscope after termination of mask ventilation and obtain end tidal CO₂ was accepted as application time and recorded. Study terminated after 5th minute values taken.

Results and Discussion: There was no statistically significant difference in distribution of sex, weight, age, height, BMI, MPS and ASA between groups. Duration of intubation in VL group was 32 ± 2 sn and statistically significantly longer than DLS group (23,8 ± 2,9) (p<0,05). Statistically significant increase was found in intraocular pressure after 1 minute intubation in DLS group (16,1 ± 2,4) compared with VL group (12,1 ± 2,5) (p<0,001).

Conclusion(s): We concluded that endotracheal intubation by Mc-Grath videolaryngoscope could be more useful with regard to endotracheal intubation by DLS in patients with high IOP pathologies when performed by experienced anesthesiologists.

11AP04-4

Video laryngoscopes (VL) versus fiberoptic bronchoscopy (FB) as a tool for orotracheal intubation. Systematic review, meta-analysis and trial sequential analysis

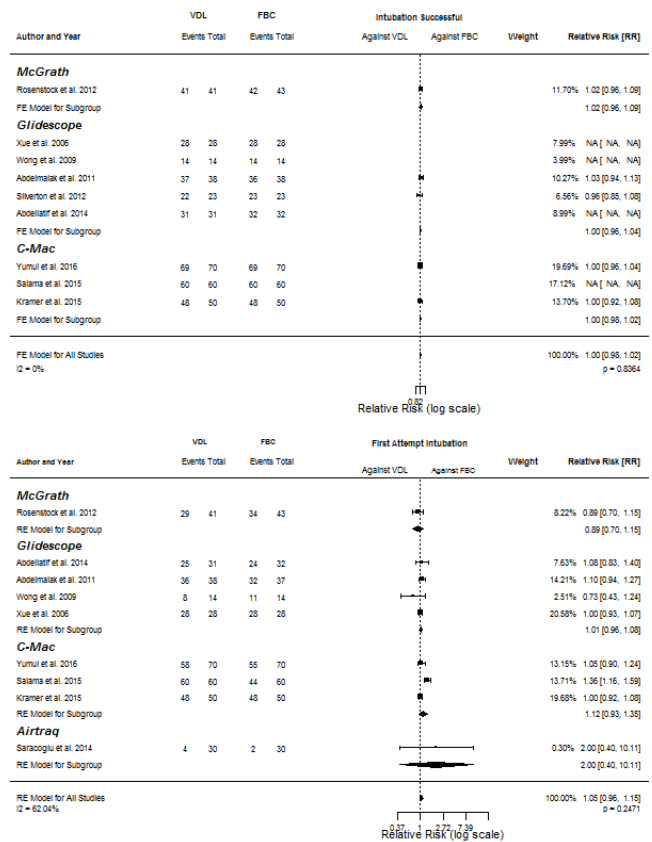
Gómez-Ríos M.Á.¹, Martínez Hurtado E.², Casans Francés R.³, Ripollés Melchor J.², Abad Gurumeta A.², Calvo Vecino J.M.²

¹Complejo Hospitalario Universitario A Coruña, Dept of Anaesthesiology and Perioperative Medicine, A Coruña, Spain, ²Hospital Universitario Infanta Leonor, Dept of Anaesthesiology, Madrid, Spain, ³Hospital Clinico Universitario 'Lozano Blesa', Dept of Anaesthesiology, Zaragoza, Spain

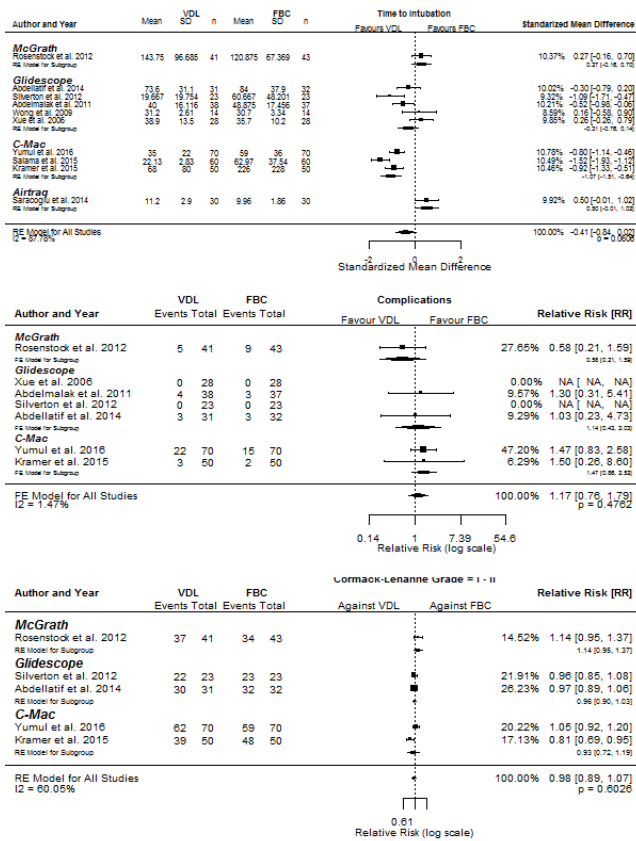
Background and Goal of Study: To compare the usefulness of video laryngoscopes (VL) versus fiberoptic bronchoscopy (FB) as a tool for orotracheal intubation according to the available evidence in the literature.

Materials and Methods: A systematic review was performed according to the PRISMA-p guidelines. A search was designed to identify randomized clinical trials and reviews comparing VL or FB as a tool for orotracheal intubation in elective surgery. The primary outcome was the success rate of intubation. Secondary outcomes were the rate of intubation at the first attempt, time to intubation, rate of complications and the rate of visibility of the glottis by Cormack-Lehane less than 3 (CL <3). Relative Risk (RR) for discrete variables and the difference of standardized means (SDM) for continuous variables were meta-analyzed. A p-value <0.05 was considered significant. Likewise, a subgroup analysis was performed according to the type of VL used. A sequential item analysis (TSA) was performed for each of the variables to determine the required sample size (RIS) for the absolute risk difference found between groups.

Results and Discussion: We retrieved 19 articles, of which 10 met inclusion criteria. No statistically significant differences were found for the rate of intubation, or intubation at the first attempt, complications, CL <3 or time to intubation.



[Fig1]



[Fig2]

In all of cases the TSA concluded that the sample size of the meta-analysis was insufficient to define as existing the observed difference. Subgroup analysis showed an improvement in intubation time of subgroup C-Mac [SMD in favor of VDL = -1.07 (-1.51, 0.64), p=0.001], confirmed by TSA [RIS/Sample Size = 73/360 patients].

Conclusion: It can not be concluded that there are no differences in the use of VL or FB due to lack of sample size. The use of C-Mac reduces the time needed for orotracheal intubation versus FB intubation.

11AP04-5

Advantages of using a software to calculate forces applied on soft airway tissues during videolaryngoscopy

Juanola Galceran A.¹, Callicó Ros F.², Julian S.², Molins G.¹, Cao López L.¹, Rodiera Olivé J.¹

¹Centre Mèdic Teknon, Dept of Anaesthesiology, Barcelona, Spain, ²Centre Mèdic Teknon, Research and Development Department, Barcelona, Spain

Background and Goal of Study: The implementation of videolaryngoscopy (VL) is considered a great advance since it facilitates vision and diminish the strength required to perform the intubation. Anaesthesiologists, proceeding similarly as non-videolaryngoscopy intubations, may use excess of strength unnecessarily causing soft tissue damage. VL intubation technique based on airway forces detection requires lower tractive forces and better outcomes after tracheal intubation.

Material and methods: Pilot prospective observational case-control study to assess the application of a videolaryngoscope blade provided with strength sensors developed by the Engineering Department of Teknon Clinic. The software automatically registered real time data and calculated the area between the vocal chords and the minimum strength required to obtain the best laryngeal image. A VL intubation protocol according to strength applied was designed. VL were performed by two experienced anaesthesiologists in non-difficult airway patients. Cases (patients who underwent VL intubation guided by the protocol) were no different to controls (VL intubation without protocol) regarding airway parameters.

The study received the Ethical Committee approval.

Results: There was a significant reduction of the maximum strength applied during intubation in the control Group (n=7) in comparison with the protocol Group (n=8). Similar minimum strength values for trachea tube placement were observed. No complications were detected during the study.

Conclusions: VL devise with strength sensors was safe and detected an excess of strength applied during blade placement to obtain the first laryngeal view. It was much higher than the strength required to place the tube through trachea meaning that maximum strength was not really needed. VL intubation protocol according to strength data recorded by our device may avoid excess of strength preventing soft tissue injuries. Further studies are required to validate our results.

11AP04-6

Comparison of effects of direct laryngoscopic and fiberoptic oral endotracheal intubation on intraocular pressure

Yıldırım S.¹, Ozkan A.S.¹, Akbas S.¹, Polat N.², Mutlu K.², Durmus M.¹

¹Inonu University, Dept of Anaesthesiology & Intensive Care, Malatya, Turkey, ²Inonu University, Department of Ophthalmology, Malatya, Turkey

Background and Goal of Study: In this study; we aimed to compare the effects of direct laryngoscopic and fiberoptic endotracheal intubation on intraocular pressure in nonophthalmic surgery patients.

Materials and Methods: We obtained confirmation from the Inonu University Medical Faculty Hospital Ethics Committee (2015/134) Total of 54 ASA (American Society of Anesthesiologist) Grade 1-2, Mallampati score 1 or 2, age between 18 to 65 patient planned to undergo nonophthalmic surgery included to study. Patients with glaucoma, diabetes mellitus, cardiovascular and pulmonary diseases, ASA Grade III and IV, BMI more than 35, difficult intubation, undergo obstetrical surgery and propofol, fentanyl, rocuronium contraindicated were excluded from the study. Patients divided randomly into 2 groups as direct laryngoscopic and fiberoptic intubation group. Patients were preoxygenated with %100 O2 for 3 minutes then anesthesia was induced using propofol 2 mg / kg, fentanyl 1 mcg/kg, and rocuronium 0,5 mg / kg in both groups. After 3 minutes mask ventilation, patients were intubated (women with No:7-7,5, men with No:8-8,5 intubation tube). SBP, DBP, MAP SpO2, PI recorded and IOP (intraocular pressure) measured by ophthalmologist by tonopen were recorded pre-induction (basal), after induction, 1,2,3,5 minutes after intubation, respectively. Period between handling of laryngoscope or fiberoptic device after termination of mask ventilation and obtain end tidal CO2 was accepted as application time and recorded. Study terminated after 5th minute values taken. conflict of interest is not declared.

Results and Discussion: There was no statistically significant difference in distribution of sex, weight, age, height, BMI, MPS and ASA between groups. Duration of intubation was statistically significantly longer in FOB group (p<0,05). Heart rate was statistically significantly higher in DLS group at after induction and 1 minute after intubation compared with FOB group (p<0,05). Statistically significant increase was found in intraocular pressure after 1 minute intubation in DLS group compared with FOB group (p<0,05).

Conclusion(s): We concluded that endotracheal intubation by FOB could be more useful with regard to endotracheal intubation by DLS in patients with high IOP pathologies due to causing significantly less rise in IOP when performed by experienced anesthesiologists.

11AP04-7**Comparison of video-laryngoscope and conventional Macintosh laryngoscope for simulated emergency tracheal intubation by pre-hospital emergency care providers with copious vomiting or bleeding in oral cavity**

Suzuki K.¹, Kusunoki S.², Sadamori T.¹, Tanabe Y.¹, Itai J.², Shime N.¹
¹Hiroshima University Hospital, Dept of Emergency & Critical Care Medicine, Hiroshima, Japan, ²Hiroshima Prefectural Hospital, Critical Care Medical Center, Hiroshima, Japan

Background and Goal of Study: Greater incidences of difficult and failed tracheal intubation (TI) procedures in emergency settings as compared to an operating room environment have been reported. Notably, when copious salivation, vomiting or bleeding exists in the oral cavity, fluid makes glottis identification difficult, complicating TI. The PENTAX-AWS (AWS, HOYA, Japan) is a video-laryngoscope developed to facilitate TI under various conditions, including emergency settings. We compared the AWS to a conventional Macintosh laryngoscope (ML) for simulated TI with vomiting or bleeding in the oral cavity regarding success rate, intubation time and difficulty.

Materials and Methods: Fifty-one ambulance crews certified for TI were tested with two scenarios, vomiting and hematemesis. Using a manikin with clumped bronchus and esophagus, we simulated those scenarios by pouring rice gruel or simulant blood material, respectively, into the oral cavity, then compared the following. A) Laryngoscopy with AWS, with suctioning using an 18-Fr suction catheter inserted via the tracheal tube (TT) set into the tube-guiding groove of the blade and subsequent TT advancement. B) Standard laryngoscopy with ML with conventional suctioning using the same size catheter and subsequent TT advancement. Intubations with each device were randomly performed. Success rates and times required from device insertion to glottis visualization (T1) and tube passage through the vocal cords (T2) were noted. The subjects scored the difficulty of the TI attempts using a visual analog scale (0-100 mm, very easy to very difficult). Data are shown as the median (IQR), with Mann-Whitney's U test used for analysis.

Results and Discussion: We enrolled 26 ambulance crews for the vomiting and 25 for the hematemesis scenario. Success rate with each device was 100% in both. Time required for TI with the AWS was significantly shorter than with the ML for both vomiting [T1: 27 (19-34) vs. 41 (28-49) sec, T2: 31 (26-42) vs. 45 (35-56) sec] and hematemesis [T1: 17 (10-21) vs. 22 (15-34) sec, T2: 21 (16-28) vs. 28 (23-44) sec]. Difficulty score for the AWS as compared to the ML in the hematemesis scenario was significantly lower [13 (6-28) vs. 38 (18-56) mm], with no significant difference in the vomiting scenario [36 (20-52) vs. 46 (24-53) mm].

Conclusion: With the AWS, more prompt glottis visualization and TI was achieved in simulated vomiting and hematemesis scenarios.

11AP04-8**Laryngeal morbidity and intubating condition using a McGrath MAC® video laryngoscope with or without neuromuscular blockade: a prospective, randomised, double-blind, non-inferiority trial**

Nakanishi T., Toriumi T., Sakamoto S., Yoshimura M.
 Japan Community Healthcare Organization Tokuyama Central Hospital, Dept of Anaesthesiology, Shunan, Japan

Background and Goal of Study: Tracheal intubation without neuromuscular blockade (NMB) has been thought to increase postoperative hoarseness (PH) and sore throat (POST). However, the effect of video laryngoscope on the incidence of laryngeal morbidity with or without NMB is unknown. In the present study, we hypothesised that using a McGrath MAC® video laryngoscope during tracheal intubation would not increase laryngeal morbidity, even without NMB.

Materials and Methods: We conducted a prospective, randomised, double-blind, non-inferiority trial in a single tertiary centre from November 2015 to July 2016. A total of 250 adult patients with normal airways (body mass index <35, Mallampati classification 1 or 2, and no abnormal airway anatomy) who underwent elective abdominal surgery or laparoscopic surgery, were enrolled. Patients were randomly assigned to receive tracheal intubation without (NMB- group) or with (NMB+ group) rocuronium (6-8 mg/kg). During induction, all patients received fentanyl (2 mcg/kg), remifentanyl (0.5 mcg/kg/

min), propofol (1.5-2.5 mg/kg), and sevoflurane (5%). The anaesthetist, who was blinded to the patient's allocation, performed tracheal intubation and assessed intubating conditions. PH and POST were evaluated via a standardised interview at 24 and 48 h post-surgery by another anaesthetist who did not know patients' group assignment and intubating condition. The primary outcome was the incidence of PH at 48 h post-surgery. The prespecified non-inferiority margin was 10%. Secondary outcomes included PH at 24 h post-surgery, POST at 24 and 48 h post-surgery, and intubating conditions.

Results and Discussion: Data were analysed for 241 patients (123 in NMB- and 118 in NMB+). The incidence of PH at 48 h post-surgery was 8.1% in NMB- and 13.6% in NMB+ (absolute difference, -5.4%; 95% confidence interval, -13.3 to 2.4; P < 0.001 for non-inferiority).

No significant differences were found for PH at 24 h post-surgery (22.8% and 27.1%; P = 0.53), POST at 24 h post-surgery (12.2% and 9.3%; P = 0.61), or POST at 48 h post-surgery (1.6% and 0.8%; P = 1.00) in NMB- and NMB+. In NMB-, inferior position of vocal cords (abducted in 70.7% vs 100%; P < 0.001) was found; however, no significant differences were found for first success rate (100% vs 100%; P = 1.00).

Conclusion: When performed using McGrath MAC® video laryngoscope, tracheal intubation without NMB provided non-inferior PH, POST, and first success rate outcomes.

11AP04-9**Evaluation of videolaryngoscope use outside the operating room**

Bartzi K.¹, Papaioannou E.², Melissopoulou T.³, Schiza C.¹, Tsinari K.¹, Lambadariou A.¹

¹'Laikon' General Hospital of Athens, Dept of Anaesthesiology, Athens, Greece, ²'Laikon' General Hospital of Athens, Dept of Anaesthesiology & Pain Medicine, Agia Paraskevi, Greece,

³'Laikon' General Hospital of Athens, Dept of Intensive Care, Athens, Greece

Background and Goal of Study: Tracheal intubation outside the operating room (OR) tends to be more difficult due to inexperienced nursing staff, inability to administrate muscle paralysis especially when difficult airway is suspected, and other factors such as patient's position on bed and inadequately working devices like suction. Target of this retrospective clinical study is the evaluation of videolaryngoscope in this setting.

Materials and Methods: In a course of two years since our institution obtained the videolaryngoscope Glidescope Cobalt AVL Verathon®, 1463 patients were asked for intubation outside the OR. 853 of them were outpatients in the Emergency Room (ER), and 610 were inpatients in the wards. We recorded the number of them who could not be intubated by experienced qualified anaesthesiologists using the "conventional" methods of intubation (use of external tracheal pressure, stylet, and bougie), as well as the time needed for videolaryngoscopy intubation.

Results and Discussion: 842 (98.7%) among patients in the ER and 587 (96.2%) in the wards were intubated without the use of videolaryngoscope (mean intubation time 124±8sec and 135±11sec respectively). When other attempts failed, the anaesthesiologist used the videolaryngoscope. All patients (100%, p=0) were successfully intubated (mean intubation time 56±7sec). Moreover, an interesting fact is that in the Intensive Care Unit (ICU) when in 3 patients endotracheal tube changing using a bougie failed, videolaryngoscopy intubation was completely successful. Intubation outside the OR is challenging even for the qualified anaesthesiologist and videolaryngoscope experienced use might be useful in such situations.

Conclusion(s): Videolaryngoscope use outside the OR appears to be an effective solution when other intubation methods do not succeed. More clinical data are needed to support this option.

11AP05-1**Pitfalls during anesthesia for thyroidectomy of massive goiter**

Belitova M., Marinov T.

Medical University of Sofia, Dept of Anaesthesiology & Intensive Care, Sofia, Bulgaria

Background and Goal of Study: Multinodular goiters affect 5-8% of general population, most of them being moderate in size and less than 100 grams with usual growth ratio 10-15%/year. Massive goiters (MG) weighing more than 450 grams are exceptional but due to the strategic anatomic location can seriously compromise the patency of the trachea and oesophagus. The aim of this study is to analyze the pitfalls during anesthesia for thyroidectomy of MG.

Materials and Methods: A retrospective study conducted on 566 patients who underwent thyroidectomy over 5 year's period. Anesthetic, radiological, operative and pathological data were obtained and analyzed.

Results and Discussion: Of 566 patients, 37 cases (6,5%) were documented as having a retrosternal goiter (RSG); 12 (2, 1%) - as having a MG. All complications were observed in these two groups: shortness of breath when supine (1,5%), dysphagia (4,2%), clinically evident stridor pre/postoperatively (7%), tracheal deviation (5,3%; mean deviation 48mm [29-58]), tracheal stenosis (1%; mean diameter reduction 46% [range 41-79%]), difficult intubation (1%), compression tracheomalacia (CTRM) (1,5%), tracheopexia (0,5%), postoperative recurrent laryngeal nerve (RLN) paralysis (4%). All other patients underwent uneventful anesthesia and surgery.

Conclusion(s): Serious complications can occur in patients with MG concerning patency of airways pre/postoperatively. For risk management we would still advocate that such patients be managed in units where multidisciplinary teams are available.

References: 1. Gillfillan N, Ball CM, Myles PS and al. A cohort and database study of airway management in patients undergoing thyroidectomy for retrosternal goiter. *Anesth Int Care* 2014; 4:700-7082. Norman Oneil Machado. Thyroidectomy for Massive goiter weighing more than 500gr. *Surgical Science*, 2011, 2, 278-2843. Rifat Laffi, Joan Harper, Renato Rivera. Total thyroidectomy for giant goiter under local anesthesia and Ketamine in a surgical mission. *Int J Surg Case rep*. 2015;8:52-54

Acknowledgements: We acknowledge the support of our bronchoscopy technicians who assisted us in performing bronchoscopy and radiology technicians for performing CT scan.

11AP05-2**Protocol of cuff leak test in thyroid surgery**

Paulo L., Silva E., Lima G., Costa G.

Centro Hospitalar e Universitário de Coimbra, EPE, Dept of Anaesthesiology & Pain Medicine, Coimbra, Portugal

Background and Goal of Study: Thyroid surgery is the most frequent cause of bilateral vocal cord (VC) paralysis and can cause post-extubation stridor (PES) by bilateral recurrent laryngeal nerve (RLN) section. Although rare, PES is an emergency and the the anesthesiologist should be prepared to address it most effectively. There are no reliable and effective ways to check the integrity of the VC.

Hereupon, and because we had a clinical report with a PES in thyroid surgery, we decided to create a protocol of cuff leak test (CLT). It has the main purpose to help the anesthesiologist to manage the suspected cases of VC injuries before extubation through an easy and costless method.

Materials and Methods: Qualitative and quantitative cuff leak test is easy to use and allows us to evaluate the possibility of RLN lesion immediately before extubation. The main basis consists on an air leak evaluation around the endotracheal tube with a desinflated cuff, which will be inversely proportional to the laryngeal obstruction degree created by any mechanism of lesion of the VC. If there is no leak, the test is positive.

Results and Discussion: It is clearly documented that in Intensive Care Medicine Units, CLT is in desuse due to its low specificity. But in that type of environments, clinical contexts are very different. In thyroid surgery we can identify high-risk patients for developing PES.

It is well known that electromyography of RLN is the gold standard monitorization of VC in the intra-operative period of thyroid surgery.

However, there are limitations on its use, reduced indications, high costs and fallible results.

With a protocol of CLT, we pretend to plan an approach to predict VC paralysis and avoid the development of PES as much as possible.

Conclusion(s): Very little is known about the CLT utility in the thyroid surgery. Accordingly, a protocol of CLT with a datasheet was created and adapted to thyroid surgery.

It intends to early detect high risk patients and also to use a simple and cheap type of monitorization, although with probable fallible results.

The protocol was introduced in the Anesthesiology Service of our hospital and readily accepted.

At the moment its use is in progress in all operating rooms of general surgery of our hospital.

In the future the data will be collected in order to realize how useful the CLT test in thyroid surgery is.

11AP05-3**Respiratory distress after total thyroidectomy**

Teixeira J.C., Aquino E., Trabulo A., Pedroso V.M., Nunes L.

Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisboa, Portugal

Background: Bilateral recurrent laryngeal nerve (RLN) injury is a rare complication of thyroidectomy. Close post-operative care is recommended as airway obstruction may require emergent intervention. The authors present a case of bilateral vocal cord palsy.

Case report: 86 years-old, ASA II patient proposed for thyroidectomy due to multinodular goiter. Neck CT revealed slight right deviation of the trachea without apparent compression. Otolaryngology evaluation with videolaryngoscopy prior to surgery revealed normal vocal cord movement.

General anaesthesia was administered with propofol (TCI) and REMIfentanyl and muscle relaxation was achieved with Rocuronium. A 7.0 endotracheal tube was inserted after direct laryngoscopy without complications. The procedure was performed uneventually and the patient was extubated and transferred to the Post-Anaesthesia Care Unit (PACU) clinically stable.

After 30 minutes in the PACU, the patient presented temporary restlessness and stridor that disappear after calming the patient and breathing control. All monitorization was normal. The patient was kept in this unit for 24 hours reporting occasional stridor, that improved with head elevation.

8 Hours after being transferred to the ward asymptomatic, the patient presented stridor and respiratory distress. Videolaryngoscopy demonstrated bilateral vocal cord palsy and urgent tracheotomy was performed. Patient was de-cannulated after 14 days with recovery of left vocal cord function.

Discussion: Thyroidectomy post-operative period can be complicated with airway obstruction. Various hypothesis should be considered when vocal cord palsy is present at videolaryngoscopy, such as bilateral RLN injury. Although a rare complication, known risk factors include thyroid malignancies, reinterventions and large goiters¹. Patients usually present with stridor, dyspnea and dysphonia but symptoms can be subtle as severity depend on the remaining vocal cords function and position².

References:

1. Christou N et al, Complications after total thyroidectomy. *J Visc Surg*. 2013;1-8.
2. Mattsson P et al, Recovery of laryngeal function after intraoperative injury to the recurrent laryngeal nerve. *Gland Surg*. 2015; 4(15):27-35

Learning points: Although rare, bilateral RLN should be considered as one of the possible causes of post-thyroidectomy respiratory distress.

11AP05-4**Thoracoscopic esophagectomy in the prone position with single-lumen endotracheal tube with artificial pneumothorax. Preliminary results**Ayas B.¹, Diaz Cambronero O.¹, García Gregorio N.¹, Vila Montañés M.¹, Argente Navarro P.¹, Errando Oyonarte C.²*¹Hospital Universitario y Politecnico La Fe, Dept of Anaesthesiology, Valencia, Spain, ²Hospital General de Valencia, Dept of Anaesthesiology, Valencia, Spain*

Goal of Study: Recently, the use of thoracoscopic esophagectomy in prone position has stimulated new interest in minimally invasive approaches. It has several advantages for surgeons as a shortened learning curve, ergonomic position of the hands, better operative field due to the effects of gravity, and

theoretical improved oxygenation compared to lateral decubitus position due to a better ventilation perfusion ratio. Furthermore some surgeons have been able to operate without the use of one-lung ventilation. Artificial pneumothorax in prone position using two-lung ventilation may lead to a decrease in respiratory complications. We examine the safety and feasibility of this surgery under two-lung ventilation with single-lumen tube.

Materials and Methods: We store our data in a prospective review of 25 patients from August 2015 with esophagus carcinoma who underwent esophagectomy using thoracoscopic in prone position. After intubation with a single-lumen endotracheal tube the patient is placed in the prone position. We measured haemodynamic stability using Mostcare system (items: cardiac index (CI), mean arterial pressure, systolic volume variation); partial pressure of oxygen in arterial blood, partial pressure of carbon dioxide in arterial blood; peak airway pressure; plateau pressure, compliance.

Results and Discussion: No thoracotomy conversion was performed. The surgeons considered that the operative field was excellent in all cases. There were no major changes in CI, systolic blood pressure immediately after pneumothorax. The mean PaO₂/FIO₂ ratio was: 220,35 and PaCO₂ 45.8 during artificial pneumothorax in prone position. The mean Peak airway pressure was 24. No excessive increases in airway pressure or hemodynamic depression were observed during artificial pneumothorax.

Conclusion(s): These results suggest that thoracoscopic esophagectomy in prone position is safe and technically feasible. In our review it was successfully completed in all 25 patients. This technique shows considerable advantages such as a better operative field exposure, improved surgeon ergonomics and satisfactory respiratory results.

References:

1. H. Takeuchi. et al. Two-lung ventilation in the prone position: is it the standard anesthetic management for thoracoscopic esophagectomy? *Gen Thorac Cardiovasc Surg* (2014) 62: 133-134.
2. H. Noshiro et al. Thoracoscopic esophagectomy using prone position. *Ann Thorac Cardiovasc Surg* 2013; 19:399-408.

11AP05-5

Tracheobronchial injury after rigid bronchoscopy - A rare but possibly catastrophic complication

Matias B.¹, Conde P.²

¹Centro Hospitalar de Setúbal, Dept of Anaesthesiology, Setúbal, Portugal, ²Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background: Tracheobronchial injuries are rare but life-threatening complications of endotracheal intubations or endobronchial interventions. Surgical repair is the classic treatment, but conservative management has recently been reported¹.

Case report: 61-year old woman, proposed for rigid bronchoscopy after three month history of progressive dyspnea and dysphagia. CT revealed middle esophageal mass with tracheal infiltration. Procedure performed under general anesthesia and airway managed with high-frequency jet-ventilation. Tracheal mass resection uneventful but difficult carinal stent placement. Recovery from anesthesia without any complications.

Three hours after the procedure, sudden dyspnea and subcutaneous emphysema. Emergent rigid bronchoscopy performed (same anesthetic management) during which a carinal tear was found. A new stent was placed and endotracheal tube inserted. Mechanical ventilation possible and emphysema progression stopped. Conservative management was decided and the patient was admitted to Intensive Care Unit.

Two weeks after another bronchoscopy revealed healing. It also revealed rapid local infiltration of the mass, with left bronchus obstruction and progressive hypoxemia, which lead to patient death.

Discussion: Iatrogenic tracheobronchial injuries are rare complications and endobronchial endoscopy/intervention accounts for only about 10% of lesions¹. Subcutaneous emphysema is the most common finding². Tracheobronchoscopy is the gold standard for diagnosis, prognosis and planning treatment³. Consensus on treatment, which can be conservative or surgical, has not been reached³.

Strict follow-up is necessary and surgery should be undertaken once airway loss, inadequate ventilation or infection occurs². In our case, nonoperative conservative management was chosen and was a safe option for initial management.

Our result is in agreement with others already published¹, regardless of the final result, as prognosis is mostly related to the underlying disease³, and emphasizes the importance of early diagnosis and intervention.

References:

1. *Ann Thorac Surg* 2007; 83:1960-4
2. *Journal of Cardiothoracic Surgery* 2014; 9:117
3. *Open Journal of Thoracic Surgery* 2013; 3:130-134
4. *British Journal of Anaesthesia* 2003; 90(3):367-74

Learning points: Tracheobronchial injuries are rare but potentially life-threatening complications of endotracheal intubations or endobronchial interventions. Conservative management is possible in selected cases.

11AP05-6

Lung separation via elective tracheostomy

Suero O., Powell F, Canelli R.

Boston University, Dept of Anaesthesiology & Intensive Care, Boston, United States

Background/case: A 30-year-old Haitian female with metastatic mandibular ameloblastic carcinoma to the right lung presented for right thoracotomy, RUL lobectomy, and RLL wedge resection. The patient previously underwent composite resection with mandibulectomy, floor of mouth resection, neck dissection, tracheostomy, and left fibular free flap, with adjuvant chemotherapy and radiation therapy (RT). 6 month follow up PET-CT, and CT guided biopsy, confirmed recurrence and metastasis.

Due to significant trismus secondary to RT, the patient received awake fiberoptic nasal intubation with 7.0mm nasal ETT. General anesthesia was induced with propofol and fentanyl, and the patient was relaxed with vecuronium. Tracheostomy was performed with a 8.0 Portex tracheostomy tube, which was then replaced via exchange catheter with a 32 French double lumen tube (DLT) to allow for one lung ventilation. DLT placement was confirmed via bronchoscopy. The surgery proceeded without complication. The DLT was removed and a 8.0 Shiley cuffed tracheostomy tube was inserted into the stoma.

Discussion: Trismus is a common complication in patients receiving curative doses of RT for head and neck cancer, and maximal intercuspal distance has been shown to decrease at a mean of 32%. Traditionally awake fiberoptic intubation with a single lumen oral or nasal ETT has been the method of choice for initially securing the airway(1). Awake fiber-capnic intubation has been proposed as an alternative when visibility is extremely limited or the anatomy is unrecognizable.

Although the degree of surgical exposure with the use of bronchial blockers (BB) and DLTs are equivalent, bronchial blockers require more time for placement as well as frequent intraoperative adjustment due to dislocation(2). Nevertheless, the larger size and increased stiffness of DLTs, occasionally leading to tracheal rupture(3), contribute to the lower frequency of use in difficult airway, lung separation cases.

References:

1. Campos JH. *Current Opinion in Anaesthesiology*. 2010, 23:12-17
2. Narayanaswamy M, et al. *Anesthesia & Analgesia*. 2009, 108:1097-1101
3. Hasan A, et al. *Journal of Cardiothoracic and Vascular Anesthesia*. 1992, 6 (2): 208-211

Learning: Here we report successful lung separation via use of a 32 French left sided DLT through a fresh, elective tracheostomy. This method of lung separation in patients with known difficult airways due to head and neck cancer can provide an alternative to BB for high risk thoracic surgeries.

11AP05-7

Does endoscopic sinus surgery under general anaesthesia increase obstructive sleep apnoea syndrome-related respiratory complications during the early post-operative period in patients with suspected OSAS?

Hascilowicz T.¹, Takeda M.², Mori E.², Murakami Y.¹, Utsumi I.¹, Omi S.¹

¹The Jikei University School of Medicine, Dept of Anaesthesiology, Tokyo, Japan, ²The Jikei University School of Medicine, Otorhinolaryngology, Tokyo, Japan

Background and Goal of Study: Patients with severe obstructive sleep apnoea (OSAS) are often managed in the ICU during the first post-operative night due to possible respiratory complications and necessity of continuous

positive airway pressure (CPAP). Patients with undiagnosed but suspected OSAS and undergoing endoscopic sinus surgery (ESS) may develop early post-operative respiratory complications because of 3 possible reasons: mild to moderate OSAS, general anaesthesia and obstructed airways due to extensive intranasal packing; however, these patients are not managed in the ICU settings. We examined occurrence of post-operative respiratory events in such patients in order to determine what level of post-operative care they require.

Materials and Methods: This is an ongoing observational clinical study approved by the Institutional Review Board aimed at 60 patients and planned completion in April 2017 (at the time of abstract submission 25 patients have been enrolled). Before surgery patients had undiagnosed but suspected OSAS based on STOP-BANG criteria (3 points or more) and underwent ESS under general anaesthesia. All patients gave their written consent for participation in the study. Frequency of respiratory events (number of apnoea events [A/hr], oxygen desaturation index [ODI] changes) was examined during 4 consecutive nights: once before the operation day (POD -1) and then on POD0 to POD2, using the Capnostream monitor (Covidien, Japan). Clinical Trial Registry ID: UMIN 000024150.

Results: Data could be obtained from 19 (16 men and 3 women, average age 54 ± 25 years) out of 25 enrolled patients. Preliminary results showed mean pre-operative STOP-BANG scores of 5 ± 3 points. Mean A/hr values were: 7 ± 12 , 17 ± 28 , 18 ± 22 and 15 ± 20 on POD -1 to POD2, respectively. Mean ODI values were: 5 ± 11 , 5 ± 11 , 8 ± 18 and 6 ± 14 on POD -1 to POD2, respectively. One patient required additional therapeutic measures (oxygen therapy and monitoring) due to OSAS-related complications. In 9 out of 19 patients, deterioration in A/hr and ODI values was observed mainly on POD1 but not POD0 as initially predicted.

Conclusions: Increased number of respiratory events was observed on POD1, the second night following surgery. The frequency of respiratory events in ESS patients with undiagnosed but suspected OSAS did not strongly indicate necessity for early post-operative management in ICU settings but early post-operative ward-based care should include appropriate respiratory monitoring.

11AP05-8

Impact of anesthetic technique in endobronchial ultrasound bronchoscopy: patient and operator satisfaction

Flintras D.¹, Gioni P.¹, Emmanouil P.², Koufos N.², Stratakos G.², Dragini G.¹

¹Mediterraneo Hospital, Dept of Anaesthesiology, Athens, Greece,

²Mediterraneo Hospital, Interventional Pulmonology, Athens, Greece

Background and Goal of Study: EBUS bronchoscopy is widely recognized as a valuable tool for staging of lung cancer thus diminishing dramatically the need of surgical approach¹. Takes significantly longer than conventional bronchoscopy and may therefore cause more discomfort. Anaesthetic technique is of paramount importance regarding patient and bronchoscopist satisfaction and quality of procedure. We aimed to describe the impact of anaesthetic technique in achieving safe and comfortable procedure for the patient and an easy and successful procedure for the bronchoscopist.

Materials and Methods: Fifty seven patients, undergoing EBUS bronchoscopy under GA with laryngeal mask (i-Gel supraglottic mask), were studied. For this procedure we used pre-operatively Midazolam as anxiolytic, TIVA (Propofol/Remifentanyl infusion) intraoperatively with small dose of short acting muscle relaxant (Atracurium). Postbronchoscopy, patients responded to a Visual Analogue Scale (VAS) questionnaire for tolerability of bronchoscopy and acceptance to repeat the procedure. Bronchoscopist responded to a Visual Analogue Scale (VAS) questionnaire for quality of bronchoscope handling and easiness of the procedure. The frequency of coughing and desaturation and the length of the procedure and recovery time was recorded.

Results and Discussion: This anaesthetic technique revealed some outstanding results. 57 patients (100%) reported that they couldn't recall any distressing symptoms, and they would return for the procedure if required. Interventional bronchoscopist satisfaction was excellent in 100% of the cases. Supraglottic device (iGel) unique properties provide excellent environment for the anaesthetist and bronchoscopist. Low dose short acting muscle relaxant eliminate cough and motion, while there was no incidence of desaturation. Duration of the procedure was 72min in average. Ultra-short acting medication (Propofol/Remifentanyl infusion) reduces time interval from the end of the procedure till the removal of the laryngeal mask, which was less than 3 min.

Conclusion(s): G.A. with the use of supraglottic mask, TIVA (Propofol/Remifentanyl infusion), and small dose of short acting muscle relaxant is associated with outstanding patient and bronchoscopist satisfaction, improves the quality of the procedure by eliminating common problems (cough, desaturation, difficulty in bronchoscope handling) and reduces recovery time to minimum.

References: 1. Imaging in Clinical Oncology, Gouliamos A. pp 189

11AP05-9

Initial assessment and development of anaesthesia techniques for use of a novel, non-occlusive tracheal dilatation balloon allowing continuous oxygenation and ventilation

Hofmeyr R.¹, McGuire J.², Park K.³, Proxenos M.³, Marwick P.⁴, Lubbe D.²

¹University of Cape Town, Department of Anaesthesia and Perioperative Medicine, Cape Town, South Africa, ²University of Cape Town, Department of Otolaryngology, Cape Town, South Africa, ³DISA Vascular 2015 Pty Ltd, Research and Development Department, Cape Town, South Africa, ⁴Stellenbosch University, Dept of Anaesthesiology & Intensive Care, Cape Town, South Africa

Background and Goal of Study: Tracheal stenosis poses clinical challenges for both surgeon and anaesthesiologist. Frequently presenting as an airway emergency, it is difficult and costly to treat. Endoscopic balloon dilatation is an effective, low-risk alternative to reconstruction. However, patients may require repeat dilatation, and optimal management requires a shared airway with good communication between the anaesthesiologist and surgeon. Conflict arises due to the need for ongoing oxygenation/ventilation, and adequate duration of dilatation. A major limitation is complete occlusion of the airway by the balloon. We describe preliminary laboratory, animal and human studies assessing anaesthesia techniques with a novel, non-occlusive tracheal dilatation balloon.

Materials and Methods: Assessment was undertaken with ethical approval and informed consent in three phases. An airway manikin was used to familiarize the anaesthesiologist-otolaryngologist team with traditional placement through a rigid bronchoscope. Thereafter, use through an endotracheal tube (ETT) and supraglottic airway (SGA) by the anaesthesiologist under flexible endoscopic guidance were simulated. Phase 2: Balloons were deployed through ETTs during continuous ventilation in eight anaesthetised sheep while measuring airway pressures, capnography, pulse oximetry and tidal volumes. Phase 3: 20 patients with tracheal stenosis were enrolled in a prospective clinical trial. Data recorded included pre- and post-dilatation grading of stenosis, airway pressures and volumes, capnography, pulse oximetry and adverse events.

Results and Discussion: Manikin testing confirmed feasibility of deployment and ventilation, and allowed development of skills by the anaesthesiologist-surgeon team. During animal testing, ventilation was maintained at all times without clinically relevant changes. All human patients were successfully ventilated during dilatation, with no hypoxia or significant adverse events. Several patients who were deemed inoperable by other methods with multilevel tracheal and bronchial stenosis were successfully treated.

Conclusions: This non-occlusive balloon allows tracheal dilatation without interruption of ventilation, conferring a significant safety advantage. It facilitates endoscopically-guided techniques, simplifying the anaesthetic management but requiring enhanced skills and co-operation by the anaesthesiologist-surgeon team. Further work will elucidate the safety and long-term efficacy.

11AP05-10**Lidocaine 5% spray instillation for post-extubation laryngeal spasm management following minor ENT procedures**

Papaioannou E., Bartzis K., Bakalaki V., Kavezou F., Tsinari K., Lambadariou A.

'Laikon' General Hospital of Athens, Dept of Anaesthesiology & Pain Medicine, Athens, Greece

Background and Goal of Study: Target of this prospective clinical study was the evaluation of lidocaine 5% spray instillation for post-extubation laryngospasm management after minor ENT procedures.

Materials and Methods: Post-extubation laryngospasm is a rather common complication following ENT procedures. On a prospective study in a course of 15 years we studied 1879 patients aged 15-64, who underwent minor ENT procedures, such as amygdalotomy, microlaryngoscopy, adenotomy, sinusotomy, and nasal septoplasty or polypectomy.

Anaesthetic protocol was the same for all patients. Ranitidine 50mg and dexamethasone 8mg iv were administered preoperatively as gastric protection and antiemesis, anaesthesia was induced by midazolam 0.03-0.05mg/kg and propofol 1.5mg/kg, muscle paralysis by cis-atracurium 0.15mg/kg and analgesic needs were covered by 2-4µg/kg accordingly. Mean operation duration was 38±6.5min. Most patients 1765 (93.9%) received clonidine 1.5µg/kg iv as hypotensive agent to control excessive bleeding. Paracetamol 1gr and lornoxicam 8mg iv were administered to all patients as postoperative analgesia. For muscle paralysis reversal patients were given atropine (0.014mg/kg) and neostigmine (0.05-0.08mg/kg).

Results and Discussion: Among studied patients, 341 (3,72%) demonstrated post-extubation inspiratory stridor, SpO₂ decrease and agitation which indicated laryngospasm. Drug allergies and vocal cord dysfunction due to residual muscle paralysis were excluded. In all patients slight positive pressure ventilation with face mask 100% O₂ was applied and lidocaine 5% spray (5-10 times) was intrabuccally administered. In 306 (89.7% among patients who developed stridor), signs of laryngeal spasm improved and they did not need any other medication. In 39 patients (11.43%), lidocaine 1.5 mg/kg and diazepam 0.04-0.08mg/kg iv were administered in order to manage laryngospasm and none of the patients needed re-intubation. All patients did not remember anything afterwards and overall satisfaction was high.

A few publications report laryngeal spasm, or bronchospasm improvement by lidocaine used in aerosol mask, but there are no data about using lidocaine spray directly intrabuccally in post extubation laryngospasm.

Conclusion(s): Lidocaine 5% spray use in post-extubation laryngospasm treatment might be a useful option helping to avoid iv drugs administration and patient re-intubation. More data are needed to support this study.

11AP06-3**Analysis of capnogram during patient-controlled sedation with propofol or midazolam in healthy volunteers**

Lee J.-M.¹, Seo K.-S.²

¹Seoul Metropolitan Government Seoul National University Boramae Medical Center, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Seoul National University Dental Hospital, Department of Dental Anesthesiology, Seoul, Korea, Republic of

Background and Goal of Study: For safe sedation, capnogram should be important. However, some limitations such as high false positive and high false negative on detecting the respiratory depression still exist in using capnogram. Therefore, accurate algorithm should be needed for safe sedation. The purpose of this study was to analyze the capnogram obtained from nasal cannula during patient-controlled sedation (PCS) with propofol or midazolam in healthy volunteers for algorithm to monitor capnogram.

Materials and Methods: This retrospective observational study was based on data from the registered study (KCT0001618) at Seoul National University Dental Hospital for a new protocol development of PCS for dental treatment. Total of 60 patients were enrolled. Each patient was randomly assigned to 6 groups according to drug and dose used in the PCS. We converted the digital data of partial pressure of carbon dioxide from each patient into analyzable waves with a signal analysis processing program. Respiratory depression was defined to no wave during more than 30 seconds in capnogram or an event of SpO₂ <90%. We defined 'capnographic inspiratory time (cTi)' and 'capnographic expiratory time (cTe)' based on the peak velocity of increasing

and decreasing of partial pressure of carbon dioxide. Also, we defined the value of 'cTi:cTe' as 'capnographic I:E ratio'. We analyzed the 'capnographic I:E ratio' on the change of respiratory pattern in each volunteer.

Results and Discussion: All data from total of 60 volunteers were analyzed. When observation period of each volunteer was divided to three parts of 'Before PCS', 'Consciousness during PCS', and 'Unconsciousness during PCS', the capnographic I:E ratios of all volunteers were 1:1.10 ± 0.35, 1:1.09 ± 0.23, and 1:0.93 ± 0.17 respectively. It was significantly lower in 'Unconsciousness during PCS' period than other periods (p<0.001). Forty-nine respiratory depressions were observed in 21 volunteers.

For 21 volunteers who experienced it, standard deviation of capnographic I:E ratio during respiratory depression periods was significantly higher than during normal breathing periods (0.24 ± 0.10 vs. 0.28 ± 0.69, p = 0.001).

Conclusion(s): Quantification analysis of capnographic I:E ratio could help in improving the diagnosis of respiratory depression. Also, it could be helpful in predicting of significant desaturation. In the future, capnogram can be a more useful monitoring tool for safety of patients during sedation.

11AP06-4**Iatrogenic tracheal rupture after gastrointestinal endoscopy**

Albaladejo Magdalena J.¹, Fresnedo Perez R.M.², Alvarez Barrial A.M.¹, Garcia Menendez M.J.¹, Alvarez Alvarez A.³, Bermejo Alvarez M.A.¹

¹Hospital Universitario de Cabueñes, Dept of Anaesthesiology & Pain Medicine, Gijon, Spain, ²Hospital Universitario de Cabueñes, Dept of Surgery, Gijon, Spain, ³Hospital Universitario de Cabueñes, Dept of Gastroenterology, Gijon, Spain

Background: Tracheal rupture is a rare and severe lesion of post-traumatic aetiology (head and neck injuries), iatrogenic (often related to endotracheal intubation [1]), or spontaneous; being the first of them the most common, and the last the most infrequent and associated to underlying factors.

Case report: 57-year-old female, subjected to a gastric polypectomy with intra-exploratory suspicion of gastric perforation, therefore transferring to operation theatre in order to perform gastroscopy under general anaesthesia for placing a clipping device. Endotracheal intubation was performed without any difficulty using a reinforcing tube by an experienced anaesthesiologist. The gastroscopy went on for 15 minutes; the extubation and transfer to post-anaesthesia care unit passes without complications.

A supraclavicular subcutaneous emphysema was detected 4 hours later, maintaining spontaneous ventilation without dyspnea. An emergent computerized tomography revealed a tracheal rupture 5.5 cm from the carina (Fig. 1). The patient was transferred with hemodynamic stability to reference centre of Thoracic Surgery. 8 hours later, right pneumothorax was found on Chest X-ray (Fig. 2), and treated with chest tubing. After that a lineal laceration of 1.5 cm of the posterior membranous was confirmed via fiberoptic bronchoscopy. The patient recovered completely with conservative treatment.

Discussion: In the present case we assume iatrogenic rupture. Post-intubation tracheal rupture incidence is estimated around 0,005% for standard endotracheal tube, determined by anatomical and mechanical factors. In this patient, anatomical factors should be considered (female sex, over 50 years, short height); but also mechanical (overinflation of the cuff and abrupt head and neck movements while the patient is intubated) as injury-contributive. Standard endoscope is not usually responsible of traumatic lesions; so, an unnoticed overinflate cuff in addition to anatomic underlying factors, look more likely to have caused the injury over the patient's trachea in a positional-demanding technique.

References: 1. Miñambres E, Burón J, Ballesteros MA, Llorca J, Muñoz P, González-Castro A. Tracheal rupture after endotracheal intubation: a literature systematic review. Eur J Cardiothorac Surg. 2009 Jun; 35(6):1056-62.

Learning points: The anaesthetic management should not exclude the attention to uncommon but life-threatening complications that may appear in gastrointestinal endoscopy.

11AP06-5**Intubating laryngeal mask airway for overweight and obese patients: gastro-oesophageal reflux during positive pressure ventilation**

Stamov V.I.¹, Dolbneva E.L.², Gavrilov S.V.³, Bunyatyan A.A.²

¹Sechenov First Moscow State Medical University, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation,

²Petrovsky National Research Centre for Surgery, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation,

³15th City Clinical Hospital, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation

Background and Goal of Study: There are concerns that the use of the intubating laryngeal mask airway ILMA (ILMA Fastrach™) for patients with obesity might promote gastro-oesophageal reflux and subsequent regurgitation of gastric contents especially during intermittent positive pressure ventilation (IPPV). We tested the hypothesis that whether or not the use IPPV via ILMA is associated with a higher risk of gastro-oesophageal reflux for patients with overweight and obesity.

Materials and Methods: In order to assess if the use ILMA is associated with an increased risk of gastric regurgitation during mechanical ventilation (V), we studied 40 patients allocated randomly out of 156 adults undergoing of the general anesthesia I-IV classes ASA (20/100 males and 20/56 females) with increased body mass index (BMI) and obesity (BMI >30 kg·m⁻²), in whom ILMA was used electively within 25 minutes after induction and IPPV. Size selection ILMA was based on gender principle (5 for male, 4 for female). Estimated parameters: amounts of predictors difficult TI, V by a facemask; success of insertion ILMA, quality of IPPV (ILMA-V) and time for insertion/removal of ILMA and ETT (ILMA-IT). Regurgitation risk was assessed by pH strips before insertion (strip-1) and after blind tracheal intubation (TI) and removal of ILMA (strip-2). Induction: midazolam 0.1-0.15 mg·kg⁻¹, propofol 2-3 mg·kg⁻¹, fentanyl 1-1.5 mg·kg⁻¹, rocuronium 0.6 mg·kg⁻¹. We used descriptive statistics and Wilcoxon test.

Results and Discussion: 38 patients had predictive (4 or more) signs of difficult TI (see Table). In 2 patients (BMI 30-35 kg·m⁻²) with unpredicted difficult TI and ILMA was inserted after 2 attempts TI failure. The V by a facemask was successfully and ILMA inserted at the first attempt within 8.2±2.9 s after induction in 100% and after them ILMA was connected to the anesthetics machine and IPPV was beginning 25 min to normocapnia. Subsequent blind TI through ILM (ETT № 7.5 or 8) was successful in 40/40 (100%) of cases, and in 95% at first attempt. Signs of regurgitation weren't registered (as indicated by a decrease in pH strips to below 4). Both pH strips have a pH about 6.0 (p=0.11).

BMI, kg·m ⁻²	25-30 N=2 (5%)	30-35 N=20 (50%)	35-40 N=12 (30%)	40-45 N=4 (10%)	>45 N=2 (5%)
Number of predictors per patients	4	3,7	4,7	4,5	4

[Table 1]

Conclusion(s): In our study we found no evidence to suggest that the use of IPPV via ILMA increases the risk of gastro-oesophageal reflux for patients with overweight and obesity.

11AP06-6**Nebulized lidocaine and fentanyl as a part of local airway anesthesia with sedation for tracheal stenting**

Moustafa M.A., Moustafa A.M.

Alexandria Faculty of Medicine, Dept of Anaesthesiology & Intensive Care, Alexandria, Egypt

Background: Stent placement for central airway obstruction (CAO) requires meticulous anesthetic plan⁽¹⁾. We describe two cases of CAO scheduled for ultraflex™ tracheal stent placement with rigid bronchoscopy.

Cases: 63 year old male with large superior mediastinal mass at the pre and paratracheal regions and a 65 year old female with huge malignant retrosternal goiter compressing the trachea and the surrounding vasculature.

Anesthetic plan: local airway anesthesia with sedation comprised of nebulized mixture of lidocaine 1 mg·kg⁻¹+fentanyl 1 μg·kg⁻¹ 30 minutes preoperatively, nasal cannula carrying 100 % O₂ at 6 L·min⁻¹, IV midazolam titrated to

the effect of response to tactile stimulation, IV fentanyl 0.5 μg·kg⁻¹, lidocaine 10 % 2 puffs on the tongue and 2 puffs on either side of the oropharynx and cricothyroid injection of 3 ml 2 % lidocaine.

Bronchoscopy was carried out after IV propofol 1 mg·kg⁻¹ slowly, continued with propofol 100 μg·kg⁻¹ min⁻¹ via a syringe pump and boluses of 300 μg·kg⁻¹ were given in case of cough or straining.

Durations of the procedures were 35 and 40 minutes. There was no episodes of hemodynamic instability or marked hypoxemia. Serious cough was not encountered and spontaneous respiration was maintained without postoperative complications.

Discussion: The main aim in the 2 cases was maintaining spontaneous respiration for preservation of the normal transpulmonary pressure gradient to keep the airway patent. Several authors recommended a local anesthetic plan for such cases like Conacher et al⁽¹⁾ in tracheobronchial stent insertion and Moustafa MA⁽²⁾ in tracheobronchial foreign body removal in pediatrics. Previous studies documented central as well as peripheral analgesic, anti-inflammatory and antitussive effects of opioids⁽³⁾.

References:

1. Conacher ID, Paes ML, McMahon CC. Anesthetic management of laser surgery for central airway obstruction. *J Cardiothor Vasc Anesth* 1998;12:1-5
2. Moustafa MA. Nebulized lidocaine alone or combined with fentanyl as a premedication to general anesthesia in spontaneously breathing pediatric patients undergoing rigid bronchoscopy. *Pediatr Anesth* 2013;23:429-34
3. Adcock JJ. Peripheral opioid receptors and the cough reflex. *Respir Med* 1991, 85(Suppl A):43-6

Learning points: Application of nebulized fentanyl with lidocaine seemed to play a role in the technique of local airway anesthesia as a sedative with suppression of cough in response to rigid bronchoscopy.

11AP06-7**Successful use of inhalational sevoflurane for a life-threatening bronchial obstruction unresponsive to conventional therapy**

Vives M., Ramirez L., Perez L., De Francisco J.

Hospital Universitari Bellvitge, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain

Background: Asthma may be life-threatening as mechanical ventilation is often difficult causing air-trapping. A successful use of inhalational sevoflurane for a severe asthma with a mixed acidosis in a patient unresponsive to conventional therapy is reported.

Case report: A 40 year old man, with asthma, underwent an uneventful resection of an odontogenic abscess. During weaning from mechanical ventilation, a severe bronchial obstruction occurred. Patient was sedated with propofol and remifentanyl. Nebulized salbutamol, anticholinergics and intravenous hydrocortisone were given. Given the lack of response to magnesium and ketamine, cisatracurium was also given. After the lack of response to iv salbutamol, sc and iv adrenaline were given. Arterial gas showed a pH of 7.19, pCO₂ 71, HCO₃ 26. Given the unresponsiveness to conventional treatment, patient was transferred to the OR for inhaled sevoflurane treatment. After 3h of sevoflurane 2-4% with the same setting of pressure control ventilation at 35cmH₂O, a significant improvement was observed by a decreased of etCO₂, an increase of tidal volume, along with a decrease in the air-trapping, allowing us to transfer the patient to ICU again. Patient was extubated 36h later, only maintaining a low-dose ketamine and remifentanyl. One week later was discharged from the hospital.

Discussion: A case of a patient suffering from a severe asthma only resolving after inhalational sevoflurane is reported. A multipharmacologic approach was used combining conventional treatment. However, the key therapeutic intervention for resolving airway obstruction was inhalational sevoflurane. Sevoflurane is known to modulate bronchial tone via voltage-dependent Ca⁺⁺-channel activity and intracellular cyclic adenosine monophosphate levels. Limited data from case reports and small observational studies^{1,2} showed benefit from using inhaled sevoflurane in this scenario.

References:

1. Turner DA, Heitz D, Cooper MK, et al. Isoflurane for life-threatening bronchospasm: a 15-year single-center experience. *Resp Care* 2012;57:1857-64.
2. Schutte D, Zwitserloot AM, Houmes R, et al. Sevoflurane therapy for life-threatening asthma in children. *Br J Anaesth* 2013;111:967-70.

Learning points: Inhalational anaesthetics should be considered as an early treatment option in ventilated asthmatic patients with unresponsive bronchial obstruction.

11AP06-8**Unanticipated difficult laryngoscopy in a diabetic patient undergoing coronary artery bypass graft surgery**

Chan H.S.P., Chew S.T.H.

Singapore General Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore

Background: We present a case of unexpected difficult laryngoscopy in a patient with long-term diabetes mellitus.

Case report: A 53-year-old man scheduled for coronary artery bypass grafting had a 30-year history of juvenile onset diabetes mellitus complicated by hypertension and chronic renal impairment. His blood glucose control was fair. His mouth opening (>3 finger breadths), thyromental distance (6 cm), and neck mobility were normal. No difficulty with intubation was anticipated. Following induction of general anaesthesia, direct laryngoscopy with a Macintosh blade revealed only the tip of the epiglottis. Lifting the epiglottis was difficult as it was very stiff. Attempts to intubate with a stylet or a bougie using a video laryngoscope were also unsuccessful. A Miller blade was then used, which just lifted the tip of the epiglottis, allowing a tactile blind maneuver of a bougie through the vocal cords. An endotracheal tube was then successfully railroaded over the bougie into the trachea.

The surgery was uneventful and the patient made a full recovery. Post-operatively, the patient was assessed for limited joint mobility associated with diabetes mellitus and he demonstrated a positive Prayer sign.



[Figure 1]

Discussion: Limited joint mobility (LJM) syndrome is present in 30-40% of insulin-dependent diabetes patients and is associated with difficult laryngoscopy. It typically affects metacarpophalangeal and proximal interphalangeal joints but can also involve the cervical and atlanto-occipital joints. However, this patient had normal neck mobility. It was only during intubation that the epiglottis was discovered to be almost immobile.

The palm print has been found to be a sensitive predictor of difficult laryngoscopy. Patients with LJM syndrome also encounter difficulty in opposing their palms and interphalangeal joints, especially of the fourth and fifth finger (Prayer sign), as seen in our patient.

Learning points: Apart from routine airway assessment, it is important to consider additional tests of LJM in patients with long standing diabetes mellitus.

References:

1. Salzarulo HH, Taylor LA. *Anesthesiology* 1986; 64:366-368
2. Reissel E, et al. *Anaesthesia* 1990; 45: 1024-7

11AP06-9**Effects of different nebulizers and positions on aerosol salbutamol drug delivery in the anesthetic breathing circuit**Thongsukh V.¹, Artnasiaw B.¹, Chutipongtanate S.²

¹Faculty of Medicine Ramathibodi Hospital, Mahidol University, Dept of Anaesthesiology, Bangkok, Thailand, ²Faculty of Medicine Ramathibodi Hospital, Mahidol University, Central Laboratory, Department of Pediatrics, Bangkok, Thailand

Background: Aerosol bronchodilator is an option to relieve bronchospasm during anesthesia. The recent study demonstrated impact of the nebulizer type, position in the ventilator circuit and reservoir spacer to the medication delivery in the intensive care ventilator models. However, this information is lacked in the anesthetic breathing circuit.

Objective: To determine the effects of different types of nebulizer and positions on the amount of aerosol drug delivery in the anesthetic breathing circuit.

Method: The 180 cm anesthetic breathing circuit with fresh gas flow 2 L/min (oxygen 1 L/min and air 1 L/min) is connected to a test lung, ventilated by pressure controlled 20 cmH₂O, I:E ratio 1:2, respiratory rate 12 breath per min. Two different types of nebulizer (the continuously operated jet nebulizer 6 L/min, oxygen or the vibrating-mesh nebulizer) were tested in 2 breathing circuit positions (near the inspiratory valve or 30 cm before the Y-piece adapter). Each nebulization (2.5 mg of salbutamol sulfate diluted to 5 mL) was operated for 15 min.

The aerosol salbutamol was collected using the mechanical bacterial filter connected between the Y piece and the test lung. Salbutamol was eluted from the filter using deionized water and was measured at λ 289 nm using UV-visible spectrophotometer. Each experiment was performed in triplicate.

Result: For the jet nebulizer placed near the inspiratory valve or at 30 cm before the Y-piece, the amount of eluted salbutamol from the filter membrane were not statistical difference (597.3 \pm 32.8 μ g vs. 621.5 \pm 74.0 μ g, respectively). For the vibrating mesh nebulizer placed near the inspiratory valve, the amount of eluted salbutamol was significantly lower than at 30 cm before the Y-piece (588.2 \pm 59.6 μ g vs. 794.2 \pm 37.8 μ g, respectively) (p <0.01).

Conclusion: This study suggested that the jet nebulization in the anesthetic breathing circuit, position (near the inspiratory valve or 30 cm before the Y-piece adapter) does not affect aerosol salbutamol drug delivery, while in the vibrating mesh nebulizer, position does.

Salbutamol nebulization using the vibrating mesh nebulizer positioned at 30 cm before the Y-piece adapter provides higher amount of aerosol drug delivery than the others, which may lead to better treatment effectiveness for bronchospasm during anesthesia.

11AP06-10

Management of accidental extubation in patients in the prone position

Bosch Duran L., Pacreu S., Pardo A., Castellort L., Sadurni M., Gallart L.

Parc de Salut MAR, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain

Background: Accidental extubation in surgical prone position is an exceptional and life-threatening complication¹. We present a case report and propose a management algorithm for this accident.

Case report: A 78-year-old man, ASA III, underwent C1-C4 fixation. Airway evaluation was Mallampati Class I, mandibular subluxation 0⁹, correct thyromental distance and slight limitation of head extension. History of previous easy tracheal intubation. General anesthesia and tracheal intubation were practiced. The patient was placed in prone position and head was fixed with Mayfield® skull clamp. Anesthesia was maintained without neuromuscular blockade due to intraoperative neurophysiological monitoring. After 3 hours of surgery, accidental extubation was confirmed. We warned the surgeon and made an attempt of fiberoptic intubation in prone position, without success. A LMA Fastrach® in prone position was placed. Tracheal intubation through LMA was achieved with adequate ventilation. In this context, the patient presented oxygen desaturation and extreme bradycardia, ending up with cardiac arrest due to asystolia. We rotate the patient, started cardiopulmonary resuscitation maneuvers and administered adrenaline. Return of spontaneous circulation was achieved in 3 minutes. Surgical procedure was finished and patient had a satisfactory evolution without sequels.

Discussion: Accidental extubation must be prevented, identifying and correcting the causes. In our case, extubation was caused by perioral muscular activity induced by intraoperative neurophysiological monitoring and copious secretions. These factors decreased the adhesion of paper tape used to attach the tracheal tube. We have changed the model of tape and modified tube attachment standards. If no formal contraindication exists, atropine is administered.

We decided to design an algorithm (Figure 1)² that defines the team roles. The strategy is based on the ability of adequate prone mask ventilation, the ability of LMA ventilation and the difficulty of tracheal intubation. A previous simulation of the scene could be useful, assigning a task to every person involved. The path of the algorithm has to be previously discussed and decided, in order to act fast and effectively.

References:

1. Spond M et al. A&A Case Reports 2016.
2. Hung MH et al. Anesth Analg 2008.

Learning points: We believe that insertion of the LMA Fastrach® should be a good choice.

It would be the first option in patients in prone position.

11AP07-1

Performance of a revised capnodynamic method during lung injury

Sigmundsson T.S.¹, Öhman T.¹, Hallbäck M.², Suarez Sipmann F.³, Hällsjö Sander C.¹, Björne H.¹

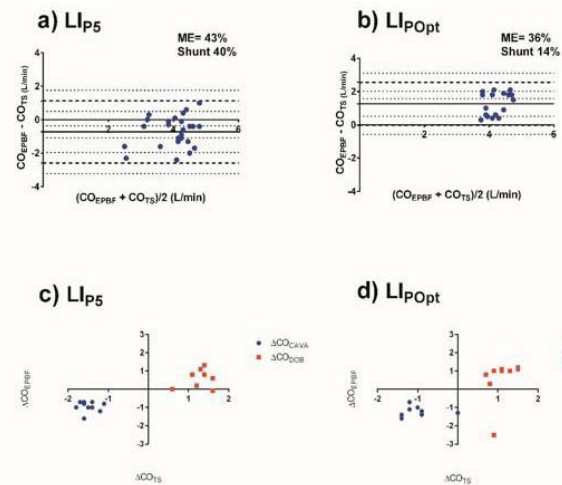
¹Karolinska University Hospital, Perioperative Medicine and Intensive Care, Solna, Sweden, ²Maquet Critical Care, Research and Development Department, Solna, Sweden, ³Uppsala University, Department of Surgical Sciences, Section of Anaesthesiology and Critical Care, Hedenstierna Laboratory, Uppsala, Sweden

Background and Goal of Study: A capnodynamic method effectively calculates pulmonary blood flow (CO_{EPBF}) using an automatic hold in three out of nine breaths during mechanical ventilation. In a previous study, the performance of the capnodynamic method was affected during lung injury (LI) when using inspiratory holds.¹ Revision of the method with expiratory holds inserted into the breathing pattern has shown better performance during hemodynamic changes in normal lungs with low shunt fraction.² The aim of the current study was to evaluate the revised CO_{EPBF} during acute lung injury with high shunt fractions.

Materials and Methods: Ten pigs were submitted to severe LI with lavage and subsequent ventilator induced lung injury. CO_{EPBF} was compared, using Bland Altman plots, to a reference method for cardiac output, an ultrasonic

flow probe placed around the pulmonary artery trunk (CO_{TS}). Measurements were performed at (1) baseline with PEEP 5 cmH₂O (BAS_{PEP}), (2) LI with PEEP 5 cmH₂O (LI_{PEP}) and (3) LI with optimal PEEP (LI_{POPT}) using an open tool lung recruitment. CO changes were enforced during steps 2 and 3 to estimate trending in a concordance plot.

Results and Discussion: Lung injury and PEEP resulted in significant changes in shunt and PaO₂/FIO₂ index (PFI). Bias (levels of agreement) changed from 0.5 (-0.6 to 1.6) L/min and mean error (ME) 30% at BAS_{PEP} to -0.7 (-2.6 to 1.2) L/min and ME 43% during LI_{PEP} and finally 1.3 (0.0 to 2.6) L/min and ME 36% after LI_{POPT} . Concordance was 89 and 90% during LI_{PEP} and LI_{POPT} .



[Figure 1. a-b) Bland Altman plot comparing CO_{EPBF} and CO_{TS} performance during lung injury before and after PEEP optimization, c-d) Concordance plot during hemodynamic changes before and after PEEP optimization. ME=Mean Error, Shunt is shown as average, CAVA=preload reduction, DOB=dobutamine stimulation]

Conclusion(s): CO_{EPBF} performed acceptably during LI with high shunt fractions using expiratory holds in the breathing pattern and trending remained good. CO_{EPBF} could possibly be used in patients with increased shunt for which clinical studies are pending.

References:

1. Hällsjö Sander C. Acta Anaesthesiol Scand. 2015 Sep; 59(8): 1022-31. Doi: 10.1111/aas.12559
2. Hällsjö Sander C. J Clin Monit Comput. 2016 30(6): 761-69. Doi: 10.1007/s10877-015-9767-7

Acknowledgements: Hedenstierna laboratoriet, Uppsala, Sweden.

11AP07-2

Protective mechanical ventilation and risk of postoperative complications in abdominal surgery

Haddad F., Kamoun S., Ben Souissi A., Farih K., Arfaoui H., Mebazaa M.S.

Mongi Slim Hospital, Dept of Anaesthesiology & Intensive Care, Tunis, Tunisia

Background and Goal of Study: Since 2013 [1], it was proven that the protective lung ventilation protects against postoperative pulmonary complications. Nevertheless, in current practice, the use of the protective lung ventilation was not well adopted [2] even if the high Vt (10-12 ml/kg) and 0 PEEP used in recent randomized controlled trials [1] are no more used. We aimed at determining the effectiveness of protective mechanical ventilation during open abdominal surgery on the reduction of postoperative morbidity.

Materials and Methods: In this randomized controlled trial, we recruited 80 patients who were planned for open abdominal surgery lasting more than 2 hours under general anesthesia. We randomly allocated patients to either a low Vt of 6 ml/kg of predicted body weight (PBW), a high level of PEEP (10 cm H₂O) with RM applied after intubation, before extubation and in case of disconnection from the ventilator (Protective Ventilation Group) or a Vt of 8 ml/kg of PBW, a low level of PEEP (4 cm H₂O) without RM (Control Group (CG)). Primary endpoint was postoperative pulmonary complications. Secondary endpoints were intra-operative complications and postoperative extra pul-

monary complications. Data were presented as frequencies and percentages. Comparison of percentages was made with the Chi square test. A p-value of 0.05 was considered significant.

Results and Discussion: The two intervention groups had similar characteristics at baseline. The rate of respiratory complications was significantly lower in the Protective Ventilation Group (PVG): 2 of 40 patients (5 %) versus 15 of 40 (37.5%) in the PVG and CG respectively; ($p < 10^{-3}$). No differences were observed in extrapulmonary complications between the 2 groups. During RM, systolic arterial pressure decreased less than 90 mmHg for more than 3 min in 2 patients in the PVG. The mortality rate was 12.5 % in the CG and 0% in the VPG ($p = 0.055$).

Conclusion: Our study showed that use of a prophylactic lung protective approach composed of Vt of 6 ml/kg PBW, PEEP of 10 cmH₂O, and repeated RM was associated with a significant reduction in pulmonary complications after abdominal surgery.

References:

1. Futier E, Constantin JM, et al. A trial of intraoperative low-tidal-volume ventilation in abdominal surgery. *N Engl J Med.* 2013;369(5):428-37.
2. Patel JM, Baker R. Intra-operative adherence to lung-protective ventilation: a prospective observational study. *Perioperative medicine.* 2016;5:8.

11AP07-3

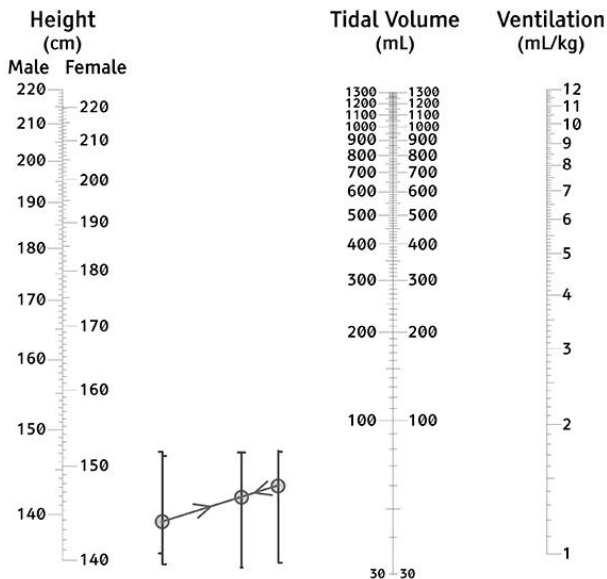
A nomogram to calculate tidal volumes for ventilation of adult patients with Acute Respiratory Distress Syndrome (ARDS)

Williams D.J.¹, Walker J.D.²

¹ABM University Health Board, Swansea, Dept of Anaesthesiology, Swansea, United Kingdom, ²Betsi Cadwaladr University Health Board, Dept of Anaesthesiology, Bangor, United Kingdom

Background and Goal of Study: High frequency low Tidal Volume (VT, mL) lung ventilation is recommended in ARDS to reduce risk of volutrauma. VT is calculated per kilogram ideal body weight (IBW, kg) - typically 6 mL/kg to 8 mL/kg IBW - which in turn may be calculated from height (h, cm) and gender.¹ We developed a low cost graphical calculation aid (nomogram) to perform this calculation, and validated it by comparing the graphically calculated value of VT with that produced by the gold standard of a spreadsheet (Excel, Microsoft, WA).

Materials and Methods: The nomogram (Fig 1) was designed using standard techniques² with the aid of software (www.pynomo.org).



READ INSTRUCTIONS BEFORE USE
 - FOR CHECKING TIDAL VOLUMES ONLY:
 - always calculate tidal volumes by two different methods
 - If any values fall between scale graduations, use next LOWEST values on each scale

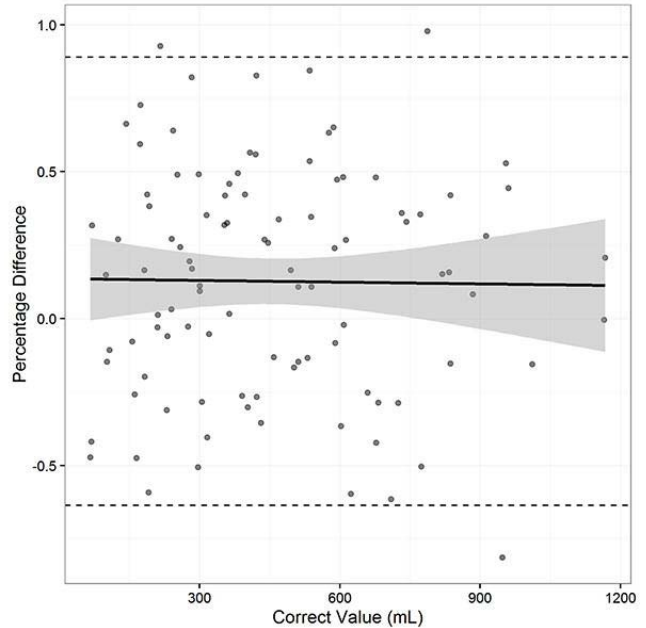
Tidal volume (mL) = Ventilation (mL/kg) * Ideal Body Weight (kg)
 Ideal Body Weight (Male)(kg) = $50.0 + 0.91 (\text{height (cm)} - 152.4)$
 Ideal Body Weight (Female)(kg) = $45.5 + 0.91 (\text{height (cm)} - 152.4)$
 after: ARDSnet. *NEJM* 2000; 342: 1301-8

© J.Walker & D.Williams 2016

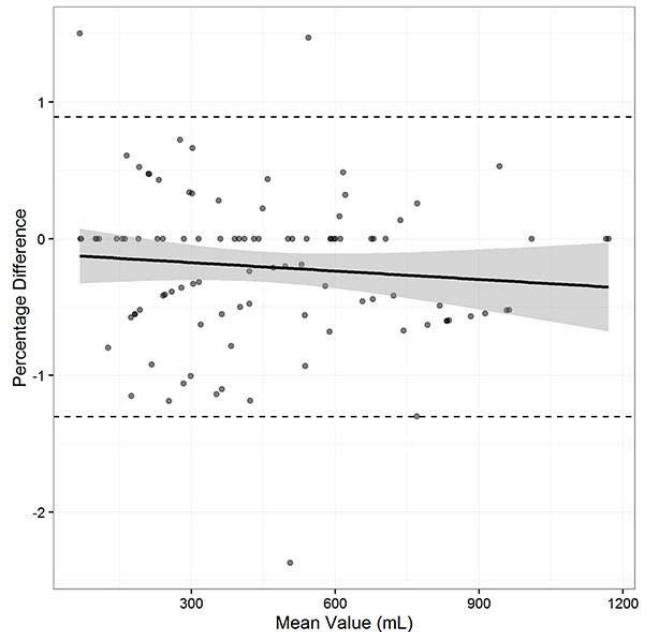
[Fig 1. The Nomogram - Ventilatory tidal volume by Height]

A spreadsheet was used to randomly generate 100 sets of simulated values for gender, height and VT/kg, from which the two investigators independently calculated values for VT using the nomogram. The results were compared with values calculated automatically by the spreadsheet and with each other using Bland-Altman (BA) analysis to evaluate the accuracy and repeatability of the nomogram.

Results and Discussion: Accuracy (Fig 2a) was: SD: 0.39%; Bias: 0.13%; Limits of agreement (LoA) (+/- 1.96 SD): -0.64% to 0.89%. Repeatability (Fig 2b) was: SD: 0.56%; LoA: -1.3% to 0.89%.



[Fig 2a. BA plot for Accuracy]



[Fig 2b. BA plot for Repeatability]

Conclusion(s): The nomogram enabled VT to be calculated from height and gender simply and rapidly to an appropriate degree of accuracy and repeatability for clinical use.

References:

1. *NEJM* 2000; 342: 1301-8
2. Allcock HJ. *The Nomogram.* 1950. London, Pitman

11AP07-4

Accuracy of the pulse oximetry-derived respiratory rate determination during positive pressure ventilation

Noji Y., Murakawa M., Ebana H., Hakozaiki T., Obara S., Isosu T.
Fukushima Medical University School of Medicine, Dept of Anaesthesiology, Fukushima, Japan

Background and Goal of Study: It is important to monitor the respiratory rate to prevent adverse events during perioperative management. In the operating rooms and ICU, the respiratory rate is usually determined by detecting exhaled CO₂ using a capnography, which is considered highly reliable. However, in the wards, the thoracic impedance method is used and its accuracy is not high. Recently, a device (PM1000N, Medtronic, Covidien Japan, Tokyo) was developed to monitor the respiratory rate based on respiratory variation during plethysmography (RRpulse), and its usefulness has been investigated with spontaneous respiration¹. However, it remains unclear whether measurement is possible under positive pressure ventilation. Thus, we compared RRpulse with the respiratory rate measured using a capnography (RRcapno) in surgical patients under general anesthesia with artificial respiration, and investigated the accuracy of the device.

Materials and Methods: The subjects were 15 ASA1-3 patients, mean(range) age was 63(28-86), who underwent scheduled surgery under general anesthesia with the PM1000N attached. The mean RRpulse of one minute was recorded for every 30 minutes after intubation during positive pressure ventilation managed by an anesthesia apparatus, and compared with the RRcapno measured at the same time-points (using IntelliVue G5 M1019A, Philips Electronics Japan, Tokyo). The bias (difference between 2 different respiratory rate measurement methods) and standard deviation (precision) were calculated and plotted with the upper and lower limits of agreement ($\pm 1.96SD$) as described by Bland and Altman.

Results and Discussion: The respiratory rate was compared at 2,760 time-points in total. Respiratory rates were easily assessed with both instrumental methods and ranged from 7 to 13 brpm. The bias and precision (1SD) were 0.46(1.24) brpm for RRpulse compared with capnography. Bland-Altman plots showed limits of agreement of -1.97 to 2.89 brpm for RRpulse vs RRcapno. Differences in respiration rate of 3 brpm or more between the two devices led to 4.5%.

Conclusion(s): RRpulse may be measurable even under positive pressure ventilation. The PM1000N is capable of measuring SpO₂ and pulse rate using one sensor, in addition to the respiratory rate. Its usefulness as a new respiratory monitor during treatment under positive pressure ventilation without capnography was suggested.

References: 1. Addison PS, et al. J Clin Monit Comput 2015; 29: 113-20

11AP07-5

Cardiorespiratory effects of a stepwise tidal volume increase versus maximal pressure controlled lung recruitment during general anesthesia in pigs: a comparison of the PROVHILO and iPROVE study recruitment maneuvers

Bluth T.¹, Herold J.¹, Huhle R.¹, Kiss T.¹, Vivona L.², Gama de Abreu M.¹

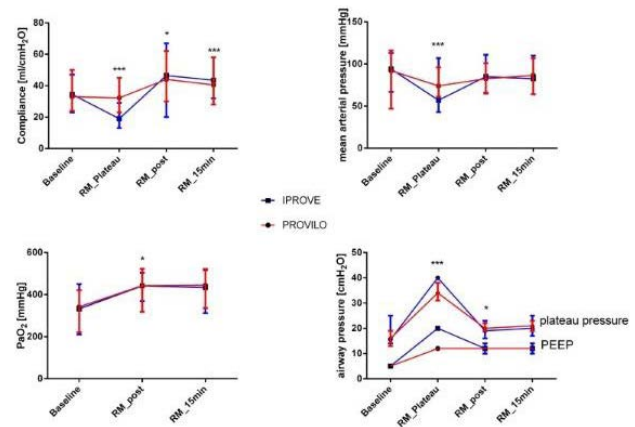
¹University Hospital Dresden, Dept of Anaesthesiology & Intensive Care, Dresden, Germany, ²University of Naples, Dept of Anaesthesiology & Intensive Care, Naples, Italy

Background and Goal of Study: We compared a RM using stepwise increase of tidal volume (V_T) at fixed PEEP of 12 cmH₂O (PROVHILO-RM) with an individual optimized PEEP and maximal RM (iPROVE-RM) during low-tidal volume ventilation in anesthetized pigs without lung injury. We hypothesized that both approaches would result in comparable effects on cardiorespiratory variables in the ultra-short term.

Materials and Methods: Twenty anesthetized pigs (30-45 kg) were used in this randomized, crossover study. Prior to each RM, animals were disconnected from the ventilator and volume-controlled ventilated during 5 minutes (baseline). The PROVHILO-RM consisted of stepwise increase of V_T until inspiratory plateau pressure P_{plat} of 30 to 35 cmH₂O for at least three breaths, followed by a fixed PEEP of 12 cmH₂O. The iPROVE-RM consisted of a pressure controlled increase of PEEP (10 to 15 to 20 cmH₂O) at fixed driving pressure (20 cmH₂O) for 10-15 cycles, decremental PEEP trial to detect the PEEP level at highest compliance (best-PEEP) followed by RM and individual best-

PEEP +2 cmH₂O. Gas exchange, lung mechanics and hemodynamic variables were measured during the RMs, as well as 1 and 15 minutes thereafter.

Results and Discussion: PEEP levels applied after the initial RM in the iPROVE-RM and PROVHILO-RM groups did not differ significantly (p=0.69). The airway pressure time product (PTP) per recruitment was significantly higher with iPROVE-RM than PROVHILO-RM (PTP 81±9.7 vs. 57.7±11.2 cmH₂O-minute; p<0.001). Compared to PROVHILO-RM, mean arterial pressure was significantly lower during iPROVE-RM (77.2±11 vs. 59.8±14 mmHg p<0.001), but values did not differ 15 min after recruitment. In iPROVE-RM, respiratory system compliance was significantly higher and P_{plat} significantly lower 15 minutes after the RM when compared to PROVHILO-RM, but PaO₂ did not differ between groups.



[Figure 1]

Conclusion(s): In anesthetized pigs without lung injury, iPROVE-RM increased compliance without affecting oxygenation in the ultra-short term, as compared to PROVHILO-RM. During the recruitment period, hemodynamic impairment was greater with iPROVE than PROVHILO-RM.

11AP07-6

Individualized lung recruitment maneuver guide by pulse-oximetry in anesthetized non-obese patients undergoing laparoscopy

Villena A.¹, Jurado Pulgar A.², Carrizo Sanchez J.², Duca A.², Soro M.², Ferrando Ortola C.²

¹Clinic University Hospital, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²Hospital Clinico de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background and Goal of Study: General anesthesia and mechanical ventilation promote atelectasis which negatively affects the lung function¹ and may promote postoperative pulmonary complications. The open-lung approach (OLA) is aimed at restoring the functional lung volume². In a recent study pulse oximetry hemoglobin saturation (SpO₂) under low FIO₂ was useful to monitor the lung's opening and closing pressure in morbidly obese anesthetized patients³. Our goal was to test whether SpO₂ can personalize the implementation of an open-lung approach during laparoscopy.

Materials and Methods: Thirty patients with SpO₂ ≥97% on room-air before anesthesia were studied. After anesthesia induction and capnoperitoneum the FIO₂ was reduced to 0.21. Those patients whose SpO₂ decreased below 97% complete the following phases:

1. First recruitment maneuver (RM), until reaching lung's opening pressure, defined as the inspiratory pressure level yielding a SpO₂ ≥97%;
2. A positive end-expiratory (PEEP) titration trial until reaching lung's closing pressure defined as the PEEP level yielding a SpO₂ <97%;
3. A second RM was performed and,
4. Ongoing ventilation with PEEP adjusted above the detected closing pressure.

Results and Discussion: Breathing air, 24 of 30 patients (80%) showed SpO₂ <97% together PaO₂/FIO₂ <400mmHg. The mean opening pressures were found at 40(6) and 33(4) cmH₂O during the first and second RM, respectively. The closing pressure was 11(5) cmH₂O. This SpO₂-guide approach reached

an open-lung condition (table 1). SpO₂ discriminates the lung's opening and closing pressures with accuracy taking the reference PaO₂/FIO₂ (area under the receiver-operating-curve of 0.88, 95%CI: 0.80 - 0.97).

Conclusion(s): The non-invasive SpO₂ value can easily individualize an open-lung approach.

References:

1. Hedenstierna G, et al. *Acta Anaesthesiol Scand* 1976; 20:334-42.
2. Futier E, et al. *Anesthesiology* 2010; 113:1310-9.
3. Tusman G, et al. *Anesth Analg* 2014; 118:137-44.

11AP07-7

Monitoring of alveolar recruitment maneuvers using the Oxygen Reserve Index in the prevention of atelectasis formation in postoperative patients undergoing major surgery. Pilot, observational study

Serralta F¹, Puig J.², Gutierrez A.¹, Ferrando C.¹, Belda F.J.², Soro M.¹

¹Hospital Clinico de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ²Hospital Clinico de Universitario de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background and Goal of Study: The monitoring of the oxygenation state has advanced remarkably nowadays. The parameter Oxygen Reserve Index (ORI) is available, a relative indicator of arterial oxygen partial (PaO₂) pressure in the range of 100-200 mmHg. Theoretically, when PaO₂ is 100 mmHg ORI value is 0 and grows up to 1 with PaO₂ of 200 mmHg. ORI seems very useful to allow a continuous and non-invasive detection of aO₂ fall and therefore can warn an imminent hypoxemia. Atelectasis occurs with hypoxemia, but are masked when supplemental oxygen is given. In fact, with a FIO₂ 0.5 and PaO₂ of 100 mmHg, it would indicate the presence of alveolar shunt (atelectasis) and while the value of SpO₂ would be 100%, ORI value would be close to zero. Therefore, a decrease in ORI maintaining the same FIO₂, could detect at an early stage the formation of atelectasis before true hypoxemia occurs, without the need for arterial blood gas or other parameters more complex. Therefore, a clinical study is necessary to observe the behavior of the ORI during the ARM for an open lung strategy and to determine if the non-invasive parameter allows the detection of pulmonary opening and closing pressures using a FIO₂ safety where atelectasis may be masked by hyperoxia.

The goal of the study is describe the changes produced during the different phases of an open lung strategy in the ORI.

Materials and Methods: Prospective, observational study. Total of 30 patients requiring mechanical ventilation will be recruited. The Masimo Radical-7 monitor will be used for the continuous monitoring of SpO₂, ORI and perfusion index. Once the patient is stabilized, a ARM is performed, with a PEEP rise of 2 in 2 cmH₂O, until 40 cmH₂O. After this, a second phase of decreasing PEEP, in which the closing PEEP is calculated. A second recruitment maneuver, leaving the optimal PEEP.

Results and Discussion: With the patients collected so far, baseline values of ORI have been obtained between 0.1-0.5, and maximum values between 0.5-0.9 coincident with the opening pressure when performing the ARM, decreasing again coinciding with the decreasing PEEP phase. And rising again to values of 0.4-0.7 when resolving the second recruitment maneuver. Which suggests that ORI is a useful parameter to detect the opening and closing pressures, maintaining a safety FIO₂.

Conclusion: ORI values are correlated with the ARM (open lung and collapsed pressure). All this suggest that ORI could be useful for monitoring alveolar pressure and detect alveolar collapse.

11AP07-8

Separate assessment of dependent and non-dependent lung regions by forced oscillation technique in a porcine model

Balogh A.L.¹, Sudy R.¹, Fodor G.H.², Tolnai J.², Petak F.², Babik B.¹

¹University of Szeged, Dept of Anaesthesiology and Intensive Therapy, Szeged, Hungary, ²University of Szeged, Dept of Medical Physics and Informatics, Szeged, Hungary

Background and Goal of Study: Mechanical ventilation in supine position generates dependent lung zones dorsally and non-dependent regions ventrally, these collectively determine global lung ventilation and mechanics. We sought to develop an experimental model suitable for the assessment of the ventilatory and mechanical properties of the dependent and non-dependent lung zones separately, thereby allowing the isolated examination of the effects of respiratory treatments.

Materials and Methods: In this prospective self-controlled study, anaesthetised pot-bellied pigs (n=7) were intubated with a right sided double-lumen endotracheal tube, and ventilated with 10 ml/kg tidal volume (V_T) and zero positive end-expiratory pressure (PEEP) while V_T was separately measured in each lung. The forced oscillation technique was used to determine airway resistance (R_{aw}), inertance (I_{aw}), tissue damping (G) and elastance (H). At the beginning of the protocol, the pigs were placed in supine position, and baseline measurements (BL) were performed. Subsequently, the animals were turned to their left side, and measurements were repeated after 15 (P0-15) and 45 (P0-45) minutes. Further measurements were made with the PEEP increased to 4 (P4) and 8 cmH₂O (P8).

Results: V_T showed a tendency to decrease in the dependent lung and increase in the non-dependent lung, without reaching statistical significance. Increasing PEEP to 8 cmH₂O lead to drops in R_{aw} in the dependent lung compared to P0-15 (-35±16[SE]%). I_{aw} increased in the dependent side at P0-15 compared to BL, and remained unchanged to PEEP. G and H increased in the dependent (+55±13%) and decreased in the non-dependent lung (-29±12%). Elevated PEEP lead to reductions in G and H compared to the P0-45 in both the dependent (-23±11% and -47±20%) and the non-dependent lung (-26±12% and -39±10% for G and H, respectively, p < 0.05 for all).

Conclusions: This experimental model allows the separate assessment of lung ventilation and mechanics. Side-lying position results in decreased tidal volume with increased atelectases and tissue stiffness in the dependent lung, while converse changes can be observed in the non-dependent lung. Increasing PEEP to 8 cmH₂O alleviates the adverse respiratory alterations in the dependent lung caused by lateral position without deteriorating lung mechanics in the non-dependent lung.

Acknowledgement: OTKA-NKFI K115253

11AP07-9

The effect of high positive-end expiratory pressure on elastance of respiratory system and ventilation distribution during robot-assisted laparoscopic radical prostatectomy

Shono A., Katayama N., Aoyama Y., Ozasa H., Nikai T., Yoji S. Shimane University, Dept of Anaesthesiology, Izumo, Japan

Background and Goal of Study: It has been demonstrated that pneumoperitoneum and steep Trendelenburg position during laparoscopic surgery increase elastance of the respiratory system and impair gas distribution in the lung, resulting in hypoxia. In this study, we investigated the effect of high PEEP on elastance of respiratory system and regional ventilation distribution using Electrical Impedance Tomography (EIT) during robot-assisted laparoscopic prostatectomy (RALP).

Materials and Methods: 11 patients undergoing RALP under general anesthesia were enrolled. After induction of anesthesia (T1), tidal volume was set at between 6 to 8 ml/kg/PBW and 15 cmH₂O of PEEP was applied after lung recruitment maneuvers before the establishment of pneumoperitoneum and the Trendelenburg position (T2). Airway and esophageal pressures were measured and elastances of respiratory system, chest wall, and lung were calculated at T1, T2 and 20 min (T3), 60 min (T4), 120 min (T5) after the patients being placed in the steep Trendelenburg position. We also recorded the impedance variation caused by ventilation using EIT in 5 patients to detect regional ventilation distribution, especially dependent part of the lung, during surgery. Data was analyzed by one-way ANOVA with repeated measures and Tukey test as post-hoc analysis.

Results and Discussion: Elastances of chest wall and respiratory system significantly increased at T3, T4 and T5 compared to T2 ($p < 0.05$), and peak airway pressure significantly increased during pneumoperitoneum and in the Trendelenburg position.

On the other hand, lung elastance didn't change significantly at any time point ($p = 0.507$), showing that lung compliance was kept constant during surgery. The ventilation distribution of the dependent part of the lung didn't decrease significantly at the Trendelenburg position compared to at T1 and T2.

In addition, P/F ratio at T3, T4 and T5 were not lower than at T1 and T2, indicating that lung collapse caused by pneumoperitoneum and Trendelenburg position might be prevented by applying 15 cmH₂O of PEEP.

Conclusion(s): Lung elastance would not increase when high PEEP is applied before the establishment of pneumoperitoneum and Trendelenburg position, by preventing lung collapse and keeping the better ventilation distribution, which leads to maintenance of oxygenation.

11AP07-10

The relation between intra-abdominal pressure and driving pressure is linear - the Individualized Pneumoperitoneum Pressure in Colorectal Laparoscopic Surgery (IPPCollapse-I) trial

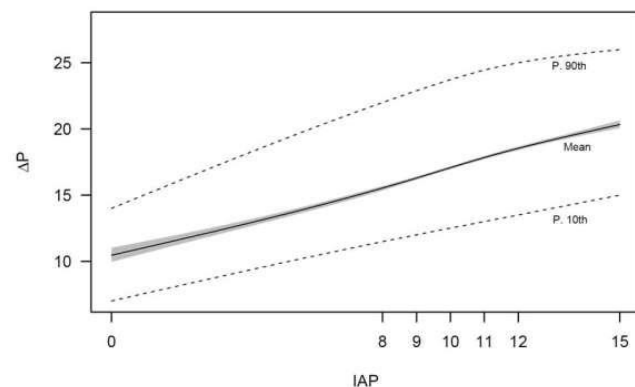
Mazzinari G.¹, Diaz Cambronero O.², Vila Montañes M.², Garcia Gregorio N.², Schultz M.J.³, Errando Oyonarte C.L.⁴
¹Hospital de Manises Valencia, Dept of Anaesthesiology & Pain Medicine, Manises Valencia, Spain, ²Hospital Universitario y Politecnico La Fe, Dept of Anaesthesiology, Valencia, Spain, ³Academic Medical Centre, University of Amsterdam, Dept of Intensive Care, Amsterdam, Netherlands, ⁴Hospital General Universitario, Dept of Anaesthesiology, Valencia, Spain

Background and Goal of Study: There is evidence for a role of driving pressure (ΔP) levels in the pathogenesis of ventilator induced lung injury (VILI), also during intraoperative ventilation. ΔP could rise, at least in part by increases in intra-abdominal pressure (IAP) as the one caused by gas insufflation for laparoscopic surgery.

In a secondary analysis of a study seeking for the lowest IAP level during colorectal laparoscopic surgery, we aimed to determine the relationship between respiratory system ΔP and IAP levels.

Materials and Methods: Multicenter observational prospective study in 92 ASA I-III patients planned for colorectal laparoscopic surgery. After induction of anesthesia and protective ventilation (tidal volume of 8 ml/Kg PBW, PEEP 5 cm H₂O, FiO₂ 60-80%) gas insufflation was titrated to the lowest IAP level at which the surgical workspace remained acceptable. At baseline, and at 15, 12, 10 and 8 mmHg IAP, the ΔP level was calculated. We analyzed the relationship between ΔP and IAP levels using Pearson's correlation, graphic correlation and multivariable linear regression.

Results and Discussion: Out of 92 patients, 90 were fully analyzable. The optimized IAP level was 8 mmHg in 80% percent of patients. Median respiratory system ΔP at optimized IAP was 15 [13-18] cmH₂O, with 91% of the patients having a $\Delta P > 10$ cmH₂O, and 70% having a $\Delta P > 13$ mmHg. Median respiratory system ΔP at a standard IAP level of 12mmHg in the same cohort was 19 [16-22] cmH₂O.



[Driving vs Intra-Abdominal Pressure Relationship]

Suggests an almost linear relationship between ΔP and IAP levels; an increase in IAP of 0.67 mmHg resulted in an increase in ΔP of 1 cmH₂O ($p < 0.01$, adjusted R²: 0.43). There is a 25% reduction in median ΔP lowering IAP from 15 mmHg to 8 mmHg in the whole sample ($p < 0.01$).

Conclusion(s): During colorectal laparoscopic surgery the relation between IAP and respiratory system ΔP levels is linear. Aiming at the lowest workable IAP level still resulted in high respiratory system ΔP levels, though lower than at the standard IAP level. Future studies need to focus on strategies to reduce ΔP levels, in particular pulmonary ΔP levels.

11AP07-11

The role of endogenous cannabinoid metabolism pathway in fatty acid amide hydrolase inhibitor ameliorating one-lung ventilation induced lung injury in rabbits

Wang R.¹, Yin H.²

¹West China Hospital, Sichuan University, Dept of Anaesthesiology, Chengdu, China, ²Fifth Hospital of Chengdu, Dept of Anaesthesiology, Chengdu, China

Background and Goal of Study: Inflammation is involved in the development of One-lung ventilation (OLV) induced ALI. Endocannabinoids such as arachidonylethanolamine (AEA) are important regulators of inflammation. Fatty acid amide hydrolase (FAAH) is the principal AEA-degrading enzyme, and the downstream metabolites play a role in inflammation. The goal of this study was to explore the role of endocannabinoid metabolism pathway in OLV-induced lung injury by using FAAH inhibitor URB937.

Materials and Methods: New Zealand white rabbits were anesthetized and OLV modes were established. 24 male rabbits were randomly divided into 4 groups (n=6): TLV (two lung ventilation)-S (TLV 2.5 h + saline 1.5ml/kg + TLV 1 h), OLV-S (OLV 2.5 h + saline 1.5ml/kg + OLV 0.5 h + TLV 0.5 h), OLV-U (OLV 2.5 h + URB937 1.5ml/kg + OLV 0.5 h + TLV 0.5 h), and U-OLV group (URB937 1.5ml/kg + OLV 3.0 h + TLV 0.5 h). Arterial blood gas, wet/dry ratio and lung injury score of non-ventilated lung were performed. Levels of AEA, arachidonic acid (AA) and ProstaglandinI₂ (PGI₂), ThromboxaneA₂ (TXA₂) and leukotrienes B₄ (LTB₄) in non-ventilated lung were quantified with HPLC and ELISA.

Results and Discussion: Arterial oxygenation index (PaO₂/FiO₂) decreased after 0.5h of OLV in three OLV groups as compared their baseline ($P < 0.05$, Repeated measures ANOVA) and the TVL-S group ($P < 0.05$, ANOVA). At the end of the experiment, PaO₂/FiO₂ in the OLV-U group was higher than in the OLV-S and U-OLV groups ($P < 0.05$, ANOVA). Wet/dry ratio and lung injury scores in the OLV-S and U-OLV groups increased as compared to the TVL-S and OLV-U groups ($P < 0.05$, One Way ANOVA). The AEA level in the OLV-U group were higher than other three groups ($P < 0.05$, One Way ANOVA). The levels of AA, PGI₂, TXA₂ and LTB₄ were higher in the OLV-S and U-OLV groups than in the TVL-S and OLV-U groups ($P < 0.05$, One Way ANOVA).

The results indicated that OLV induced lung injury evidenced by decreased PaO₂/FiO₂ and increased lung wet/dry ratio and injury scores in rabbits. Administration of URB937 after OLV 2.5 h but not before OLV attenuated OLV-induced lung injury by increasing AEA levels and reducing downstream metabolites from AA to PGI₂, TXA₂ and LTB₄.

Conclusion(s): Treatment with FAAH inhibitor URB937 after OLV attenuated OLV-induced lung injury in rabbit. Furthermore, AEA/FAAH metabolism pathway is involved in the protective effect of URB937 on OLV-induced lung injury.

11AP08-1

A 2-year audit of the Emergency Airway Service in a Singaporean regional hospital

Quek K.H., Ong A.S.C., Ong C.S.

Changi General Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore

Background and Goal of Study: Compared to in-theatre intubation, emergency out-of-theatre endotracheal intubation (EEI) is associated with higher rates of failed intubation and hypoxia. In 2011, an Emergency Airway Service (EAS) was set up to manage airway emergencies outside OT. The team comprises of an anaesthetist, a trainee and a nurse with specialized equipment

readily available in a runaway trolley. We describe the characteristics and outcomes of EAS activation in our hospital.

Materials and Methods: Following institutional review board approval, we conducted a 2-year retrospective audit of EAS activations (April 2014 to April 2016). EAS forms and electronic records were reviewed. There were 135 activations, of which 90 with record forms were analysed.

Results and Discussion: Activations originated mainly from General Ward (37%), A&E(19%), Medical ICU (19%) and High Dependency Units (18%). Reasons for intubation included respiratory (58%), cardiac (16%), airway (14%) and neurological (8%). Median patient age was 62 years (range 18-86). Intubation was attempted in 84 (93.3%) cases by the EAS team. 83 (99%) cases were intubated successfully while 1 (1%) required open tracheostomy. Mask ventilation and intubation were deemed to be difficult in 29 (35%) and 33 (39%) cases respectively. Difficulties were attributed to anatomical (53%), pathological (28%) and operator (19%) reasons. Techniques used included videolaryngoscopy (73%), direct laryngoscopy (23%), fiberoptic bronchoscopy (3%), and tracheostomy (1%). Capnometry / capnography was used in 53 (63%) cases to confirm endotracheal intubation. All-cause 30-day mortality was 68% in patients who required EAS activation during their hospital stay. We reported a higher incidence of difficult intubation compared to earlier studies, likely because the EAS was activated only when the primary team had failed intubation or anticipated difficulty.

The videolaryngoscope is suggested as the first-choice device during EEI as there is good evidence that it improves glottic view and first-pass success rate. Also, we encourage our EAS team to use capnography to confirm correct tube placement, in accordance with recommendations from the National Audit Project 4.

Conclusion(s): Our EAS has been successful in managing airway emergencies and EEI outside the operating theatre. We recommend a regular audit of the EAS as part of an on-going quality improvement process.

11AP08-2

A survey of “can’t intubate, can’t oxygenate” (CICO) readiness amongst anaesthetists in a Singaporean regional hospital

Ong A.S.C., Quek K.H., Ong C.S., Jain A.

Changi General Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore

Background and Goal of Study: The “can’t intubate, can’t oxygenate” (CICO) situation is an increasingly rare event in anaesthesia practice. However, the importance of training for this situation has been highlighted in the National Audit Project 4 and Difficult Airway Society 2015 guidelines. We aimed to explore the perceptions of specialist anaesthetists at a Singaporean regional hospital regarding their readiness for managing a CICO situation.

Materials and Methods: All specialist anaesthetists at Changi General Hospital (CGH) were requested to complete an online survey regarding their experience, preferences and level of confidence pertaining to CICO situations. Surveys were sent to all 35 specialist anaesthetists working at CGH in April 2016. Twenty-nine responses were collected online and 5 responses manually.

Results and Discussion: Total response rate was 34/35 (97%). Experience of the respondents ranged from registrar to senior consultant level. Nine (26%) respondents had encountered a CICO situation previously. If faced with a CICO situation with a hypoxic patient, the preferred rescue technique was cannula cricothyroidotomy (11/34, 32%), followed by scalpel-bougie technique (10/34, 29%) and commercial cricothyroidotomy kit (9/34, 26%), with a further three (9%) preferring surgical tracheostomy by surgeon and one (3%) preferring a percutaneous tracheostomy.

Five (15%) were very confident they could quickly (<2 mins) fetch the equipment required to perform their preferred rescue technique in a CICO situation in the operating theatre and three (9%) were very confident they would be able to perform it. The number of respondents that were very confident in their abilities dwindled to two (6%) when asked if they would know how to use another technique if their preferred technique failed.

Thirteen (39%) had either never attended an airway course that included CICO management or had done so more than five years ago. While there are no definitive revalidation requirements for CICO management, suggestions are that it should be recent, frequent and relevant.

Conclusion(s): Based on the results of the survey, establishing a dedicated and regular CICO workshop at CGH would be justified. Future studies should focus on whether standardising the equipment and techniques within the department and providing a CICO workshop will increase CICO readiness.

11AP08-4

Features of airway management procedures - an audit in tertiary care hospital in Lithuania

Karbonskienė A., Grauslytė L., Masiliūnienė G., Macas A.

Lithuanian University of Health Sciences, Dept of Anaesthesiology, Kaunas, Lithuania

Background and Goal of Study: Problems of airway management can result in severe consequences despite technological and educational advances in airway management techniques. We attempted to audit airway management procedures at our institution (tertiary care teaching facility, Hospital of Lithuanian University of Health Sciences, HLUHS) in order to suggest further training opportunities for the staff and plan acquisition of devices for advanced airway management.

Materials and Methods: Prospective observational study of 1 month period (November 23rd-December 23rd, 2015). Using a standardized proforma we collected data on tracheal intubation procedures. Data included location, patient characteristics, results of airway evaluation, training grade and affiliation of intubator, assistance present, details of technique and adverse events.

Results: Data was collected for 1041 tracheal intubations. 825 (79.3%) patients were graded as having no probability of difficult airway management (group I), borderline predicted intubation difficulty was found in 192 (18.4%) (group II) and severe predicted intubation difficulty in 24 (2.3%) patients (group III). Primary intubation technique is shown in table 1.

Patients' groups according to predicted difficulty of intubation	Primary intubation technique (n of cases, %)		
	Direct laryngoscopy	Videolaryngoscopy	Flexible fiberoscopy
I	781 (94,7%)	21 (2,5%)	23 (2,8%)
II	169 (88,0%)	9 (4,7%)	14 (7,3%)
III	14 (58,3%)	4(16,7%)	6(25%)

[Table 1. Primary intubation technique]

A total of 109 airway-related events were reported. Incidence of airway events was 7,9% in patients of group I, 18,2% of group II and 37,5% of group III. There were 3 aspirations, two patients required a surgical airway. No deaths due to airway management were registered during study period.

Conclusion: Usage of advanced airway techniques is still scarce in HLUHS, especially in cases predicted airway management difficulty. Further training and acquisition of airway management devices is warranted.

11AP08-8

The optimal exhaled concentration of sevoflurane for intubation without neuromuscular blockade using clinical bolus doses of remifentanil

Shin H.W.¹, Goo E.-K.², Lee J.S.³, Lim C.H.¹, Koh J.C.¹

¹Korea University Anam Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of, ²Armed Forces Capital, Dept of Anaesthesiology & Pain Medicine, Seongnam-si, Korea, Republic of, ³Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Many studies have shown that remifentanil, sevoflurane, or both agents in combination may provide adequate conditions for laryngoscopy and tracheal intubation. However, there are few number of studies which have measured the optimal concentration of sevoflurane for performing intubation without neuromuscular blockade.

The aim of this study was to investigate the optimal exhaled sevoflurane concentration that produces adequate endotracheal intubation conditions when sevoflurane is combined with the different bolus doses of remifentanil used in clinical practice.

Materials and Methods: Patients aged 18-30 years who were scheduled to undergo elective otolaryngological surgery were enrolled in the study. The patients were randomized to three groups (groups 1.0, 1.5, and 2.0), receiving remifentanil bolus doses of 1.0, 1.5 or 2.0 $\mu\text{g}\cdot\text{kg}^{-1}$, respectively. For each group, the concentration of sevoflurane used for each consecutive patient was

increased or decreased using the “up-and-down” method based on the success or failure to achieve adequate conditions for intubation in the previous patient. The remifentanyl bolus dose was administered 90 s before intubation and after the target sevoflurane concentration was achieved.

Results and Discussion: Twenty-two, 24, and 22 patients were analyzed in groups 1.0, 1.5, and 2.0, respectively. In groups 1.0, 1.5, and 2.0, the EC_{50} of the sevoflurane concentration required to perform successful intubation was 3.0, 2.0, and 1.29 vol% and the EC_{95} was 3.45, 2.91, and 1.89 vol%, respectively. When sevoflurane was administered for the induction, the increase in heart rate of group 1.0 was the highest among the groups. The highest number of adverse events occurred in group 2.0, including vocal cord rigidity, hypotension, and bradycardia.

Conclusion(s): The EC_{50} of the exhaled sevoflurane concentration was 3.0, 2.0, and 1.29 vol% when it was combined with a bolus dose of remifentanyl of 1.0, 1.5, and 2.0 $\mu\text{g}\cdot\text{kg}^{-1}$, respectively. Of the three different bolus doses of remifentanyl, the dose of 1.5 $\mu\text{g}\cdot\text{kg}^{-1}$ was least associated with changes in the heart rate/mean blood pressure during intubation without increasing adverse effects.

References: Cros AM, Lopez C, Kandel T, Sztark F. Determination of sevoflurane alveolar concentration for tracheal intubation with remifentanyl, and no muscle relaxant. *Anaesthesia* 2000;55:965-9.

11AP08-9

Ultrasound-based quantification of submandibular space compliance as predictor for difficult intubation. A prospective observational preliminary study

Petrișor C., Szabo R., Constantinescu C., Prie A., Trancă S., Hagău N.

Iuliu Hațieganu University of Medicine and Pharmacy Cluj-Napoca, Dept of Anaesthesiology & Intensive Care, Cluj-Napoca, Romania

Background and Goal of Study: Ultrasonography might be a tool to assess airway difficulty¹. However, no validated measurement of submandibular space compliance as part of airway assessment has been reported². We investigated whether two indices, derived from the ultrasound-based quantification of the distances between the hyoid bone and mandible (HMD) in neutral, sniffing, and maximal hyperextended positions, may be used to predict the occurrence of Cormack 3 and 4 grades during direct laryngoscopy.

Materials and Methods: After the Ethics Committee approval and signing the informed consent forms, fifty adult patients scheduled to undergo general anaesthesia with oro-tracheal intubation were prospectively included. Exclusion criteria were morbid obesity and rapid sequence inductions. We measured the HMDs in neutral, sniffing, and maximal hyperextended positions, in mid-sagittal plane, using a curvilinear ultrasound transducer. We calculated the ratio between HMDs in sniffing and neutral positions (Comp₁) and the ratio between the HMDs in maximal hyperextended and neutral positions (Comp₂). All intubations were performed in sniffing position, with Macintosh curved laryngoscope blades, with no external laryngeal manipulation, by skilled anaesthesiologists. We used ROC (receiver operating characteristics) curve analysis to determine the performance of Comp₁ and Comp₂.

Results and Discussion: For Comp₁, we identified an optimal threshold of 1.06, with 75% sensitivity, and 97.83 specificity. For Comp₂, we identified a threshold of 1.24 as being most discriminative between patients with and without difficult intubation, with 100% sensitivity and 71.7% specificity. Thus, the lengthening of the submandibular space (HMD) by less than 24% from neutral to maximal hyperextended position had the highest sensitivity in predicting the occurrence of Cormack grades 3 and 4. The areas under the ROC curve were 0.87 for Comp₁ and 0.91 for Comp₂ ($p=0.65$).

Conclusion(s): Ultrasound-based quantification of submandibular space compliance might be a useful tool, with good sensitivity and specificity, in the prediction of difficult airway.

References:

- Fulkerson J, Moore H, Anderson T, Lowe R Jr. Ultrasonography in the pre-operative difficult airway assessment. *J Clin Monit Comput* 2016; DOI 10.007/s10877-016-9888-7.
- Greenland KB. Airway assessment based on a three column model of direct laryngoscopy. *Anaesth Intensive Care* 2010;38:14-19.

Acknowledgements: ISRCTN 34940667

11AP08-10

Using temporomandibular joint mobility to predict difficult tracheal intubation

Hekimoglu Sahin S.¹, Yilmaz A.², Gunday I.³, Kargi M.⁴, Sut N.⁵, Taşkınalp O.²

¹Trakya University Medical Faculty, Dept of Anaesthesiology, Edirne, Turkey, ²Trakya University Medical Faculty, Anatomy, Edirne, Turkey,

³Trakya University Medical Faculty, Dept of Anaesthesiology & Intensive Care, Edirne, Turkey, ⁴Bursa Higher Specialization Training and Research Hospital, Dept of Anaesthesiology & Intensive Care, Edirne, Turkey, ⁵Trakya University Medical Faculty, Statistics, Edirne, Turkey

Background and Goal of Study: The aim of this prospective study was to determine the reliability of temporomandibular joint (TMJ) mobility measurements for predicting difficult intubation.

Materials and Methods: To evaluate the accuracy in predicting difficult intubation by TMJ mobility measurement, 762 patients requiring general anaesthesia with tracheal intubation for elective surgery were enrolled in this prospective, observational, single-blind study. Maximum mouth opening, right-left jaw excursion, and degrees of protraction were determined with a digital inclinometer. Incisor gap was measured using a vernier caliper during full mouth opening. After induction of anaesthesia using a standard protocol, the patient's grade of laryngeal view by Cormack-Lehane classification was documented by an anaesthesiologist.

Results and Discussion: We found that the degrees of protraction and incisor gap in the easy intubation group were significantly higher than those in the difficult intubation group. The incisor gap was found to be more sensitive (88.37%) and more specific (95.71%) than protraction degrees (58.14% and 59.76%, respectively).

Conclusion(s): The results revealed that measurements of the incisor gap and degrees of protraction may be useful routine screening tests for preoperative prediction of difficult intubation.

References:

- Caplan RA, Posner KL, Ward RJ, Cheney FW. Adverse respiratory events in anaesthesia: a closed claim analysis. *Anesthesiology*. 1990;72:828-33.
- Rosenstock C, Moller J, Hauberg A. Complaints related to respiratory events in anaesthesia and intensive care medicine from 1994 to 1998 in Denmark. *Acta Anaesthesiol Scand*. 2001; 45:53-8.
- Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. *Anaesthesia*. 1984;39:1105-11.
- Crosby ET, Cooper RM, Douglas MJ, Doyle DJ, Hung OR, Labrecque P, Muir H, Murphy MF, Preston RP, Rose DK, Roy L. The unanticipated difficult airway with recommendations for management. *Can J Anaesth*. 1998;45:757-76.
- Ramadhani SAL, Mohamed LA, Rocke DA, Gouws E. Sternomental distance as the sole predictor of difficult laryngoscopy in obstetric anaesthesia. *Br J Anaesth*. 1996;77:312-6.

Acknowledgements: Support was provided from institutional and departmental sources.

11AP08-11

Refractory airway hyperresponsiveness controlled with upper airway blocks during general anaesthesia - a case report

Costa-Martins I.¹, Carreteiro J.¹, Neto M.¹, Gilberto N.²

¹Centro Hospitalar Lisboa Ocidental, Dept of Anaesthesiology & Intensive Care, Lisboa, Portugal, ²Centro Hospitalar Lisboa Ocidental, Dept of Otorhinolaryngology, Lisboa, Portugal

Background: Tympanomastoidectomy with facial nerve monitoring usually impairs muscle relaxants' use. Airway hyperresponsiveness is common while manipulating a smoker's airway, particularly during endotracheal intubation⁽¹⁾. Increasing the depth of anaesthesia as well as blunting airway reflexes may be useful in these cases.⁽¹⁾

Case report: 59 year-old woman with heavy smoking habits was admitted for tympanomastoidectomy. She was submitted to surgery under total intravenous anaesthesia, using ASA standard monitoring, capnography, BIS and facial nerve monitoring. Remifentanyl and propofol perfusions were used for induction. We did not use muscle relaxant and after intubation the patient pre-

sented upper airway hyperresponsiveness although pulmonary auscultation remained normal. We used high rates of propofol and remifentanyl perfusions and added sevoflurane. Though the deepen anesthesia, the hyperactivity remained, even without exogenous stimuli.

After discussion with the ENT surgeons, we decided to perform a bilateral block of the internal branch of the superior laryngeal nerve, associated with transcricoid infiltration, with lidocaine. The upper airway blocks were effective, without complications. The procedure lasted 6 hours and the patient was extubated without incidents. At 15th post-operative day the patient is still hospitalized due to a resolved liquor fistula and an ongoing bullous dermatitis and mucositis caused by antibiotic therapy.

Discussion: The potent reflex to airway's stimulation can be attenuated by upper airway nerve blocks.(2) The described blocks are usually performed in awake/anesthetized laryngoscopy, awake fiberoptic bronchoscopy and as

an adjuvant to general anesthesia to facilitate intubation without muscle relaxant.(2) They attenuate catecholamine release and hemodynamic response to airway's manipulation, with lower incidence of cough and bulking, providing significant analgesia(2). Aspiration is not a concern because swallowing reflex is preserved.(2)

References:

1. Duggappa et al. Anaesthesia for patient with chronic obstructive pulmonary disease. *Indian Journal of Anaesthesia*. 2015; 59.

2. Ahmed *et al.* Superior laryngeal nerve block as an adjuvant to General Anesthesia during endoscopic laryngeal surgeries. *Egyptian Journal of Anaesthesia*. 2015; 31.

Learning points: Upper airway blocks are useful in laryngoscopy, awake fiberoptic bronchoscopy and intubation without muscle relaxation and should be performed by skilled professionals.

Transfusion, Haemostasis and Thrombosis

12AP01-1

HepciFer study: hepcidin overexpression after hepatectomy: does iron supplementation make sense ?

Benoliel A.¹, Assouline B.², Blaudszun G.², Legouis D.², Kraiem A.², Schiffer E.²

¹Hôpital Cochin, Dept of Anaesthesiology & Intensive Care, Paris, France, ²Hôpital Universitaire Geneva (HUG), Dept of Anaesthesiology, Geneva, Switzerland

Background and Goal of Study: Anemia is frequent in liver surgery with an estimated incidence of 32%⁽¹⁾. The causes of anemia in surgical patients are often the iron deficiency anemia and the functional iron deficiency (FID). FID is associated with an elevated level of hepcidin (synthesized by the liver), the central regulatory protein of iron metabolism. Our hypothesis was that hepcidin is overexpressed after liver surgery and contributes to postoperative anemia. We aimed to assess the impact of intravenous iron administration in the immediate postoperative period on hemoglobin levels.

Materials and Methods: The HepciFer trial was a single-center, randomized, placebo-controlled, double-blinded clinical trial (RCT) in 50 patients undergoing liver surgery. Adult patients undergoing elective liver surgery were screened and included from the September 2015 to August 2016. According to the randomization process, patients received either ferric carboxymaltose (15mg/Kg, maximum 1g) or placebo 4 hours after surgery. The primary outcome was to assess the difference of plasma Hb levels between the two groups seven days after surgery. The secondary outcomes included plasma level of hepcidin and the iron status at different time points after surgery, the length of hospitalization and the incidence of blood transfusion.

Results: Both groups were comparable regarding patients' baseline characteristics, type of surgery, pathology analyses and postoperative complications.

Iron supplementation was associated with an increase of 1.2 g/dL of Hb level (p=0.04) and higher hematocrit level (34.7 (30.9-36.6) vs 30.4 (29.0-33.5); P=0.02) at POD 7.

Hepcidin level was also higher after iron supplementation (50ng/l [30,4-134] vs 8,4ng/l [4,4-25];

P<0.0001) whereas IL-6 level did not differ across groups. Finally, length of hospitalisation and rate of blood transfusion were comparable.

Conclusion: This study is to our knowledge the first RCT to evaluate the impact of IV iron administration in the postoperative period after liver surgery. Our findings suggest that IV iron supplementation increase Hb and Hct level at POD 7 by treating the FID. In addition, this trial adds new knowledge regarding the physiopathology of iron metabolism and hepcidin kinetics and thus, provides a better understanding of the mechanism involved in FID in the postoperative period after liver surgery.

References: 1. Tohme S, *and al.* HPB. mars 2016;18(3):255-61.

12AP01-2

Tromboprofilaxis in elective spinal surgery: a systematic review

Colomina M.J.¹, Bago J.², Urrutia G.³, Salas K.⁴, Requeijo C.⁴, Nishishinya M.B.⁴

¹Hospital Universitari de Bellvitge, Dept of Anaesthesiology & Intensive Care, L'Hospitalet de Llobregat - Barcelona, Spain, ²Hospital Universitari Vall d'Hebron, Orthopedic and Trauma Department, Spine Unit, Barcelona, Spain, ³Hospital Sant Pau, Biomedical Research Institute - CIBERESP, Barcelona, Spain, ⁴Iberoamerican Cochrane Centre, Biomedical Research Institute Sant Pau, Barcelona, Spain

Background and Goal of Study: Venous thromboembolic disease (VTE) is a serious and life-threatening complication in the postoperative period of spinal surgery (SCx)¹. Since there is no consensus on the use of different types of thromboprophylaxis in this type of surgery², we performed a systematic review whose main objective was to evaluate the efficacy and adverse effects of mechanical and chemical thromboprophylaxis in the prevention of complications in elective SCx in adolescent and adult population.

Methods and Design: A sensitive strategy was designed that was executed in the Medline and Embase, and covered until March 2016. Patients: adolescent and adult (>10 years) undergoing elective spinal deformity and/or degenerative surgery (from C1 to S1). Intervention: Mechanical perioperative thromboprophylaxis: 1) compression stocking (CS), 2) pneumatic sequential compression devices (PSCD); Chemical perioperative thromboprophylaxis: LMWH, LDUH, AAS, New direct oral anticoagulants. Studies could be randomized controlled trials (RCT) or observational and reporting data on any relevant clinical outcomes.

Results: A total of 1,567 citations were identified; 137 articles were included for full text reading after which 26 studies were included in the systematic review: 6 randomized clinical trials and 20 cohort studies and / or cases and controls. We found 5 studies with pharmacological interventions (3 RCT and 2 observational), 13 with mechanical interventions (3 RCT and 10 observational) and 8 observational studies with mixed interventions. Quantitative synthesis (meta-analysis) of the results was not possible; so data are presented in a narrative manner.

Discussion and Conclusion: The high variability observed in terms of interventions, population, outcome measures, and methods, as well as the lack of detailed information on relevant issues limits the accurate assessment of the quality of the evidence as well as the interpretation of results. There is no clear advantage of mechanical over pharmacological thromboprophylaxis, as well as for a specific mode of intervention.

No significant risk of epidural haematomas was observed.

There is still need of further high quality studies and better reporting standards in this field.

References:

1. Tominaga H, Setoguchi T, Tanabe F, et al. *Medicine (Baltimore)*. 2015 Feb;94(5).

2. Yoshioka K, Murakami H, Demura S, et al. *Spine* 2015;40(5):E301-6.

12AP01-3

Factors influencing portal vein velocity after liver transplantation

Popescu M.¹, Dima S.², Marcu A.³, Calancea E.³, Dinca A.³, Tomescu D.¹

¹Carol Davila University of Medicine and Pharmacy, Dept of Anaesthesiology & Intensive Care, Bucharest, Romania, ²Fundeni Clinical Institute, Dept of Surgery, Bucharest, Romania, ³Fundeni Clinical Institute, Dept of Anaesthesiology & Intensive Care, Bucharest, Romania

Background and Goal of Study: Vascular complications are one of the most common complications after liver transplantation (LT) and are generally associated with a poor prognosis if adequate measures are not undertaken. The aim of our study was to determine risk factors for decreased portal vein velocity and portal vein thrombosis after LT.

Materials and Methods: We retrospectively analyzed 165 patients undergoing deceased-donor LT. Preoperative severity (MELD and MELD-sodium score), intraoperative blood loss and transfusion requirements were noted. Standard coagulation tests (INR, APTT, PT), platelet count and fibrinogen levels were recorded 15 minutes after reperfusion of the graft and for the first 3 postoperative days.

Rotational thromboelastometry (ExTEM, InTEM, FibTEM, ApTEM) was performed 15 minutes into the neohaptic phase and 24 hours after LT and both standard parameters (clotting time-CT, clot formation time-CFT, maximum clot firmness-MCF) and derived (thrombin potential index-TPI, maximum velocity of clot formation-MaxV, time to MaxV-MaxVt, area under the curve-AUC and maximum clot elasticity-MCE) were noted. Maximum blood velocity in the portal vein (PVV) was determined daily during the first 3 postoperative days using Doppler ultrasound and the mean value was recorded. Portal vein thrombosis (PVT) was diagnosed using contrast-enhanced computer tomography.

Results and Discussion: The mean age in the study group was 50±12 years and the mean severity scores (MELD, MELD-sodium) were 19.2±6.1 and 21.5±6.0 respectively. 23 patients (14.2%) were preoperatively diagnosed with PVT. Mean postoperative PVV was 44.9±15.9 cm/s and 9 patients (5.5%) were diagnosed with PVT. Risk factors for decreased postoperative PVV were high blood loss (p=0.01), fresh frozen plasma transfusion (p=0.02), intraoperative ExTEM CT (p=0.01), InTEM CT (p=0.01), ExTEM CFT (p=0.01), ExTEM MCF (p=0.02), AUC (p=0.01) and postoperative ExTEM CT (p=0.01), InTEM CT (p=0.01). Risk factors for postoperative PVT were: fresh frozen plasma transfusion (p=0.01) and platelet transfusion (p=0.01), intraoperative ExTEM CFT (p=0.01), ExTEM MCF (p=0.03) and postoperative ExTEM CT (p=0.01), MaxVt (p=0.01), AUC (p=0.03).

Conclusion(s): Blood loss and transfusion represent the most important and potentially reversible risk factors for both PVT and low PVV. Thromboelastometric parameters, especially extrinsically activated, may help in identifying patients at risk for PVT.

12AP01-4

Risk of spinal haematoma caused by epidural catheters after major upper gastrointestinal surgery: normal postoperative changes in coagulation, and the relationship between advanced and routine tests of coagulation

Thomas O.¹, Rein H.², Lybeck E.², Strandberg K.³, Schött U.²

¹Children's Hospital, SUS Lund University Hospital, Dept of Anaesthesiology & Intensive Care, Lund, Sweden, ²University of Lund, Dept of Anaesthesiology & Intensive Care, Lund, Sweden, ³University of Lund, Faculty of Medicine, Lund, Sweden

Background: Routine coagulation tests are often taken to estimate the risk of spinal haematoma in patients receiving epidural catheters, and previous research shows that the first few days after operation are characterised by apparent mild hypocoagulation as shown by the routine tests PT-INR (prothrombin international normalised ratio) and aPTT (activated partial thromboplastin time). Guidelines are inconsistent on what to do when results indicate slight hypocoagulation and there is a clinical indication to remove the catheter: post-operative patients are known to be prone to thrombosis.

We conducted routine and advanced tests, hypothesizing that patients undergoing major upper gastrointestinal (GI) surgery would be deficient in vitamin K-dependent coagulation factors, or hypocoagulable because of accumulation of low molecular weight heparin (LMWH).

Methods: Blood tests were taken prior to epidural catheterization and at catheter withdrawal, from 38 adult patients receiving epidural analgesia for major upper GI surgery. PT-INR, aPTT and platelet count (Plc) were analysed, also albumin, proteins induced by vitamin K absence (PIVKA), rotational thromboelastometry (ROTEM®), multiple electrode aggregometry (Multiplate®) and factor II, VII, IX, X, XI, XII and XIII activities.

Results: postoperative thrombocytosis and hyperfibrinogenemia were demonstrated. Mean PT-INR increased from 1.0±0.1 to 1.2±0.2*; mean aPTT increased from 27±3 to 30±4s*. Activity of vit. K-dependent factors did not decrease significantly but FIX and FX activity increased* while FXII and FXIII decreased*. All mean ROTEM-MCFs (maximal clot firmnesses) especially FIBTEM-MCF increased to above their reference intervals*. All mean ROTEM clotting times were within their reference intervals both before and after surgery. There were significant correlations between routine tests and the expected coagulation factors, but not any of the viscoelastic parameters or PIVKA. Multiplate AUC and EXTEM-MCF correlated to Plc* as did EXTEM-MCF to fibrinogen*, FIX*, FX* and FXIII*; and FIBTEM-MCF to Plc*, FII*, FXI* and FXIII*.

Conclusions: The increase in PT-INR may be caused by decreased postoperative FVII while the elevated aPTT may be caused by low FXII. The mild hypocoagulation indicated by routine tests is not consistent with ROTEM, whose relevance in the context of moderately increased postoperative routine tests remains unclear.

Reference: Thomas et al. Perioperative Medicine (2016) 5:28

*P<0.05.

12AP01-5

Does inherited thrombophilia contributes thrombosis in microvascular free flap surgery: a pilot study

Drizlionoka Gorovenko K.¹, Stepanovs J.¹, Ozolina A.², Nikitina-Zake L.³, Mamaja B.¹

¹Riga East University Hospital, Dept of Anaesthesiology, Riga, Latvia, ²Riga Stradins University, Dept of Anaesthesiology & Intensive Care, Riga, Latvia, ³Latvian Biomedical Research and Study Center, Research and Study Center, Riga, Latvia

Background and Goal of Study: The microvascular surgery has been technically improved such as failure rates declined to under 10 percent in most centers, nevertheless mishap due to thrombosis still occurs delaying restitution thus bearing detrimental effect for patient, medical team and expenses. Hereditary thrombophilia is a well known factor possessing increased risk for vascular events however still beyond the scope of the microvascular surgery. The goal of the study is to elucidate whether link between genetic factors and likelihood of thrombosis exists in microvascular free flap surgery.

Materials and Methods: A total of 42 patients who have undergone free flap microvascular surgery were enrolled in the cohort study, we selected nine single nucleotide polymorphisms (SNPs) (rs5361 in SELE, rs2066865 in FGG, rs2227589 in SERPINC1, rs1613662 in GP6, rs13146272 in CYP4V2, rs2289252 in F11, rs1801133 in MTHFR, rs6025 in F5, rs1799963 in F2) reported to be associated with vascular thrombosis.

Results and Discussion: Among all patients (n=42), male (n=37), mean age 38.5 in 9/42 (21.4%) patients free flap failure due to thrombosis occurred. 4/9 (44%) (p<0.001) were heterozygous for polymorphism rs2227589 SERPINC1 with no perioperative thromboprophylaxis, other 9 patients with same gene mutation but with thromboprophylaxis due to co-morbidities showed no sign of thrombosis. 6/9 (67%) (p<0.001) having thrombotic complication revealed heterozygosity for F11 rs2289252 polymorphism with no perioperative thromboprophylaxis, and 17 of those having F11 rs2289252 polymorphism with perioperative thromboprophylaxis had no negative surgical outcome. CYP4V2 gene mutation at rs13146272 were revealed in thrombosis group in 4/9 (44%) (p<0.001) without thromboprophylaxis and 17/42 having the same SNP had no sign of thrombosis with perioperative thromboprophylaxis. We found slight difference in mean age between thrombotic versus non-thrombotic group, 44 and 37 respectively.

Conclusion(s): Gene polymorphisms are found in patients with thrombotic complications indicating potential cause of microvascular free flap thrombosis however likely synergistic with other well known thrombophilia aggravating factors. Further data are mandatory to set clear relationship between gene mutation and thrombotic complications in microvascular free flap surgery.

12AP01-7

Preoperatively detected hypercoagulability as free flap thrombosis risk factor in reconstructive microvascular surgery

Stepanovs J.¹, Ozolina A.², Vanags I.², Nikitina L.³, Mamaja B.²
¹Riga East University Hospital, Dept of Anaesthesiology, Riga, Latvia, ²Riga Stradins University, Dept of Anaesthesiology & Intensive Care, Riga, Latvia, ³Latvian Biomedical Research and Study Center, Latvian Genome Center, Riga, Latvia

Background and Goal of Study: Despite progress in free flap transfer surgery, microvascular thrombosis remains a serious threat. One of the significant thrombogenic problems is hypercoagulability. The aim was to evaluate influence of preoperatively detectable by rotational thromboelastometry (RTE) hypercoagulable state on free flap thrombosis rate.

Materials and Methods: In the prospective observational study we enrolled 76 patients underwent free flap surgery due to traumatic tissue injury in the Latvian Centre of Reconstructive and Microsurgery. Preoperatively external thrombogenic factors and RTE data were registered. Two groups of patients: with or without hypercoagulation detected by fibrinogen/platelet ratio (FPR) ≥ 42 were compared. Association between external thrombogenic factors, hypercoagulability in RTE and surgical outcome was analysed.

Results and Discussion: External thrombogenic factors were identified: recent (<1month) trauma in 27/76 patients (35%), chronic osteomyelitis in 14/76 (18%), thrombogenic comorbidities in 17/76 (22%). Demographical and surgical data were similar in both groups. Hypercoagulability by RTE was found in 21 (30%) patients, confirming by CFT_{EXTM} ($P < 0.001$), MCF_{EXTM} ($P < 0.001$), CFT_{INTEM} ($P < 0.001$), MCF_{INTEM} ($P < 0.001$), MCF_{FIBTEM} ($P < 0.001$). Patients in group with hypercoagulability had significantly lower haemoglobin level (11 vs 13.5; $P < 0.001$), higher fibrinogen level (4.98 vs 3.49; $P < 0.001$), and platelet count (434 vs 274; $P < 0.001$). Recent trauma was found to be significant factor for hypercoagulability: there were significantly more patients with recent trauma in hypercoagulation group 15/21 (71%) vs 12/55 (27%) $P < 0.001$. Chronic osteomyelitis demonstrated hypercoagulation tendency in RTE data without FPR changes. Incidence of free flap thrombosis was higher in RTE hypercoagulability group, 6/21 (28%) vs 7/55 (12%), $P = 0.101$. In recent trauma patients, thrombosis developed only in hypercoagulation group, 4/15 (26.7%) vs no thrombosis in non hypercoagulation group ($P = 0.053$). RTE hypercoagulative data demonstrated a strong trend to predict higher flap thrombosis possibility in patients with recent trauma.

Conclusions: Hypercoagulability detected preoperatively by rotational thromboelastometry can influence postoperative free flap thrombosis rate in recent trauma patients, acquired data allow early identification of patients at higher risk of transferred tissue failure.

12AP01-9

Thrombo-ischemic complications in Hyperglycemic Hypermolar syndrome (HHS)

Soekarman D.¹, Alkasem M.¹, Ganaw A.E.A.², Lance M.D.³, Marcus M.A.E.²

¹Hamad Medical Corporation, Medicine, Doha, Qatar, ²Hamad Medical Corporation, Dept of Anaesthesiology & Intensive Care, Doha, Qatar, ³Maastricht University Medical Center MUMC, Dept of Anaesthesiology, Maastricht, Netherlands

Background and Goal of Study: Patients in a Hyperosmolar Hyperglycemic State (HHS) are often admitted to the intensive care unit for further treatment. An increased blood viscosity creates a hypercoagulable state predisposing to infarcts and tissue ischemia in any organ. However, guidelines for thromboprophylaxis remain under debate for the fear of therapy-related hemorrhagic complications. A literature review was performed to obtain more information on complications of the coagulation system in HHS.

Materials and Methods: The PubMed database was screened as outlined in the PRISMA statement (1) from the year 2000 until November 2nd 2016. Case reports with a glucose value over 30 mmol/L and an osmolality over 320 mmol/L as the two quantitative, main criteria for HHS were searched for.

Results and Discussion: 107 cases met the inclusion criteria for further analysis. In 20 cases a complication of the coagulation system or compromised circulation had been reported. In 15 cases the events were of a thrombo-ischemic nature, while in 4 cases a mix with a hemorrhagic component had been

reported. Two cases with a deep venous thrombosis recovered from the crisis. However, the 3 cases with arterial thrombo-ischemia of the limbs suffered from a rest disability (1 case) or died in hospital or after discharge (2 cases).

Conclusions: Detailed data including sufficient length of follow up are lacking for thrombo-ischemic complications of HHS. Well-designed, prospective studies should deliver proper information to be able to unravel the mechanism of coagulation activation in HHS. This is required to establish optimal treatment algorithms and to design an appropriate prevention program.

Reference:

1. Moher, D., A. Liberati, J. Tetzlaff and D. G. Altman (2009). "Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement." *J Clin Epidemiol* 62(10): 1006-1012.

12AP02-1

Audit on the role of tranexamic acid (TXA) in major obstetric haemorrhage - the unanswered questions that need addressing

Robbins M., Hughes J., Sud A., Parbhoo P., Bhardwaj M.
 Wexham Park Hospital, Dept of Anaesthesiology, Slough, United Kingdom

Background: The MBRRACE report examining maternal mortality stated 16% of direct causes of maternal death were from major obstetric haemorrhage (MOH). Guidelines from the Association of Anaesthetists of Great Britain and Ireland (AAGBI), based on TXA use in trauma cases (CRASH2 trial), suggest giving TXA in all MOH ≥ 1000 ml; however our local policy, like many others, does not yet specify when and how it should be administered.

Methods: Through case note review, anonymised data on management and documentation of MOH $> 2L$ was collated in respect to when, why and how TXA was given.

Although the Obstetric Anaesthetists Association (OAA) state MOH as blood loss $\geq 1.5L$, local policy is $\geq 2L$. 8 months of data was collected as MOH data is locally categorised by year.

As well as TXA dosing and timing, other factors thought to influence clinicians' decisions to administer TXA are included.

Results and Discussion: A retrospective audit of our medium sized (4350 deliveries/yr) maternity unit reviewed 30 out of 31 cases of $\geq 2L$ MOH.

TXA was given in 43% of cases; these demonstrated partial correlation with total blood loss.

83% of cases involved anaesthetic support. 68% of anaesthetic charts recorded total blood loss but none recorded incremental losses. The causes of MOH was solely uterine atony in only 30% of cases; the remaining cases related to tissue, trauma or a combination of factors.

	Total	Activation of MOH protocol	Average blood loss (median + IQR)	TXA given	TXA given <30 mins	Requiring blood products
No. of cases	30	9	2.2L (2.1-3.0L)	13	10	10

[Summary Table]

Without local policy in place this audit demonstrated only limited use of TXA with inconsistency in dosing and timing. This is understandable; prior to the CRASH trial all guidelines listed TXA as a medication of last resort.

The WOMEN trial is due to complete and will hopefully answer many of our questions; including dose and timing of TXA, its pre-emptive role and advanced use in differential (tone/trauma/tissue) classes of MOH; however, in the mean time, updating and circulating our policy should promote earlier administration. Encouraging documentation of cumulative/incremental blood loss will encourage vigilance and enforcing activation of the controlled/critical MOH protocol could persuade doctors to be more proactive, rather than reactive.

Conclusions: We keenly await the results of the WOMEN trial; however, until such time, we will encourage a culture of thorough documentation and early, proactive medical management/optimisation in line with AAGBI recommendations.

12AP02-2

Anaesthetic approach to epidural hematoma, after minor head trauma in an infant with previously unknown fibrinogen deficiency

Spartinou A., Chaniotaki F, Christofaki M., Arkalaki E., Astyrakaki E., Papaioannou A.
 General University Hospital of Heraklion, Dept of Anaesthesiology, Heraklion, Greece

Background: Congenital fibrinogen deficiencies are inherited autosomal disorders with unknown prevalence². Only few cases of CNS bleeding in pediatric patients with fibrinogen deficiency are reported.

Case report: A previously healthy 10months old infant (11.7 kg) was admitted to the emergency department after minor head trauma followed by vomiting episodes. The infant became lethargic, brain CT revealed an epidural hematoma, and it was transferred to the operating theatre for emergency craniotomy haemodynamically stable and responsive only to painful stimuli. General anaesthesia with invasive monitoring was used. Preoperative Hb was 7.8g/dl and coagulation tests were normal. Major blood loss (>250ml) was recorded and the infant was resuscitated with crystalloids, 240ml of RBCs, 120ml of FFP and vasopressors. At the end of surgery another 50ml of blood was removed by the drainage resulting in hypotension, which was treated with bolus of adrenaline and crystalloids. The infant was transferred to the PICU, where the mother reported family history of fibrinogen deficiency. Fibrinogen level at that time was 13mg/dl and INR 2.36, APTT>120 sec. Fibrinogen replacement therapy was promptly initiated successfully, as secondary prophylaxis. Further hospital stay was uncomplicated and the child was referred to haematologist.

Discussion: Fibrinogen has a key role to haemostasis. Normal plasma fibrinogen level is 200-450 mg/dl². Congenital fibrinogen deficiencies can be either quantitative (afibrinogenemia/ hypofibrinogenemia) or qualitative (dysfibrinogenemia)¹. In case of spontaneous bleeding or surgery, target fibrinogen level is >100 mg/dl until haemostasis is secure and >50 mg/dl until wound healing. Fibrinogen Dose(g)=Desired increment(g/L) x Plasma volume². Cryoprecipitate and FFPs are alternative replacement therapies, in lack of Fibrinogen Concentrate¹.

References:

1. Peyvandi F Epidemiology and treatment of congenital fibrinogen deficiency *Thromb Res* 2012 Dec;130 Suppl 2:S7-11
2. P. H. B. Bolton-Maggs et al The rare coagulation disorders - review with guidelines for management from the United Kingdom Haemophilia Centre Doctors' Organisation *Haemophilia* 2004;10:593-628

Learning points: Fibrinogen deficiencies have a great spectrum of clinical appearance. Few data are available to guide clinicians. Even though afibrinogenemia is usually diagnosed in the neonatal period, other fibrinogen deficiencies might be diagnosed after injury or emergency surgery.

12AP02-3

Effective tranexamic acid concentration for 95% inhibition of tissue-type plasminogen activator-induced fibrinolysis in full-term pregnant women

Lechien A.¹, Faraoni D.², El Kenz H.³, Van der Linden P.¹

¹Université Libre de Bruxelles - Brugmann University Hospital, Dept of Anaesthesiology, Bruxelles, Belgium, ²University of Toronto - The Hospital for Sick Children, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada, ³Université Libre de Bruxelles - Brugmann University Hospital, Dept of Blood Transfusion, Bruxelles, Belgium

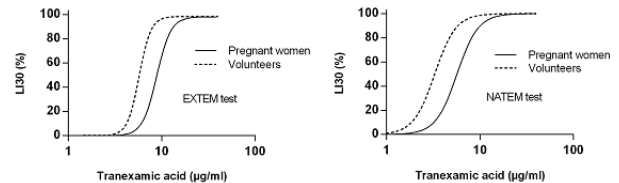
Background and Goal of Study: Postpartum hemorrhage (PPH) is the leading cause of maternal mortality and morbidity worldwide. Tranexamic acid (TXA) has been shown to reduce blood loss and blood products transfusion requirements (1). Despite clinical evidence, further studies are needed to better define the pharmacokinetic and pharmacodynamic characteristics of TXA in pregnant women. The first objective of our prospective ex-vivo study was to define the minimum TXA concentration required to inhibit fibrinolysis in full-term pregnant women. The second was to compare these results to those obtained in healthy non-pregnant volunteers.

Materials and Methods: After IEC approval, maximal fibrinolysis was induced by adding supraphysiologic concentration of tissue-type plasminogen

activator (t-PA) to blood samples obtained from 30 full-term pregnant women and 10 volunteers who gave written informed consent. Increasing TXA concentrations (0 to 40 µg/ml) were then spiked into the blood samples and inhibition of fibrinolysis was assessed using the LI30 of the ROTEM measured on EXTEM and NATEM tests.

Effective TXA concentrations required to achieve 95% inhibition of fibrinolysis (EC95) were extrapolated using nonlinear regression. EC95 were compared between groups using the Fisher test.

Results and Discussion: EC95 in pregnant women was 14.7 µg/ml (CI 95%: 12.4-17.5 µg/ml) on EXTEM and 11.2 µg/ml (CI 95%: 8.3-15.1 µg/ml) on NATEM tests. These values were significantly higher than those obtained in volunteers (8.7 µg/ml (CI 95%: 5.5-13.9 µg/ml) and 6.8 µg/ml (CI 95%: 5.3-8.8 µg/ml) respectively; both p<0.001 (fig 1)).



[Figure 1. Nonlinear regression for EXTEM test (left) and NATEM test (right): TXA concentration after logarithmic transformation]

Conclusions: Despite a decreased fibrinolytic activity associated with a prothrombotic state in the 3rd trimester of pregnancy (2), our results suggest a higher fibrinolytic potential in pregnant compared to non-pregnant women. Further studies are required to define the optimal TXA dose in PPH. A first step might be to determine if the TXA dose used actually is able to fully inhibit t-PA-induced fibrinolysis in our ex-vivo model.

References:

1. Novikova N, et al. *Cochrane Database Syst Rev*. 2015 CD007872
2. Hellgren M. *Semin Thromb Hemost*. 2003 29(2):125-30

12AP02-4

Tranexamic acid and postoperative cell-trans autotransfusion system in patients underwent total Knee replacement - analysis of one year

Lima M., Noversa C., Moura A., Gonçalves J.
 Centro Hospitalar e Universitario de Coimbra, Dept of Anaesthesiology & Pain Medicine, Coimbra, Portugal

Background and Goal of Study: Tranexamic acid (TA) and postoperative cell-trans autotransfusion system (CTS) are blood-saving strategies widely used in total knee arthroplasty (TKA). (1)

This study aims to analyse the impact of these two strategies in reducing the haemoglobin (Hb) drop in patients underwent TKA.

Materials and Methods: An observational retrospective study was carried out by analysing the clinical data of all patients who underwent TKA in our hospital during the year 2015.

Demographic, transfusion and complication data were collected. In our analysis patients were divided in four groups:

1. received CTS;
2. TA IV was administered before turning up the tourniquet and after lowering it;
3. received both the techniques;
4. none of the techniques were used. We compared the haemoglobin (Hb) drop in the four groups by analysing the Hb values before and 24h after surgery.

Statistical analysis was performed using SPSSv20.0. The tests used for parametric variables were t student and ANOVA.

Results and Discussion: Overall, 103 patients were included, 34 males (33%) and 69 females (67%) with an average age of 70,4±6,4 years. Mean Hb drop (g/dL) in each group is expressed on table 1.

Group	Mean Hb drop (g/dL)
Group 1 - CTS (n= 31)	2,15±0,85
Group 2 - TA (n=51)	2,15±0,77
Group 3 - CTS+TA (n=7)	2,23±0,59
Group 4 - No CTS and no TA (n=14)	2,96 ±1,09

[Mean Hb drop by Group]

There was a statistically significant difference ($p=0,014$) in Hb drop between patients who received TA (group 2) or CTS (group 1) and those who did not (group 4).

When compared to patients who received CTS (group 1) or TA (group 2), patients who received both techniques (group 3) showed no significant difference in Hb drop.

There was no statistically significant difference ($p = 0.992$) in Hb drop between using CTS (group 1) versus using TA (group 2).

Our series showed an overall complications rate of 17,5% and no thromboembolic events.

Conclusion(s): Despite the fact that these techniques lowered the Hb drop, we did not find any statistically significant difference between them. There was no evidence of thrombotic complications with TA during hospitalization.

References: 1. Balaji S, Sahil B, Rajat G, et al. *Journ of Clin Orthop and Trauma* 4 (2013): 164 - 170.

12AP02-5

Dose-response relationship of tranexamic acid in pediatric scoliosis surgery

Goobie S.¹, Hresko T.², Sethna N.¹, Mccann M.E.¹, Brustowicz R.¹, Pereira L.¹

¹Childrens Hospital Boston, Dept of Anaesthesiology, Boston, United States, ²Childrens Hospital Boston, Dept of Surgery, Boston, United States

Background and Goal of Study: Tranexamic acid (TXA) reduces blood loss in various settings, from traumatic to surgical. However, no dose-response relationship has been identified to support an evidence-based dosing rationale. This study was conducted to fill that knowledge gap. The aim of this prospective, randomized, double-blinded, placebo-controlled trial was to determine the pharmacokinetics of TXA in pediatric idiopathic scoliosis surgery and thereby to build a pharmacokinetic / pharmacodynamics (PK/PD) model to identify, in vivo, for the first time, a therapeutic TXA target concentration. A dose response relationship was developed and an evidence-based dosing regimen recommendation reported.

Methods: With hospital institutional review board approval, 80 children ages 10 to 21 years with idiopathic scoliosis were randomized to receive either placebo or intravenous TXA; 50 mg.kg⁻¹ loading dose and 10 mg.kg⁻¹h⁻¹ maintenance until the end of surgery. TXA plasma concentrations were measured by ultra-high performance liquid chromatography with mass spectrometry detection, concomitantly with hourly estimated blood loss (EBL). The relative difference over time (deltaEBL) was modeled as the PD variable and compared between placebo and TXA treated patients. A PK/PD modeling framework was developed to identify an in-vivo TXA dose-response relationship.

Results and Discussion: Intraoperative cumulative EBL was lower by 27% in the TXA group compared to the placebo group. The TXA group had an average 213 mL/h bleeding rate, compared to 321mL/h for the placebo group. A PK model was fitted to the deltaEBL data with an EC50 determined to be 73ug/mL. PK simulations were conducted with the final population PK/PD model to explore dosing regimens aiming at this concentration target.

Conclusions: TXA is effective in reducing perioperative blood loss by an average of 27% or 100mL/h in pediatric idiopathic scoliosis surgery. This is the first report to determine the in-vivo TXA therapeutic plasma steady-state concentration being 73 ug/mL, which was shown to elicit 50-90% of the maximum effect. An intravenous dosing regimen of 30 mg/kg loading dose and 10 mg/kg/h maintenance infusion can be recommended to achieve a therapeutic target of 70 ± 5 ug/mL required for maximum efficacy in pediatric scoliosis surgery.

Reference: *Anesth.* 2011;114(4):862-71. *Clin Pharmacokin.* 2013;52(4):267-76.

Acknowledgements: Supported, in part, by a Scoliosis Research Society Grant.

12AP02-6

Fujisan classification predicts fibrinogen concentration after allogeneic blood transfusion but not after hemodilutional autologous blood transfusion in cardiac surgery with cardiopulmonary bypass

Sakamoto H., Harasawa K.

Hokkaido Ohno Memorial Hospital, Dept of Anaesthesiology, Sapporo, Japan

Background and Goal of Study: We calculated estimated fibrinogen concentration based on the formula in Fuji-san classification and compared measured on-site fibrinogen concentration by CG02N (A & T corporation, Yokohama, Japan) to optimize fibrinogen replacement therapy.

Materials and Methods: After obtaining IRB approval and informed consent, 242 patients undergoing scheduled cardiac surgery with cardiopulmonary bypass (CPB) were enrolled in this study. Among them, recent 13 patients received surgery with hemodilutional autologous blood transfusion (HAT group). In other 229 patients, hemodilutional autologous blood transfusion was not performed (Control group). In HAT group, the amount of blood to be removed was calculated with the following formula: $80 \times \text{body weight (kg)} \times (1-27/\text{Hct} (\%))$ with the utmost 800ml.

On site fibrinogen concentration (FIB) was measured with CG02N (A&T corporation, Yokohama, Japan) at the arrival in OR and conclusion of surgery and blood loss during surgery were recorded. Fibrinogen concentration was calculated with the following formula: $187.5 \times (1 - \exp(-(16000 \times \text{FFP})/(70 \times \text{BW} \times (100-\text{Hct})))) + \text{FIB} \times \exp(-(160 \times \text{FFP})/(70 \times \text{BW}))$.

In this formula, FFP is fresh frozen plasma (units) transfused after heparin reversal, BW is patient's body weight (kg) and FIB is fibrinogen concentration (mg/dl) at heparin reversal. Data were compared using paired and unpaired t-test. A p-value <0.05 was considered statistically significant.

Results and Discussion: In Control group, measured FIB and estimated FIB showed no significant difference at the conclusion of surgery. In HAT group, estimated FIB showed significant difference at the conclusion of surgery. The calculated FIB is a good predictor of future FIB after FFP transfusion in Control group. According to result from HAT group, the hemostatic effect of normovolemic hemodilution and fresh autologous blood should be different from that of allogeneic FFP.

Conclusion: FIB estimation formula from Fuji-san classification gives good estimation of FIB in allogeneic blood transfusion case but not in hemodilutional autologous blood transfusion cases.

References: Kawashima S, et al. Four-Group Classification Based on Fibrinogen Level and Fibrin polymerization Associated with Postoperative Bleeding in Cardiac Surgery. *Clin Appl Thromb Hemost.* 2016; 22(7): 648-55

12AP02-7

Efficacy of human fibrinogen concentrate for on-demand treatment of acute bleeding and to prevent bleeding during and after surgery in subjects with congenital fibrinogen deficiency

Schwartz B.A.¹, Ross C.², Madan B.³, Lissitchkov T.J.⁴, Karimi M.⁵, Peyvandi F.⁶

¹Octapharma, Clinical Research, Hoboken, United States,

²St. John's Medical College & Hospital, St. John's Medical College

& Hospital, Bangalore, India, ³Guy's & St Thomas' NHS Foundation

Trust, Centre for Haemostasis & Thrombosis, London, United

Kingdom, ⁴SHAT, Joan Pavel', Department of Clinical Hematology

for Hemorrhagic Diatheses and Anaemia, Sofia, Bulgaria, ⁵Shiraz

University of Medical Sciences, Hematology Research Center,

Shiraz, Iran, Islamic Republic of, ⁶Università degli Studi di Milan,

Department of Pathophysiology and Transplantation, Milan, Italy

Background and Goal of Study: Patients with congenital afibrinogenemia and hypofibrinogenemia frequently experience severe bleeding episodes after minor trauma or surgical intervention, starting at birth or early childhood. Therapeutic substitution with human fibrinogen concentrate (HFC) corrects the haemostatic defect and arrests bleeding in these patients. Here, we investigate the safety and efficacy of Octafibrin (Octapharma OPG, Vienna, Austria), a new plasma-derived, highly purified, lyophilized fibrinogen concen-

trate with two dedicated virus inactivation/removal steps, in the on-demand treatment of bleeding (BE) and surgical prophylaxis.

Materials and Methods: This was a prospective, open-label, multinational study in adult and adolescent a- or hypofibrinogenemic patients. This planned interim analysis comprised data from 11 adult and 2 adolescent patients. Efficacy was assessed using a 4-point objective scale by the investigator and adjudicated by an independent data monitoring and endpoint adjudication committee (IDMEAC).

Results and Discussion: Eleven of the 13 patients experienced a total of 23 minor BEs. Sixteen BEs (69.6%) were spontaneous and 7 (30.4%) traumatic. The majority of BEs (21/23) required 1 HFC infusion (91.3%) and 2 (8.7%) required 2 infusions. The median (range) dose of HFC administered for all BEs was 57.5 mg/kg (33.9-71.4 mg/kg) per infusion and 58.8 mg/kg (33.9-101.7 mg/kg) per BE.

The success rate (efficacy rating excellent or good) for all BEs was 100% (90% CI: 0.88, 1.00).

Maximum clot firmness (MCF) using thromboelastometry (ROTEM®) performed in plasma was also determined for the first infusion administered for the treatment of all 23 BEs. The mean (±SD) change in MCF from baseline (MCF 0) to 1 h after the first infusion of HFC was 6.5 mm (±2.0) (95% CI: 5.65, 7.40; $p < 0.0001$).

Four patients underwent 4 surgeries (3 major 1 minor). The postoperative success rate (haemostatic efficacy excellent or good) was 100% (90% CI 0.5, 1.0).

There have been no reports of serious adverse events related to infusion of the HFC.

Conclusions: This study showed 100% haemostatic efficacy in on-demand treatment with HFC in bleeding patients with congenital fibrinogen deficiency. Haemostatic efficacy in surgical prophylaxis was rated excellent/good in 100% of surgeries. MCF increased significantly post-infusion in all patients after HFC administration, reflecting the successful treatment of bleeding events. There were no safety concerns relating to HFC.

12AP02-8

Influence of heparin on the fibrinogen level measured by the prothrombin time-derived method

Ichikawa J., Okamura K., Kodaka M., Nishiyama K., Komori M. Tokyo Women's Medical University Medical Center East, Dept of Anaesthesiology, Tokyo, Japan

Background: With the prothrombin time (PT)-derived method fibrinogen levels are estimated by increase of absorbance during a clotting process triggered by tissue thromboplastin. If the PT is prolonged, however, the precision of this assay is inadequate. We therefore evaluated the effect of heparin on the plasma fibrinogen level using the PT-derived method during cardiac surgery.

Methods: This study was a post-hoc analysis of a previous prospective observational study. A total of 78 patients scheduled for elective cardiac surgery were enrolled. Blood samples were obtained after anesthesia induction (baseline) and after initiation of the cardiopulmonary bypass (CPB). The fibrinogen concentration was determined by the PT-derived method using a human recombinant thromboplastin and photo-optical coagulation analyzer on the ACL TOP

Results and Discussion: After CPB initiation, nine (17.6%) patients had fibrinogen levels $< 40 \text{ mg dL}^{-1}$ from $337.1 \pm 120.1 \text{ mg dL}^{-1}$ at average heparin concentrations of $3.58 \pm 0.52 \text{ U/mL}$. At heparin concentrations of 3 and 4 U/mL, the fibrinogen concentrations were significantly lower than those at heparin concentrations of 2 and 3 U/ml (Table1). The heparin concentration after initiation of CPB was correlated with the heparin-induced prolonged PT ($r=0.49$, $P=0.0001$). There was an inverse relationship between the PT values and the fibrinogen concentration ($r=-0.36$, $P=0.001$). This means that PT values influence the results of the PT-derived method, leading to a systematic underestimation of the absorbance changes. Higher thrombin concentrations produce a dense network of relatively thin fibrin strands, related to a non-turbid fibrin gel. Increasing heparin concentrations delayed the onset of thrombin formation, which might result in a late endpoint of clot formation. A plateau is not yet reached in the clotting curve when the reading is stopped at the time defined in assay protocol.

	Heparin 1 U/ml	Heparin 2 U/ml	Heparin 3 U/ml	Heparin 4 U/ml
Baseline				
Fibrinogen(mg/dl)	415.4 ± 106.6	356.6 ± 127.0	374.1 ± 88.0	358.9 ± 104.2
APTT (s)	36.3 ± 6.0	33.1 ± 4.3	32.7 ± 7.5	32.0 ± 4.4
PT (s)	12.6 ± 0.87	12.5 ± 1.9	12.3 ± 1.02	12.2 ± 1.0
Hb (g/dL)	10.6 ± 2.1	12.1 ± 1.7	11.8 ± 1.5	12.9 ± 2.4
Total heparin (U/kg)	182.7 ± 65.8	206.3 ± 41.0	260.2 ± 68.3	278.9 ± 68.6
F1±2 (pmol/L)	192 (1111)	265.5 (1057)	324.0 (1197.6)	264 (1008)
TAT (ng/mL)	4.9 (49.8)	5.3 (58.4)	6.2 (11.3)	10.2 (30.8)
After initiation of CPB				
Heparin concentration (U/ml)	1.54 ± 0.29	2.53 ± 0.27	3.35 ± 0.29	4.38 ± 0.24
Mean ACT (s)	401.8 ± 65.8	398.3 ± 88.5	447.0 ± 96.0	411.5 ± 70.1
Fibrinogen (mg/dl)	260.1 ± 77.5	224.5 ± 108.1	159.0 ± 109.1	89.3 ± 86.7
Fibrinogen decrease (%)	37.8 ± 7.8	38.3 ± 5.4	59.2 ± 20.9	61.9 ± 25.5
Fibrinogen < 40 mg/dl (n,%)	0	0	6 (20.7%)	3 (33.3%)
APTT (s)	> 300	> 300	> 300	> 300
PT (s)	23.2 ± 8.6	42.2±27.6	101.9±42.7	148.9±36.2
PT>170 (s)	2 (16.7%)	6(21.4)	11(37.9%)	7(77.8%)
PT increase (%)	40.9 ± 13.3	58.9±23.7	88.6±6.1	92.4±2.1
Hb (g/dL)	7.2 ± 0.9	8.5±1.1	8.0±1.4	9.1±0.9
Hb decrease (%)	32.9 ± 10.6	30.3±9.6	35.6±4.0	32.1±3.9
F1± 2 (pmol/L)	465 (983)	681.5 (969)	579.0 (971.0)	570 (292)
TAT (ng/mL)	13.2 (52.2)	16.2 (56.1)	12.9 (54.5)	14.4 (22.5)

Data in the table are mean ± standard deviation, n (%) or median (range).

APTT, activated partial thromboplastin time; PT, prothrombin time; Hb, hemoglobin; F1± 2, prothrombin fragment 1,2; TAT, thrombin antithrombin complex; ACT, activated clotting time

[Table 1. Effect of heparin concentration on coagulation parameters]

Conclusions: This study showed that thrombin formation at the initiation of CPB and prolonged lag time of clotting depending on heparin concentration may lead to an underestimation of the fibrinogen level by the PT-derived method accompanied by increased PT.

12AP02-9

The effectiveness of two different administration modalities of tranexamic acid (TXA) in the control of postoperative bleeding after performing hip arthroscopy

Espinosa W., Seijas R., Rivera E., Nevado M.

Hospital Quiron Barcelona, Dept Orthopedic and Traumatology, Barcelona, Spain

Purpose: To assess the effectiveness of two different administration modalities of tranexamic acid (TXA) in the control of postoperative bleeding after performing hip arthroscopy.

Methods: A prospective study was performed on 105 patients who underwent hip arthroscopy. The patients in the TXA bolus group received TXA as a 10mg/kg bolus 30 min before surgery. The TXA infusion group received TXA as a 10mg/kg and an intravenous infusion at 2mg/kg/h was continued for the duration of the surgery. Hemoglobin and hematocrit measures were evaluated before surgery and 24 hours after surgery. Statistically significant results were considered at a $p < 0.05$, with a 95% confidence interval.

Results: Mean hematocrit decrease 24 h postoperatively was lower in patients in the TXA infusion group ($-4.05 \pm 3.77\%$) relative to the control group ($-6.30 \pm 2.63\%$) with a statistically significant decrease ($p=0.001$). The mean decrease in Hct TXA bolus group ($-5.08 \pm 2.45\%$) was not significant compared to the control group. Changes in Hb values at 24 hours were lower in the TXA infusion group of ($-1.18 \pm 0.99 \text{ g/dL}$) compared with the control group ($-2.16 \pm 0.96 \text{ g/dL}$) once again with a statistically significant difference ($p=0.001$). Changes in Hb bolus group ($-1.84 \pm 0.78 \text{ g/dL}$) were not significant compared to the control group.

Conclusions: This prospective clinical study showed that TXA infusion combined with an initial bolus reduces hemoglobin and hematocrit loss more than TXA bolus relative to a control group in patients undergoing hip arthroscopy.

12AP02-10**Preoperative fibrinogen: a predictor for intraoperative blood transfusion during liver transplantation?**

Betolaza Weimer L., De la Hoz Polo I., Gómez Pérez N., Pereira Torres L., Gajate Martin L.

Hospital Universitario Ramón y Cajal, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Fibrinogen is a protein with a key role in the coagulation cascade, and thus a potential biomarker for bleeding. However, its use to predict the risk of bleeding during liver transplantation (LT) is still controversial.

We investigated the relationship between preoperative fibrinogen levels (FB) and the need of blood transfusion during orthotopic LT.

Study Design and Method: A total of 266 patients undergoing orthotopic LT between January 2006 and December 2015 were included in a retrospective study.

We analyzed the differences in red blood cells (RBC) transfusion requirements between two groups

(FB < 200 mg/dl vs FB ≥ 200 mg/dl). The primary end point was the percentage of patients who received at least one RBC transfusion during surgery. We made a raw analysis of the difference between both groups using ji square test. We compared both cohorts looking for unbalanced variables. Once we identified all those possible confounding variables, we carried out a binary logistic regression analysis to assess the real relationship between preoperative FB and RBC requirements. Statistical significance was considered for p < 0.05 and two-tailed test. Continuous variables are described with means and standard deviations and categorical variables with percentages and absolute values.

Results: Our database included a total of 266 patients (200 men, 66 women), the final analysis was performed with 251 patients because of missing data. In the raw analysis the difference between both groups was statistically significant regarding the primary end point. In the cohort of patients with low FB, 86.7% received at least one RBC and in the other group 67.1% (OR 3.2; CI 1.7-6.1; p < 0.001). In the univariate analysis, there were some disbalanced variables between groups. So, we conducted a multivariate analysis adjusting by those confounding factors (gender, preoperative urea level, preoperative INR and length of surgery). In the logistic regression analysis, preoperative FB < 200 mg/dl was not a significant predictor for RBC transfusion during LT (OR 1.09; CI 0.49-2.62; p = 0.84).

Anyway, RBC transfusion was higher in the group with low levels (6.5 ± 7.8 vs 5.2 ± 6.1; p = 0.16).

Conclusions: Our data suggests that low preoperative FB (once adjusted by sex, preoperative urea, INR and length of surgery), does not predict the need for RBC transfusion during LT. More studies are needed to assess the real paper of fibrinogen in LT.

12AP03-1**Impact of intraoperative administration of blood transfusion during radical cystectomy and urinary diversion for bladder cancer on cancer related outcomes and overall mortality: a retrospective analysis**

Furrer M.A.¹, Fellmann A.², Löffel L.², Thalmann G.¹, Burkhard F.C.¹, Wuethrich P.²

¹University Hospital Bern, Dept of Urology, Bern, Switzerland,

²University Hospital Bern, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland

Background and Goal of Study: The relationship between perioperative blood transfusion and cancer related outcome and mortality is unclear in oncological surgery. The objective of this study was to assess if, intraoperative allogenic blood transfusions affect disease progression and survival after radical cystectomy for bladder cancer.

Materials and Methods: We conducted a retrospective analysis of a consecutive series of 887 bladder patients with transitional cell cancer of the bladder, between 2000 and 2015 in a single tertiary high case load centre. Disease recurrence-free, cancer-specific, and overall survival were estimated using the Kaplan-Meier technique and Log rank test. Multivariate Cox regression model, including known confounders to influence survival, addressed the association of blood transfusion with cancer related outcome and survival.

Results and Discussion: Mean follow-up was 58 months [95% CI 55-61]. A total of 240/887 patients (27%) received intraoperative blood transfusions. These patients were older (median 72 years [range 42-92]) vs 67 [32-92]; p < 0.001), more female (78/240 (33%) vs 151/647 (23%); p = 0.01), more comorbid (ASA score 3-4 144/240 (60%) vs 234/647 (44%); p < 0.001), had more advanced tumor stages (pT3-4 129/240 (54%) vs 251/647 (39%); p < 0.001) and a lower median preoperative haemoglobin value (120 g/L [59-169] vs 136 [64-180]; p < 0.001) and intraoperative blood loss was increased (median 1500mL [200-6500] vs 1000mL [200-3000]; p < 0.001).

Patients treated with intraoperative blood transfusion had poorer cancer related outcomes (mean estimated disease recurrence time: 104 months [95% CI 91-116] vs 128 [121-135], HR 1.49 [1.21-2.03], log rank p < 0.001; mean estimated cancer specific survival 110 months [98-123] vs 145 [138-152]; HR 1.94 [1.62-2.89], p < 0.001, and overall survival (69 months [60-79] vs 118 months [111-125], HR 2.13 [1.97-3.09], p < 0.001. Intraoperative blood transfusion remains a negative predictor in the multivariate Cox regression models for cancer specific survival (HR 1.43 [95%CI 1.00-2.01], p = 0.047), and overall survival (HR 1.50 [1.15-1.96]; p = 0.003) but not for time to disease recurrence (HR 1.16 [0.84-1.60]; p = 0.37).

Conclusions: The intraoperative administration of blood transfusion resulted in significant poorer cancer specific and overall survivals in these cystectomy patients. Relevant preoperative factors for receiving blood transfusion were advanced disease, chemotherapy, age, gender and ASA score ≥ 3.

12AP03-2**Hemodilutional autologous blood transfusion reduces postoperative 12h chest tube drainage**

Sakamoto H., Harasawa K.

Hokkaido Ohno Memorial Hospital, Dept of Anaesthesiology, Sapporo, Japan

Background and Goal of Study: Blood transfusion in cardiac surgery with cardiopulmonary bypass (CPB) can correct anemia and coagulation abnormality. Hemodilutional autologous blood transfusion seems to have more advantages than allogeneic blood transfusion. We started hemodilutional autologous transfusion since April 2016. We compared hemodilutional autologous blood transfusion with allogeneic blood transfusion.

Materials and Methods: After obtaining IRB approval and informed consent, 173 patients undergoing scheduled cardiac surgery with CPB were enrolled in this study. They were consecutive 11 patients who received surgery with hemodilutional autologous blood transfusion (HAT group) and 162 patients whose surgery matches those patients (Control group). Anesthesia was induced and maintained with propofol, remifentanyl, fentanyl and rocuronium. Blood salvage system was used in all cases. In HAT group, blood was collected after anesthesia induction and before skin incision from femoral venous line. The amount of blood to be removed was calculated with the following formula: 80 X body weight (kg) X (1-27/Hct (%)) with the utmost 800ml. Removed blood was replaced with colloid solution. On site APTT, PT-INR and fibrinogen concentration (FIB) was measured with CG02N (A&T corporation, Yokohama, Japan). Those at the arrival in OR, heparin reversal and conclusion of surgery and blood loss during surgery, the amount of allogeneic blood transfusion and postoperative 12h chest tube drainage were recorded. Data were compared using unpaired t-test. A p-value < 0.05 was considered statistically significant.

Results and Discussion: Patients' demographic data and preoperative APTT, PT-INR and FIB showed no significant difference. At the heparin reversal, APTT, PT-INR and FIB in HAT group were significantly lower but at the conclusion of surgery, they were not. The amount of blood loss and allogeneic blood transfusion during surgery showed no significant difference. 12h chest tube drainage in HAT group were significantly smaller than Control group. In HAT group, hemodilution may result in lower APTT, PT-INR and FIB at the reversal of heparin. Autologous and allogeneic blood transfusion corrected them at the conclusion of surgery. And autologous blood transfusion reduce postoperative 12h chest tube drainage.

Conclusion: Hemodilutional autologous blood transfusion reduced postoperative 12h chest tube drainage in cardiac surgery with CPB.

12AP03-3**Audit of undertransfusion in the oldest old: retrospective analysis of prospectively recruited patients undergoing elective surgery**

Pelavski Atlas A., De Miguel M., Alcaraz García-Tejedor G., Villarino Villa L., Señas García L., Lacasta A.
Vall d'Hebron University Hospital, Dept of Anaesthesiology, Barcelona, Spain

Background and Goal of Study: Recent research has questioned restrictive transfusion policies in high risk patients. The 4th age is a particularly vulnerable and understudied population. We hypothesized that they are also undertransfused, and performed this audit to assess undertransfusion (UT) and its mid-term effects.

Materials and Methods: Retrospective analysis of prospectively recruited patients aged 85+, undergoing elective surgery between 2011-5 (day-cases excluded).

Our primary endpoint was 6 month-mortality (6MM). Apart from demographic data, we recorded comorbidities, complexity of the procedure, & complications. We also considered Hemoglobin levels (Hb), trigger, pre- and postoperative, and transfusion index (TI, number of units per patient, U/p). We defined UT as preoperative or trigger Hb <9 g/dl, i.e. whenever patients underwent the stress of surgery with those Hb levels or lower.

We performed bi-variate analyses using Student's T for continuous variables, and X² or Fischer's test for discrete ones.

Results and Discussion: 131 patients recruited with a median age of 87 (85-96). 43 of them (32.8%) received a transfusion (TI 1.3 U/p). UT (32 patients, 24.4%) was associated with increased 6MM (p<0.01), and in-hospital morbidity (p<0.01). ASA and most comorbidities were evenly distributed between undertransfused patients and the rest of the cohort; however, hypertension (HT), anemia (OMS criteria) and high complexity surgery were more frequent in the UT (p 0.04, p 0.02 & p<0.01 respectively). We adjusted for those variables and found that among patients with HT, anemia and those undergoing invasive procedures, 6MM was still significantly higher in the UT group (p 0.01, p 0.01 & p<0.01). Regarding complications, ischemic cardiopathy (p 0.01), atrial fibrillation (p 0.03), acute kidney injury (p<0.01) and various abdominal complications (p 0.01) were more frequent among undertransfused patients.

Unlike the very few previous studies on the issue, we found -with our definition- a high rate of UT in this group. In such a vulnerable population liberal policies should be the norm, because given the low reserves of these patients, the effects of anemia are particularly serious.

Limitations: A larger sample would have enabled further stratification. A younger control would have allowed us to determine the specific effect of age in our outcomes.

Conclusion(s): Undertransfusion is common practice among the eldest old, and is associated with poor outcomes.

12AP03-4**Is Cell Saver an effective and safe blood saving measure in reconstructive oral and maxillo-facial surgery?**

Dobrodeev A.
Central Research Institute of Dental and Maxillofacial Surgery, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation

Background and Goal of Study: Despite of severe blood loss in reconstruction of middle and lower face areas, the cell salvage is still not recommended due to bacterial contamination of reinfused blood and risk of septic complications. When using microvascular free fibula flaps for face reconstruction the patient has two different operating fields. No data has emerged yet in literature on the blood reinfusion from donor extremity.

Materials and Methods: We investigated two similar groups of patients, who have suffered from jaw reconstruction with microvascular free fibula flaps. In group 1 (n=17) we reinfused autologous blood, collected from lower extremity during flap harvesting. In group 2 (n=20) we used controlled hypotension and routine transfusion protocols. In both groups we detected Hb, Hct and Hct after operation, intraoperatively after fibula flap have been harvested and in 2 hours after operation, when autologous red blood cell concentrate have already been reinfused. We also defined the need of the donor red blood cell transfusion in both groups.

Results and Discussion: The average volume of reinfused red cell concentrate reached 275,7±84,4 ml. Average Hb level before operation was 135,5±17,2 g/l, Hct 43,3±3,3% in group 1; in group 2 Hb was 138,7±13,1 g/l, Hct 40,1±2,5%. Intraoperatively Hb decreased to 89,2±2,3 g/l and 87,7±1,5g/l respectively; Hct got down to 24,3±2,1% in group 1 and to 23,0±2,4% in group 2 respectively. After the operation in group 1 Hb increased to 101,7±2,9 g/l and Hct was 29,3±1,6%; but in group 2 these figures continued declining to 73,7±8,8 g/l and 19,6±1,3%. In group 1 no patient needed red blood cell transfusion. On the contrary all patients from group 2 were in need of red cell transfusion.

Conclusion(s): Cell salvage from donor area during facial reconstructive operations with microvascular free fibula flaps turned to be particularly effective and safe method of blood saving. Autologous red blood cells reinfusion made it possible to avoid donor erythrocyte transfusion.

12AP03-5**Bleeding risk management in a patient with familial Macrothrombocytopenia associated with decreased receptor GpIIb/IIIa**

Tavares F, Pereira C., Marinheiro L., Domingues S.
Centro Hospitalar Tâmega e Sousa, Dept of Anaesthesiology, Penafiel, Portugal

Background: Inherited platelet disorders are rare and their perioperative management may be very demanding. We report a case of a patient with a syndrome recently described - Familial Macrothrombocytopenia Associated with Decreased Receptor GpIIb/IIIa¹.

Case report: A 22-year-old female with Familial Macrothrombocytopenia Associated with Decreased Receptor GpIIb/IIIa was scheduled for surgical removal of a pilonidal cyst. The patient presented a past history of frequent episodes of epistaxis, abundant menorrhagia, prolonged bleeding time with direct trauma and easy bruising. Preoperative studies revealed isolated thrombocytopenia (92,000 platelets/microL) and a mean platelet volume of 12.3 fL. Preoperative clotting screen (PT, APTT, INR) was within normal range. After discussion with a haematologist, 1 g of intravenous (IV) tranexamic acid and 24 µg of desmopressin in a slow IV infusion were administered one hour preoperatively. Surgery was performed under intravenous sedation and analgesia and local infiltration. Nonsteroidal anti-inflammatory drugs were avoided. Postoperatively, intranasal desmopressin (300 µg) at 24 and 48 hours and per os epsicaprom (6 g) 3 times a day for 7 days were prescribed. Intra- and postoperative course was uneventful with no bleeding event.

Discussion: Familial Macrothrombocytopenia Associated with Decreased Receptor GpIIb/IIIa is a recently described syndrome, involving a quantitative platelet disorder and some degree of platelet impaired function. Bleeding risk is not quantified to date and may be highly variable during surgery.

To the extent of our knowledge no cases have been reported of patients with this syndrome submitted to surgery. Therefore the anaesthetic management of the potential bleeding risk in patients with this syndrome is not well known and may be challenging.

References: 1. Gresele P, Falcinelli E, Giannini S, D'Adamo P, D'Eustacchio A, Corazzi T, Mezzasoma AM, Di Bari F, Guglielmini G, Cecchetti L, Noris P, Balduini CL, Savoia A (2009) Dominant inheritance of a novel integrin beta3 mutation associated with a hereditary macrothrombocytopenia and platelet dysfunction in two Italian families. *Haematologica* 94:663-669

Learning points: Anti-fibrinolytics and desmopressin may be useful in the perioperative management of patients with Familial Macrothrombocytopenia Associated with Decreased Receptor GpIIb/IIIa submitted to surgery.

12AP03-6**Do we need use fresh frozen plasma in patients after liver transplantation?**

Kuandykov T., Mutagirov V.
National Scientific Centre of Surgery, Dept of Anaesthesiology & Intensive Care, Almaty, Kazakhstan

Background and Goal of Study: Optimal coagulation management remains one of the greatest challenges in orthotopic liver transplantation. Using coagulation tests and thrombelastography (TEG) may beneficial in determining the optimal coagulation management (1).

Aim of Study: To estimate need of fresh frozen plasma (FFP) transfusion in patients after liver transplantation.

Materials and Methods: After local Ethic Committee approval and informed consent we studied 41 patients with liver cirrhosis, aged 44.0 ± 15.4 (24-60) yo, weight 54.8 ± 7.3 (48-58) kg. We studied activated partial prothrombin time (APPT), international normalized ratio (INR), protrombin index (PI), fibrinogen A (FGA), platelets count (PLT), thrombelastography (K; R; α angle; MA; LY30), plasma volume transfused postoperatively, ICU stay duration.

Results and Discussion: There was no bleeding in patients postoperatively. The coagulation tests showed significant decreasing of FGA and PI levels, increasing of INR and APPT through 10 days after liver transplantation; while thrombelastography showed slight hypocoagulation status in patients through 1-4 postoperative days (table).

	D1	D3	D7	D12
APPT (sec)	57.3 \pm 22.7	39.3 \pm 16.7	26.3 \pm 9.8	31.5 \pm 9.2
INR	2.7 \pm 0.8	2.4 \pm 0.9	2.1 \pm 0.4	1.7 \pm 0.2
PI (%)	32.2 \pm 16.4	31.6 \pm 13.4	46.0 \pm 11.2	58.3 \pm 10.2
FGA (g/l)	0.8 \pm 1.1	2.5 \pm 1.2	2.8 \pm 0.8	3.9 \pm 0.9
PLT (10^9 /mcl)	80.5 \pm 47.9	46.2 \pm 29.3	56.1 \pm 51.1	111.3 \pm 88.4
R (sec)	8.7 \pm 2.5	4.0 \pm 1.2	3.9 \pm 0.9	6.5 \pm 0.5
K (sec)	5.8 \pm 3.6	3.0 \pm 1.9	2.2 \pm 0.9	1.8 \pm 0.7
Alpha angle	48.2 \pm 16.9	50.4 \pm 11.7	64.1 \pm 6.9	72.1 \pm 8.3
MA (mm)	36.3 \pm 21.9	58.8 \pm 16.5	66.8 \pm 8.6	64.9 \pm 6.5

[Coagulation and TEG tests after OLT (day 1-12)]

Volume of FFP transfused postoperatively was 248.5 ± 704 ml on day 1. ICU stay duration 13.4 ± 6.2 days.

Conclusion: Despite of TEG and coagulation tests disorders patients after liver transplantation presenting no bleeding do not require FFP transfusion including whole postoperative period.

References: 1. Coakley M, Reddy K, Mackie I, Mallett S. J Cardiothorac Vasc Anesth. 2006 Aug;20(4):548-53.

12AP03-7

Management of massive haemorrhage: results from our protocol activation

Pinedo G.¹, Zurita S.¹, Guasch E.¹, Viejo A.², -Camaioira A.¹, Gilsanz F¹

¹La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²La Paz University Hospital, Haemathology and Blood Therapies, Madrid, Spain

Background and Goal: Massive hemorrhage (MH) is a leading cause of perioperative mortality (1), being blood loss exceeding circulating blood volume within a 24 hour period. Massive Transfusion (MT) is the administration of ≥ 10 red blood cell (RBC) units during that period of time, >4 RBC units in 1 hour or the replacement of more than 50% of the total blood volume within 3 hours. We describe the management of MH at a spanish tertiary referral hospital (according to the existing MH protocol) and the mortality of massively transfused patients.

Materials and Methods: A retrospective study was conducted at our centre over a year, based on the blood bank database and clinical records, including all patients receiving 8 or more RBC units within 24 hours. Age, sex, department, diagnosis, haemoglobin threshold for transfusion, number of transfused RBC, fresh frozen plasma (FFP), platelet pools and complementary therapies (embolization, packing) were recorded. 30 day mortality after MT episode was also evaluated.

Results and Discussion: From a total of 22117 transfusions, 70 were MT (3,35%). Main causes were: diagnostic or therapeutic procedural complications (22,9% n=16); elective surgery (22,9% n=16); Medical causes (20% n=14); Polytraumatism (18,6% n=13); Transplantation (8,6% n=6); Postpartum haemorrhage (PPH) (7,1% n=5). Haemoglobin threshold for transfusion was $7,84$ g/dl \pm 2,16. The average number of blood components administered was: RBC $13,79 \pm 5,52$, FFP $5,31 \pm 3,33$, platelets $1,67 \pm 1,3$. Complementary therapies were performed in 21,4% of the patients with MH. 30-day mortality was 41,4%: due to Medical causes (58,3%), polytraumatism (64,3%) and procedural complications (44,4%). No significant statistical differences were found between the number of blood components administered

and 30-day mortality rate. Mortality rate was found to be similar to that of other centres (1). The lowest cause of death in both studies was also PPH. The main cause of MT, which we found to be procedural complications, was not the main cause at other similar studies.

Conclusions: The vast majority of MT occurs in elective surgery and procedural complications. MT mortality is still very high.

References:

1. Måril Halmin et al. Epidemiology of massive transfusion. Crit Care Med. 2016;44:468-77.
2. H.P Pham et al. Upd on massive transfusion. BJA 2013;111 (S1): i71-i82.
3. Rossaint et al. The european guideline on management of major bleeding and coagulopathy following trauma: 4th ed. Crit Care. 2016;12:20:100

12AP03-8

Benefit of the tourniquete on postoperative bleeding in total knee arthroplasty

Focaccio Tejada C.A.¹, Barajas C.¹, Mourad M.¹, Padron O.¹, Ramirez C.¹, Rodriguez A.²

¹Hospital Universitario de Gran Canaria Dr. Negrín, Dept of Anaesthesiology & Intensive Care, Las Palmas de Gran Canaria, Spain, ²Universidad de Las Palmas de Gran Canaria, Medicine Department, Las Palmas de Gran Canaria, Spain

Background: Total knee arthroplasty (TKA) is increasing in proportion to life expectancy. One of the complications to be highlighted is post-operative bleeding with an incidence up to 35%. Thus, in older adults with multiple diseases the need for blood transfusion and mortality increases. The tourniquet is used as a blood-saving technique. It is described using an inflation pressure of 300-375 mmHg for the lower limb or 75 mmHg above baseline systolic blood pressure. Its use can lead to complications, both during inflation (neuroapraxia, tissue hypoxia and elevation of systemic and pulmonary arterial pressures) and at the moment of its release (pain and metabolic acidosis), which is why we have decided to analyze its benefit on perioperative bleeding in our environment where cuff pressure of 350 mmHg is used indistinctly.

Goal of Study: To analyze the benefit of the tourniquet on postoperative bleeding in patients submitted to TKA.

Materials and Methods: After approval of the medical ethics committee of our institution, a retrospective study was conducted for one year to all patients submitted to TKA using conventional technique and tourniquet (according to protocol of our institution establishes 350 mmHg indistinctly). Data from the registry of the recovery unit (RU) were collected. The analysis with the SPSS program were done.

Results: 83 patients were analyzed. They were ASA II and III. No statistically significant differences were found in the descriptive analysis of the demographic characteristics of the study population ($p > 0.5$). Pressure of ischemia (understood as tourniquet pressure minus systolic blood pressure) of 206.6 ± 15.10 mmHg was documented. The mean time of ischemia was 73.92 ± 24.09 minutes. The degree of anemization was 2.59 ± 1.2 g / dL. No significant correlation was found between ischemia pressure and postoperative bleeding ($p = 0.889$). However, prior antiplatelet therapy was associated with a statistically significant increase in postoperative bleeding ($p = 0.026$). No postoperative transfusion were registered. 14.9% required tranexamic acid.

Conclusion: The use of the tourniquet does not usually have benefits as a blood-saving technique as observed in our cohort and documented by other authors. Preoperative assessment and antiaggregant management seems to have a greater impact. Therefore, the use of this technique should be rethought.

*Cundy WJ et al. Blood Loss in Total Knee Arthroplasty. J Knee Surg. 2016 Sep 21. [Epub ahead of print]

12AP04-1**ROTEM™ based transfusion algorithm reduces transfusion and increases fibrinogen administration during orthotopic liver transplantation**

Gilquin N., Bonnet A., Gazon M., Quattrone D., Steer N., Aubrun F.

Croix-Rousse Hospital, Hospices Civils de Lyon, Université Lyon 1, Dept of Anaesthesiology & Intensive Care, Lyon, France

Background and Goal of Study: Orthotopic liver transplantation (OLT) remains associated with transfusion, which is associated with increased morbidity and mortality. Because coagulation is rebalanced in End Stage Liver Disease (ESLD) patients, conventional coagulation tests are unable to assess the risk of thrombosis or bleeding. ROTEM™ assesses the process of clot initiation, formation and stability on whole blood. It could then be interesting for targeted management of coagulopathy in OLT. It is recommended by European guidelines, but data concerning its use in OLT are missing.

We aimed to determine whether using thromboelastometry during OLT impacts blood products and fibrinogen administration in comparison with standard coagulation tests.

Materials and Methods: This prospective randomized controlled study included 82 adult patients undergoing OLT between 2014 and 2016. Transfusion was guided either by thromboelastometry (R group) or standard coagulation tests (S group). Quantitative results are expressed as medians (min-max) and qualitative data are presented as numbers and percentages. The Chi-Square test and the Fisher's exact test were used for qualitative variables and the Student *t*-test was used for continuous variables.

Results and Discussion: Groups characteristics were not different. The total perioperative transfusion amount was higher in S group than in R group (7(1-25) vs 3(1-22) units, $p = 0.004$). Others results are presented in table 1.

	R group (n=41)	S group (n=41)	p
Red Blood Cells (units)	26 (63,4%)	25 (61%)	0,820
Fresh Frozen Plasma (units)	6 (14,6%)	19 (46,3%)	0,002
Platelets (units)	10 (24,4%)	8 (19,5%)	0,594
Fibrinogen (g)	29 (70,7%)	12 (29,3%)	0,000
Tranexamic acid (g)	11 (26,8 %)	24 (58,5%)	0,040

[Table 1: Number of patients transfused]

These results are in accordance with previous studies(1). Higher fibrinogen administration could be explained by the good sensibility of ROTEM™ concerning fibrinogen. Maintenance of fibrinogen concentration during OLT is critical, especially in this context of hypo- and -dysfibrinogenemia in ESLD patients, and has already been shown to reduce blood transfusion(2).

Conclusion: During OLT, ROTEM™-based transfusion algorithm reduces total perioperative blood products transfusion and increases fibrinogen administration.

References:

1. Rouillet S, Freyburger G, Cruc M et al. Liver Transpl. 2015;21:169-79.
2. Novak-Padillo JA, León-Justel A, Mellado-Miras P et al. Transplant Proc. 2010;42:2973-4.

12AP04-2**Comparison of Quantra™ vs ROTEM Delta and routine coagulation tests in cardiac surgery**

Viola F.¹, Winegar D.², Fernandez L.³, Huffmyer J.³, Groves D.³

¹HemoSonics LLC, Research and Development Department, Charlottesville, United States, ²HemoSonics LLC, Clinical Affairs, Durham, United States, ³University of Virginia Health System, Dept of Anaesthesiology, Charlottesville, United States

Background and Goal of Study: Coagulation testing is often performed in cardiac surgery and other major procedures to aid in the management of perioperative bleeding. The Quantra Hemostasis Analyzer is a novel cartridge-based viscoelastic analyzer that measures changes in clot stiffness during coagulation using ultrasound detection of resonance. The goal of this pilot study was to compare results obtained with the Quantra to the ROTEM Delta and lab based coagulation assays in cardiac patients.

Materials and Methods: For each enrolled patient, citrated whole blood samples were obtained at two of three possible time points: baseline, during cardiac bypass, or after protamine administration. Measurements were performed on a research use only version of the Quantra and included Clot Time (CT), Heparinase Clot Time (CTH), Clot Stiffness (CS), Fibrinogen Contribution (FCS) and Platelet Contribution (PCS) to clot stiffness. ROTEM analysis included INTEM, HEPTM, EXTEM, and FIBTEM assays. In addition, samples were also tested in a standard coagulation panel including PT/INR, aPTT, Clauss fibrinogen, and platelet count.

Results and Discussion: A cohort of 25 patients undergoing elective cardiac surgery with cardiopulmonary bypass were enrolled in this pilot study. The Quantra was operated near patient whereas the ROTEM was placed in the blood bank. The Quantra parameters CT, CS, and FCS exhibited strong correlation with INTEM CT (r -value = 0.96), EXTEM A10 (r -value = 0.96), and FIBTEM A10 (r -value = 0.93), respectively. Strong correlation was also observed between the Quantra and conventional coagulation tests with r -values of 0.96, 0.84, and 0.90 for CT vs aPTT, FCS vs Clauss fibrinogen, and PCS vs platelet count, respectively. Complete Quantra results were available within 15 minutes of test initiation.

Conclusion(s): The Quantra parameters demonstrated strong correlation with an established viscoelastic device as well as conventional laboratory assessment of coagulation. This study suggests that the Quantra can provide rapid and accurate assessment of coagulation function during cardiac surgery.

References:

- Huffmyer JL, Fernandez LG, et al. Anesth. Analg. 2016;123:1390-1399
Naik BI, Durieux ME, et al. Anesth. Analg. 2016;123:1380-1389
Reynolds PS, Middleton P, et al. Anesth. Analg. 2016;123:1400-1407

Acknowledgements: This study was supported in part by the National Heart Lung and Blood Institute (NIH).

12AP04-3**Point-of-care haemostatic management in orthotopic liver transplantation of an ex situ hepatectomized liver graft**

Katsanoulas K., Katsika E., Georgopoulou E., Markopoulos I., Serchan P, Bali E.

Hippokrateion General Hospital Thessaloniki, Dept of Anaesthesiology, Thessaloniki, Greece

Background: It has been reported that ex vivo benching and prolonged ischemia time may endanger liver graft viability. This is a case of orthotopic liver transplantation (OLTx) of an ex situ hepatectomized liver graft and the successful point-of-care haemostatic management with rotational thromboelastometry (ROTEM).

Case report: A 45y old man with alcoholic cirrhosis (MELD score 16, conventional haemostatic profile INR 1.8, PT 19.9s, APTT 50.7s, Fib 1.94 g/L and PLTs 105000 μ /l), underwent a successful OLTx. The peculiarity of the case lies at the fact that during graft removal from the donor, an exceptional left liver lobe perfusion was noted through a separate ectopic hepatic artery rising directly from the aorta (rare anatomic variation, 1.6%). The endothelium of this specific vessel being "fractured" led to an extended graft hepatectomy of the depended liver segments (I, II and III) performed on the bench, just before transplantation. This excision produced an extended surface where no surgical haemostasis was feasible ex vivo. Baseline Hgb was 10.5g/dl and by the end of the operation 9.3g/dl after 2 PRBCs transfusion. Cold ischemia time was 10 hrs, anhepatic phase lasted 2.5 hours, reperfusion was uneventful, total OLTx duration was 6 hrs. Early graft function was relatively sufficient with mild cholestasis but no signs of "small-for-size syndrome". After prolonged ICU stay due to difficult weaning he was discharged to the ward tracheostomized, but in good general state. Intraoperative haemostatic management was accomplished with ROTEM following a published algorithm (Goerlinger K,2006).

Discussion: Platelet transfusion has been related to hypercoagulable danger and increased mortality in OLTx patients. In late anhepatic phase insignificant mild diffuse bleeding was noted (CT_{EXTEM} 176s, A5_{EXTEM} 7mm, MCF_{EXTEM} 14mm). No platelets were transfused, although this should be considered. Fibrin substrate enhancement was chosen instead (1500U PCC). In neohepatic phase, without bleeding, ROTEM showed CT_{EXTEM} 97s & A5_{EXTEM} 23mm. Again, no platelets were transfused while 1g Fibrinogen concentrate was given to enhance clot strength. No sign of hyperfibrinolysis was noted (LI30_{EXTEM} 100%).

Learning points: This is the first case of ex situ hepatectomy just before OLTx in our centre. Point-of-care haemostatic management combined with close clinical evaluation of surgical bleeding nature contributed successfully to safe decision making in the management in this rare case.

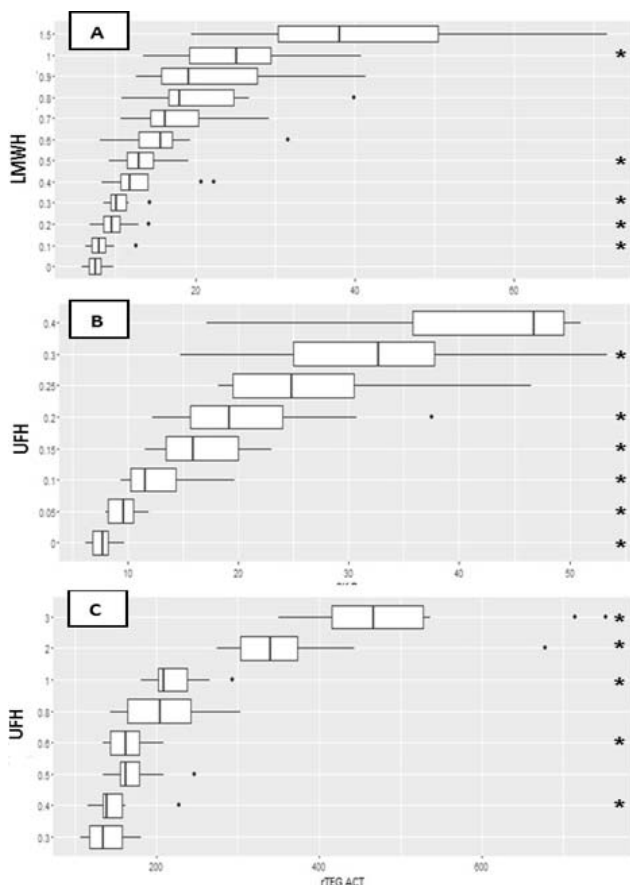
12AP04-4

In-vitro testing of the effect of unfractionated heparin, and low molecular weight heparin on new generation thromboelastogram (TEG6s) and conventional coagulation assays

Mathew B., Haney E., Lopez-Espina C., Doubleday M.
Haemonetics, Research and Development Department, Rosemont, United States

Background and Goal of Study: Unfractionated (UFH) and Low molecular weight (LMWH) heparin are used as anticoagulants for prevention and treatment of thromboembolism. The anti-Xa test has become the gold standard in measuring anticoagulant efficacy, and for the monitoring required to achieve target therapeutic range. Assays like the standard kaolin (CK), and the kaolin with heparinase (CKH) in thromboelastogram (TEG) have long been used to detect the presence of heparin. In this study we evaluate utility of TEG at various concentrations of UFH, and LMWH. We also assess the sensitivity of TEG in monitoring heparin levels outside the therapeutic ranges.

Materials and Methods: Twenty (10 each) healthy donors were enrolled. Each sample of citrated blood (3.2ml) was incubated with heparin at various amounts for final levels of UFH (0-5 IU/ml), or LMWH (0-10 IU/ml), prepared by diluting 0.9% of saline. The spiked blood was run through CK, CKH, and r-TEG (kaolin with tissue factor) and anti-Xa assays (Quest Diagnostics). R (reaction time) from CK, and CKH assays and ACT from r-TEG (activated clotting time) is time from test initiation to clot formation. Elongation of CK R and r-TEG ACT with heparin dosage was analyzed with paired t-test ($p < 0.05$ was significant). The utility of TEG in therapeutic ranges of UFH, and LMWH (defined by Anti-Xa) was assessed using a logistic regression models using ratio of CKH to CK R as predictor variable.



[Fig 1. Box plots showing (A) CK R with LMWH (0-1.5 U/ml), (B) CK R and (C) rTEG ACT at various concentrations of UFH, 0-0.4 U/ml and 0.3-3 U/ml respectively. *indicates significance from successive higher dosage level.]

Results and Discussion: Statistically significant elongation in CK.R was observed in both increasing UFH and LMWH dilutions at lower heparin levels (Fig1). We observed significant increase in r-TEG ACT at higher dilutions of UFH. Hence with CK R, and r-TEG ACT we can monitor UFH over a wide range

of dilutions (0-3 IU/ml) but they were less sensitive to higher LMWH levels. Ratio of CKH to CK R significantly predicted ($p < 0.001$) heparin outside the therapy levels.

Conclusion(s): TEG6s may be considered a reliable tool in measuring heparin levels (wide range of UFH, and lower quantities of LMWH dosage). In clinical settings requiring monitoring of heparin levels to target therapeutic ranges, TEG may be used as accurate and early indicators.

12AP04-5

The diagnosis and correction of hemocoagulation disorders in operative delivery

Tarabrin O., Mazurenko A., Tarabrin P., Sazhyn D., Volodychev D.
Odessa National Medical University, Dept of Anaesthesiology & Intensive Care, Odessa, Ukraine

Background and Goal of Study: Despite significant progress in obstetric care, the problem of bleeding during labour remains unfinished. Annually in the world 125,000 women die from obstetric haemorrhage.

Materials and Methods: The results of surgical treatment of 84 patients after cesarean section during the period from 2014 to 2016 entered the study. Condition of haemostasis was monitored by 12 standard biochemical tests, as well as the new instrumental method - low-frequency piezoelectric haemoviscoelastography preoperative, intra-operative and every day during 10 days after surgery. A randomized, double-blind study was performed. Patients were divided into two groups: the first group (n=43) received preoperative (30 minutes before operation) tranexamic acid 10-15 mg/kg (depends on severity of hemocoagulation disorders); the second group (n=41) didn't receive medication, which has influence on blood coagulation.

Results and Discussion: All patients included in the study before the surgery had moderate hyper-coagulation and increased index of fibrinolysis: increasing of the intensity of clot coagulation (ICC) to 11.4% compared to normal rates; the intensity of the retraction and clot lysis (IRCL) was 1.45 ± 0.44 in both groups. After operation in patients (group 1) - ICC decreased 9.7% ($P < 0.05$), and IRCL decreased 27.6% ($P < 0.05$) compared with preoperative study. In group 2, ICC decreased 8.8% ($P < 0.05$), and IRCL increased 11.4% ($P < 0.05$) compared with preoperative study. At the end of the operation, the condition of haemostasis in both groups came almost to the same value - moderate hypocoagulation, depressed fibrinolysis. In both groups there were no thrombotic complications. Intraoperative blood loss in the first group was $340 \pm 23,2$ and in the second was $488 \pm 33,4$.

Conclusion(s): Using tranexamic acid before surgery significantly reduces intra-operative blood loss by 40%, without thrombotic complications. Using low frequency piezoelectric haemoviscoelastography enables quickly identify disorders of haemostasis in patients after cesarean section before, during and after the surgery.

12AP04-6

Evaluation of fibrinogen level in trauma using new generation thromboelastogram (TEG6s) and Clauss assays

Mathew B., Lopez-Espina C., Doorneweerd D., Muresan A.
Haemonetics, Research and Development Department, Rosemont, United States

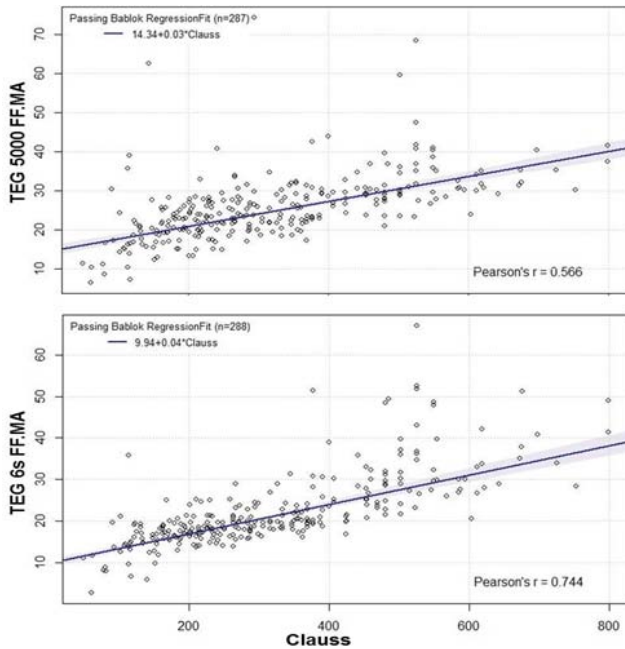
Background and Goal of Study: Hemorrhage remains one of the leading causes of death in trauma induced coagulopathy (TIC). Fibrinogen (Fbg) is key to hemostasis which declines rapidly in these patients. Fast, and accurate determination of Fbg is essential for intervention with blood products, antifibrinolytics and Fbg concentrates. Von Clauss method is commonly used, but its delay in measuring Fbg can affect early identification of coagulopathy. The maximum clot strength (MA) from Functional Fbg (FF) assay in TEG have been used to derive Fbg level. Our objectives are to investigate the performance of predicate (TEG5000), and TEG6s with Clauss assay, and to measure the ability of TEG assay in detecting low Fbg levels in massively transfused trauma patients.

Materials and Methods: 305 trauma patients (age: 45 ± 18 , ISS: 17 ± 10 , GCS: 12 ± 4) were enrolled. Blood was drawn for testing in the TEG systems, and Clauss (Quest Diagnostic). Using linear regression model we evaluated the correlation between MA, and Clauss. ROC analysis was performed at pre-

determined Clauss thresholds and metrics were computed at MA cut points derived from the model. Receipt of massive transfusion (MT) was evaluated (N=75) with a logistic model.

Results and Discussion: Fig 1 shows significant correlation between TEG 5000 MA ($r=0.56, p<0.001$), and TEG6s ($r=0.74, p<0.001$) with Clauss. ROC analysis at each Clauss threshold proved TEG6s MA levels has the highest Sensitivity, and AUC (table 1). At low levels of Clauss, TEG6s MA is 15.9mm which aligns with the manufacturers reference range of 15-32mm. In patients requiring MT, Clauss, and TEG6s significantly predicted the transfusion.

Conclusion(s): This study has shown that TEG6s FF assay may be useful where fast, and accurate determination of Fbg level is critical to guide hemostatic resuscitation and therapy. This study confirms the utility of TEG in TIC.



[Fig. Correlation scatter plots of function fibrinogen MA levels in TEG5000 and TEG6s versus Clauss plasma fibrinogen levels (mg/dL)]

		AUC	Sensitivity	Specificity
Clauss <250	TEG5000 FF.MA <21.8	0.82 (0.77 - 0.87)	0.59 (0.50 - 0.67)	0.86 (0.81 - 0.91)
	TEG6s FF.MA <19.9	0.88 (0.84 - 0.92)	0.89 (0.83 - 0.94)	0.68 (0.60 - 0.75)
Clauss <200	TEG5000 FF.MA <20.3	0.82 (0.77 - 0.88)	0.57 (0.46 - 0.69)	0.86 (0.82 - 0.91)
	TEG6s FF.MA <17.9	0.85 (0.80 - 0.90)	0.72 (0.62 - 0.82)	0.82 (0.77 - 0.88)
Clauss <150	TEG5000 FF.MA <18.8	0.82 (0.72 - 0.92)	0.64 (0.48 - 0.81)	0.91 (0.87 - 0.94)
	TEG6s FF.MA <15.9	0.86 (0.78 - 0.93)	0.66 (0.50 - 0.81)	0.90 (0.86 - 0.93)

[Table 1. ROC for various cutoffs for Clauss Fbg levels recommended in the guidelines for fbg supplementation in trauma patients]

12AP04-7

Perioperative rotational thromboelastometry during and after adult living donor liver transplant recipients with genetic and acquired tendency to hypercoagulability

Yassen K.¹, Hassanin A.¹, Ahmed A.R.², Abdel Salam Y.¹, Afifi M.², Görlinger K.³

¹Liver Institute Menoufiya University, Dept of Anaesthesiology & Intensive Care, Sheeben El Kom, Egypt, ²Faculty of Medicine, Menoufiya University, Dept of Anaesthesiology & Pain Medicine, Sheeben El Kom, Egypt, ³University Hospital Essen and Tem International GmbH, Munich, Dept of Anaesthesiology, Essen, Germany

Background and Aim of Work: Hypercoagulability can lead to serious thromboembolic events. Aim is to assess perioperative coagulation status in recipients with genetic and acquired tendency to hypercoagulability.

Methods: A prospective observational study with 43 consecutive recipients (South African Cochrane Registry 201405000814129). Two or more of following inclusion criteria were used: low protein C, low protein S, low antithrombin, abnormal Factor V Leiden mutation, increased lupus anticoagulant, increased homocystein IgG/IgM, and increased antiphospholipid antibodies.

Rotational thromboelastometry (ROTEM) (EXTEM, INTEM and FIBTEM assays) and conventional coagulation tests (CCT) were assessed preoperative, during surgery and on postoperative days 1, 3 and 7. ROTEM was used to guide blood transfusion. Heparin was infused postoperatively for 3 days (60-180 U/kg/day) and replaced by low molecular weight heparin (20 mg/12 h).

Results: Postoperative FIBTEM (MCF) gradually increased above reference range (Day 7) despite normal fibrinogen plasma levels ($P<0.05$). EXTEM and INTEM significantly changed with transplant phases ($P<0.05$), but with no hypercoagulability observed. No significant correlation was found between ROTEM and CCT. INTEM CT (reference range, 100-240 sec) normalize on days 3 and 7 (199.5±73.5 and 186.9±67.01, respectively), despite prolonged aPTT (62.5±17.9 and 48.4±15.7, respectively; reference range 35-45 sec). Partial thrombosis of Hepatic artery and portal vein were reported in 5/43 (11.62%) and 2/43 (4.65%), respectively, with high FIBTEM (MCF) in 5 /7. Intraoperative Mean±SD units consumed (transfused patients/overall patients) of red blood cells 8.80±5.82(35/43), fresh frozen plasma 8.62±4.07 (27/43) and cryoprecipitate 12±4 (12/43). No postoperative transfusion was required. Transplant indications were hepatitis C (83.7%), combined with carcinoma (37.2%). Increased lupus anticoagulant, decreased antithrombin III and decreased protein C reported in 88.4%, 86.2% and 74.4%, respectively, with Factor V Leiden mutation positive in 25.6%. 3 month and one year survival was 74.5% and 61.3%.

Conclusion: A significant postoperative step-wise increase in FIBTEM MCF to beyond normal reference range despite normal fibrinogen plasma levels in this study population. FIBTEM as a predictor for thromboembolic events need to be investigated further with a larger number of recipients, particularly after one week when CCTs fails to diagnose the condition.

12AP04-8

Point-of-care haemostatic management in orthotopic liver transplantation of a patient with a coronary stent

Katsanoulas K., Katsika E., Markopoulos I., Georgopoulou E., Bilali P., Vranas D.

Hippokrateion General Hospital Thessaloniki, Dept of Anaesthesiology, Thessaloniki, Greece

Background: In orthotopic liver transplantation (OLTx) bleeding management remains a big challenge due to reduced levels of both procoagulant factors and inhibitors. This is a case of OLTx in a patient with a coronary stent and point-of-care haemostatic management with rotational thromboelastometry (ROTEM).

Case report: A 66y old man with non-alcoholic steatohepatitis cirrhosis (MELD score 17) and 4 encephalopathy episodes underwent a successful OLTx. Suffering ischemic heart disease he was under dual antiplatelet therapy till surgery, due to a LAD artery stent implanted one year ago. Pulmonary hypertension (PAPs 68mm) but good contractility (EF 60%) was noted. Baseline Hbg was 9.9g/dl and by the end of the operation 9.6g/dl after 3 PRBCs transfusion. The anhepatic phase lasted 2,5 hrs, reperfusion was uneventful and

total OLTx duration was 8 hrs. He was discharged at home 1 month later. Haemostatic management and transfusions were accomplished with ROTEM following a published algorithm (Goerlinger K, 2006). We compared standard haemostatic lab tests data (SLT) to ROTEM data suggesting agreements and disagreements in between, on haemostatic state interpretation.

Discussion: During anhepatic phase, 3 FFPs (INR 2.07, APTT 138.4s, CT_{EXTEM} 103s, CFT_{EXTEM} 403s SLTs. ROTEM agreement), 6 PLTs (PLT 148000 μ l while A10_{EXTEM} 25mm with MCF_{FIBTEM} 11mm, SLTs. ROTEM disagreement) and 1g tranexamic acid (hyperfibrinolysis sign after ROTEM data) were transfused. During neohepatic phase a relative agreement between SLT and ROTEM data was noted (PLT 118000 μ l along with A10_{EXTEM} 32mm & MCF_{FIBTEM} 13mm) with an indication of PLT transfusion according to algorithms.

Nevertheless, due to absence of clinically relevant diffuse bleeding, no PLTs were transfused, although this should be considered. Platelet transfusion has been related to hypercoagulable danger and increased mortality in OLTx patients and generally is to be avoided, moreover with a coronary stent in place. Instead, 10 cryoprecipitate units were given to enhance clot strength. Bleeding ceased completely and operation was smoothly completed.

Learning points: Intraoperative standard lab tests during OLTx may lead to improper even dangerous decisions for blood product or factors transfusion, especially in the presence of co morbidities affecting haemostasis. Point-of-care haemostatic management along with close surgical bleeding evaluation contributed successfully to safe decision making in the management in this complex case.

12AP04-9

Perioperative hemostatic management of cardiohepatic transplant with Rotational Thromboelastometry (ROTEM)

Kataife E., Mileo F., Adrover A., Viso H.

Hospital Italiano de Buenos Aires, Dept of Anaesthesiology, Ciudad Autonoma de Buenos Aires, Argentina

Background: The haemostatic management of the cardiohepatic transplant becomes a challenge considering not only the coagulopathy of the end stage liver disease (ESLD) but also the alteration of the extracorporeal circulation (ECC). In this context, standard laboratory tests (SLTs) do not allow the correct diagnosis presenting slow turnaround times and increasing the number of allogeneic transfusions. Until now, algorithms for haemostatic management of multiorgan transplants have not been published. We propose a five step algorithm (pre ECC, intra ECC, post protamine/ basal hepatic, anhepatic and reperfusion) guided by ROTEM, based on factor concentrates therapy.

Case report: The patient was a 60 year old male with cryptogenic cirrhosis and viral myocarditis. The only episode of diffuse bleeding occurred after reversal with protamine. The analysis by ROTEM showed a prolonged coagulation time (CT) in the EXTEM (CT 85s) with reduced amplitude (A5 30 mm, A10 39 mm), FIBTEM in the lower limit (A5 8 mm, A10 10 mm), ACT 130 s, CT INTEM/HEPTEM 1. The SLTs showed a PT 26%, aPTT 60 seconds, platelet count of 63.800 μ l, fibrinogen of 1.45 g/L. At this point, 8 units (U) of platelets and 4 g of fibrinogen concentrate were administered. The bleeding self-limited and ROTEM from the anhepatic phase showed no alterations. A total of 1000 ml of Cell salvage were transfused and the hemoglobin value was 9.7 g/dL. At the end of the surgery, while the SLTs remained significantly altered (PT 22%, aPTT 56 seconds), ROTEM parameters were normal.

Discussion: Current studies indicate that hemostatic therapy guided by viscoelastic tests reduces allogeneic transfusions rates. The SLTs do not show the whole thrombin formation, neither clot strength or the presence of hyperfibrinolysis. According to SLTs, higher allogeneic transfusion rates would have been necessary.

References:

1. K. Görlinger et al. Coagulation management in patients undergoing mechanical circulatory support. *Best Pract Res Clin Anaesthesiol* (2012) Jun; 26(2): 179-98
2. Kirchner, et al. Coagulation management with factor concentrates in liver transplantation: a single center experience. *Transfusion* (2014) Oct; 54 (10 Pt2): 2760-8.

Learning points: There is a poor correlation between SLTs and ROTEM. Furthermore, SLTs overestimate transfusion requirements. ROTEM guided algorithm based on factor concentrates therapy, allows the reduction of allogeneic transfusions in cardiohepatic transplant.

12AP05-1

Massive transfusion protocol in a tertiary university hospital. Is it followed by surgeons, anesthesiologists and other medical specialists?

Guirao Monreal M.Á., Guasch Arévalo E., Gilsanz Rodriguez F
Hospital Universitario La Paz, Dept of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Today, massive bleeding (MB) is one of the conditions with highest death rates. It may occur in different clinical settings such as cardiovascular surgery, obstetrics or trauma. Current guidelines recommend to guide the assistance through a massive transfusion protocol (MTP). The goal of this study is to educate about the MTP in a tertiary university referral hospital. It is important to find out our physicians knowledge on MTP, if transfusion knowledge is related to a better transfusion practice (TP) and to describe which are the main parameters to start transfusional support in MB.

Materials and Methods: After local ethics committee approval (HULP: PI-230) an anonymous survey was developed in six departments; Anesthesia (AR), Emergency (ED), Internal medicine (IM), Orthopedics (OT), Intensive Care Unit (ICU) and General Surgery (GS). Data were collected throughout a three-month period (Dec 15'-Feb 16'). Pearson's chi-square test, Fisher exact test and likelihood ratio was used for qualitative variables.

Results and Discussion: 125/302 surveys were sent back (41.3%). 76% (N=95) were staff members and 23.2% (N=29) were residents. 74.2% (N=92) were familiar with the existence of a MTP at hospital while 25.8% (N=32) were unaware of its existence. Data obtained in each department is shown in table 1.

Group	Residents	Staff	AR	ED	ICU	IM	OT	GS
%	86.2	70.2	86.4	90	85.7	53.3	8.3	50
n	25	66	51	18	12	8	1	2

[Table 1: % physicians who know about the MTP]

67.2% (N=84) of doctors had received education about TP 89.2% (N=74) of trained doctors were aware of the MTP vs 42.5% (N=17) of non-trained ($p < 0.001$).

A trend was observed between frequently use of transfusions and higher knowledge about MTP ($p = 0.177$). Main triggers for transfusion were patient's clinical status plus Hemoglobin (Hb) value in 75% (N=54) while isolated Hb value was in 25% (N=18). Physicians trained in TP had a tendency to use isolated Hb value more frequently than those without it (30.6% vs 13.0%), although we couldn't find statistically significant (SS) differences ($p = 0.108$). A bigger sample might be useful to demonstrate SS differences.

Conclusions: Our physicians knowledge rate in MTP and transfusion practice is low, even lower when it's related to medical specialties who don't deal often with MB. Transfusional training doesn't seem related to a better transfusional practice. Isolated hemoglobin level is used by one out of four doctors to prescribe blood products.

12AP05-3

Optimized management of transfusion of hemocomponents in a pediatric surgical block

Pérez Ferrer A., Viejo Llorente A., Latorre J.

La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Tolerance to hypovolemia is physiologically lower in the pediatric patient compared to the adult. In addition, due to their lower blood volume, bleeding volumes of minor importance in an adult, can be critical in the child. For this reason, it is not uncommon to request blood components from the operating room in surgical procedures in which it is not certain that it will be transfused but, if necessary, will require it immediately. Frequently these blood components have to be discarded in case of non-transfusion.

The aim of our study was to analyze the impact of a new transport and storage protocol of blood components in portable coolers with controlled temperature, between the Blood Bank (BB) and the operating room.

Materials and Methods: An analysis of the number of blood components returned to the BB from the operating room over a period of 7 years (2009-2015) was carried out. These units had to be discarded for remaining outside

the transfusion service for a period of more than 30 minutes. We also analyze the economic cost of these discarded packages.

During the first 7 months, the impact of the implementation of a protocol for the delivery of blood components to the operating room in portable coolers with controlled temperature was evaluated, both in the number of blood components that were reused and the savings that this entailed.

Results and Discussion: Discarded units in the previous 7 years were: 277 in 2009, 163 in 2010, 146 in 2011, 108 in 2012, 129 in 2013, 110 in 2014 and 110 in 2015 with a total cost of €161,119.

The provisional results of the first 7 months since its implementation showed 108 sent portable coolers, with a total of 405 Units of blood components (243 CH, 146 FFP and 16 PC).

The number of units of blood components returned to BB and reused was 74 (52 CH, 18 PFC, 4 PQT). Only 2 units of CH and 2 of PFC have been rejected by BB.

The savings calculated at the official price of the Community of Madrid in these 7 months was €8,700.

The Transfusion committee allowed the detection of an easily avoidable expense through the purchase of 3 portable coolers, accumulators and temperature control systems, which were amortized in a single month.

Conclusions: The development of a protocol for sending portable coolers with blood components to the children's surgical block will allow an estimated annual savings to the hospital and the Community of Madrid of €15,000.

12AP05-4

Effects of balanced crystalloids and colloids on haemostasis: in vitro assessment

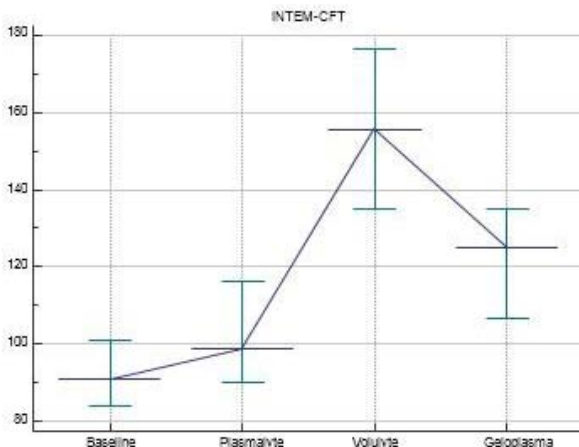
Krzyżak Ł., Czempik P.

Medical University of Silesia, Dept of Anaesthesiology & Intensive Care, Katowice, Poland

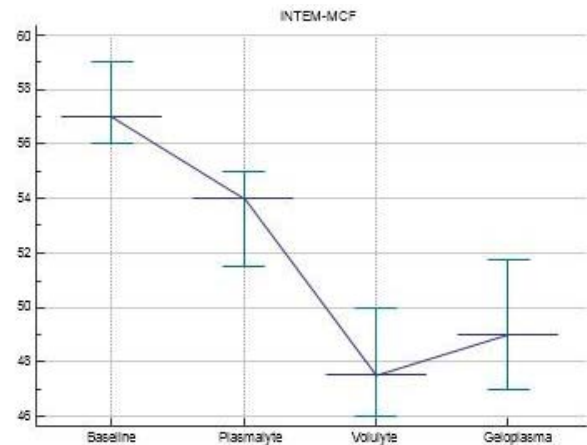
Background and Goal of Study: Massive bleeding may complicate perioperative course and remains the primary cause of death in about 30% of major trauma patients[1]. According to current guidelines[2,3], crystalloids and colloids are used as the first line treatment in fluid resuscitation. However, they may have deleterious impact on haemostasis. Therefore we aimed to investigate effects of balanced crystalloid and colloid solutions on coagulation and fibrinolysis in an in vitro setting.

Materials and Methods: Blood samples drawn from 32 young healthy males were diluted with study fluids to make a 20-vol% end-concentration. The fluids used were: crystalloid solution (Plasmalyte®), 4% succinylated gelatin (Geloplasma®) and 6% HES 130/0.4 (Volulyte®). Rotational thromboelastometry (ROTEM®delta) and platelet aggregometry (Multiplate®) were implemented at baseline and after dilution. CBC, aPTT, PT, fibrinogen, D-dimers were also performed.

Results and Discussion: Both succinylated gelatin and HES showed deranged INTEM (CFT, AA, A10 and MCF) and FIBTEM (A10, MCF) parameters ($p < 0.01$), however the effect of HES was more apparent (Fig. 1). In EXTEM, only HES significantly affected coagulation (i.e. CT prolongation). There was no effect on fibrinolysis or platelet function, as evidenced by unchanged ML and TRAP values, respectively. In standard laboratory tests dilution effect was found, however all investigated parameters stayed within reference values.



[INTEM CFT after mixing with study fluids]



[INTEM MCF after mixing with study fluids]

Conclusions: Despite marked haemodilution balanced crystalloid cannot affect coagulation. Balanced colloids impair clot formation and firmness, although the effect of HES is more pronounced. None of the fluids significantly impacted fibrinolysis or platelet function.

References:

1. Tieu BH et al. Coagulopathy: Its pathophysiology and treatment in the injured patient. *World J Surg.* 2007;31:1055-64.
2. Kozek-Langenecker SA et al. Management of severe perioperative bleeding: guidelines from the European Society of Anaesthesiology. *Eur J Anaesthesiol.* 2013 Jun;30(6):270-382.
3. Rossaint R et al. The European guideline on management of major bleeding and coagulopathy following trauma: fourth edition. *Crit Care.* 2016 Apr 12;20:100.

12AP05-5

Prevention of disorders of blood coagulation at the patients after total hysterectomy

Tarabrin O., Mazurenko A., Tarabrin P., Sazhyn D., Volodychev D.
Odessa National Medical University, Dept of Anaesthesiology & Intensive Care, Odessa, Ukraine

Background: Each year in the world the diseases of reproductive system is diagnosed in more than 700,000. In 8.35% of patients with diseases of reproductive system pulmonary embolism was the cause of death, and at 43% - the background for other fatal complications.

Materials and Methods: The results of surgical treatment of 96 patients after hysterectomy under epidural anesthesia during the period from 2014 to 2016 entered the study. Condition of hemostasis was monitored by 12 standard biochemical tests, as well as the new instrumental method - low-frequency piezoelectric haemoviscoelastography preoperative, intraoperative and every day during 10 days after surgery. Prevention of thrombosis in group 1 (n=46), conducted by Bemiparin 3,500 IU: the first injection 12h before epidural anesthesia, than at 12h after the operation in the future once a day for 10 days; group 2 (n=50) received unfractionated heparin (UFH) 5,000 IU: the first 6h before epidural anesthesia than 6h after the operation, than 4 times per day for 10 days.

Results and Discussion: All included in the study patients prior to surgery in the hemostasis system direct a shift towards hypercoagulation and inhibition of fibrinolysis: increase in MA (maximum density of the clot, fibrin-platelet constant of the blood) at 20.7% ($p < 0.001$) reduction of IRCL - the intensity of the retraction and clot lysis to 13.6% ($p < 0.05$) in both groups compared to normal rates. At first day after surgery in patients treated by Bemiparin (group 1) declines MA, ICD - the intensity of coagulation drive to 12.7 ($p < 0.05$) and 9.6% ($p < 0.001$), respectively, and IRCL increased be 4.4% ($p < 0.001$). At the fifth day condition of hemostasis in both groups came almost to the same value - a moderate hypocoagulation, normal activity of fibrinolysis. At the 7th day of postoperative period, thrombotic complications developed in 2 patient of first group (4.3%). In the second group, complications developed in 4 patients (8%) patients; in 3 causes of them - was deep venous thrombosis, and in 1 case of coagulopathic bleeding.

Conclusion(s): Using combination of Bemiparin and epidural anesthesia reduces the level of postoperative thrombotic complications, such as deep ve-

nous thrombosis, massive bleedings at the patients after total hysterectomy. Using low-frequency piezoelectric haemoviscoelastography (LPTTEG) enables quickly identify disorders of hemostasis in patients after hysterectomy before, during and after the surgery.

12AP05-6

Observational study to assess the safety and clinical effectiveness of the Hospital Universitario de Canarias massive transfusion protocol: a pilot design studio

González Fariña V.¹, Martín Lorenzo M.D.C.¹, Montón Giménez N.¹, Torres Dios J.Á.², Acuña Fernández C.¹, Trujillo Estévez J.¹

¹Hospital Universitario de Canarias - Tenerife, Dept of Anaesthesiology, S/C Tenerife, Spain, ²Hospital Universitario de Canarias - Tenerife, Dept of Anaesthesiology, La Laguna, Spain

Background: Bleeding, together with coagulopathy, remains one of the leading causes of avoidable hospital deaths among patients. Several studies have shown that transfusion protocols (MTP) improve survival in patients with severe traumatic injury. Transfusion with a predefined ratio of 1:1:1 (1 each of red blood cells [RBC], frozen plasma [FP] and platelets) has reduced the severity of trauma-induced coagulopathy and the mortality after severe trauma. Protocol has its challenges and can increase the risk of respiratory complications. This study was conducted to evaluate the feasibility of a 1:1:1 MTP and its effect on mortality and complications among patients with massive hemorrhage.

Methods: We designed a prospective observational study, 35 patients were included (60% men, 51% urgent surgery). The population studied includes all patients who needed a massive transfusion in a surgery. Patients were divided in two groups: group 1 intervention (MTP application) and group 2 non intervention (transfusion of non-guided MTP). Safety was measured based on 30 day mortality and survival free of acute respiratory distress syndrome.

Results: Both groups were similar about age, sex, APACHE-II score and preoperative hematocrit and INR. Patient's characteristics are given in Table 1. Red blood cells administration was similar in both groups, in group 1 (n=20) 3,5±2,6, in group 2 (n=15) 4,5±1,8 (p=0,18). However FP and PLT administration were higher in group 1 (PFC 2,6±2,2 vs 1,4±1,6 in the group 2, p=0,1) and PLT (0,65 ± 0,67 vs 0,33 ± 0,61, p=0,1), while administration of fibrinogen (1,45 ± 0,88 vs 0,87±1,2, p=0,07), tranexamic acid (2,55±1,09 vs 1,6±1 p=0,03) and protrombines complexes (900±911 vs 333±523, p=0,07) were higher in group 1.

Group 2 showed lower 30 days mortality (40% vs 21,4%, p=0,3) and transfusion related acute lung injury were similar between two groups (2 [10%] vs 3 [20%]) p=0,63).

	Group 1 (n=20)	Group 2 (n=15)	P value
Sex (male) — n (%)	12 (60)	9 (60)	1
Age (years)	55±19	57±18	0,83
Surgery — n (%)			0,24
Elective	8 (40)	9 (60)	
Urgent	12 (60)	6 (40)	
APACHE II-score	12,6±5	13±7	0,93
Hematocrit (%)	37±6	33,4±7,4	0,17
INR	1,12±0,32	1±0,15	0,78
RCBs (Units)	3,5±2,6	4,5±1,8	0,18
FP (Units)	2,6±2,2	1,4±1,6	0,1
PLT (Units)	0,65±0,67	0,33±0,61	0,1
Tranexamic Acid (g)	2,5±1	1,6±1	0,03
Prothrombin Complex (IU)	900±911	333±523	0,07
Fibrinogen (g/L)	1,45±0,88	0,87±1,2	0,07
Intraoperative bleeding (ml)	2640±1467	2090±866	0,24
TRALI	2 (10)	3 (20)	0,63
All-cause 30-day mortality	8 (40)	3 (21)	0,3
Death from exsanguinatio	2	1	
Death from multiple organ failure	5	—	
Anastomotic Leak (surgical)	1	—	
Right heart failure	—	1	
Cerebral stroke	—	1	

INR: international normalized ratio, FP: frozen plasma, TRALI: transfusión related acute lung injury, PLT: platelets, RCB: red blood cells.

[Table 1. Baseline characteristics]

Conclusion: Adherence to a management protocol for massive bleeding is feasible and allows a homogenous treatment of patients. The 30 day mortality and acute respiratory distress syndrome were similar between the groups. Larger randomized trials are needed to evaluate the efficacy of such a protocol.

12AP05-7

New proposal for the treatment of asymptomatic patients with acquired factor V deficiency

Mikulandra S.¹, Stambolija V.², Zupancic Salek S.³, Gornik I.⁴, Gasparevic V.⁴, Zadro R.⁵

¹General Hospital Elisabethinen, Dept of Anaesthesiology & Intensive Care, Linz, Austria, ²Clinical Hospital Centre Zagreb, Dept of Anaesthesiology & Intensive Care, Zagreb, Croatia, ³Clinical Hospital Centre Zagreb, Dept of Internal Medicine, Zagreb, Croatia, ⁴Clinical Hospital Centre Zagreb, Dept of Intensive Care, Zagreb, Croatia, ⁵Clinical Hospital Centre Zagreb, Dept of Medical Biochemistry, Zagreb, Croatia

Background: Acquired factor V deficiency (AFVD) is a rare but challenging bleeding disorder with approximately 150 cases reported in the literature. Its clinical presentation may span from the asymptomatic laboratory abnormalities to the life-threatening bleeding. Current recommendations emphasize the importance of decreasing the anti-FV antibody titre only if bleeding symptoms are present. (1) Based on this report, a new proposal for the treatment of asymptomatic AFVD patients could be made.

Case report: A 72-year old caucasian woman was admitted to the hospital for the craniotomy and evacuation of the traumatic subdural hematoma. The preoperative history was unremarkable. The routine laboratory testing on the 14th postoperative day showed great disturbance only at these coagulation parameters: PV 0,06, APTV (s) >120 and INR >6, what was contrary to the normal coagulation profile before, but there was not any clinical bleeding. The fresh frozen plasma was administered but without effect on the coagulation parameters. Haematologist was consulted and AFVD was detected: FV < 0,05 kIU/L and anti FV 25 BU/mL. On the 21th day tracheal bleeding and enterorrhagia occurred. The packed RBC's (700 mL) are given, plasmapheresis (2,5 L plasma was exchanged with each plasmapheresis) and methylprednisone (2 mg/kg iv.) started immediately and continued daily for the next 5 and 8 days, respectively. The FV inhibitor titre fell significantly after the first plasmapheresis (50,2 % clearance). The bleeding has stopped on the 25th day, the coagulation tests were normal without FV inhibitor in the follow up and the patient has transferred to the ward in a good clinical condition.

Discussion: Combination of corticosteroid and plasmapheresis proved optimal in this patient when the bleeding occurred. Because of the initial asymptomatic nature of the AFVD, we decided, according to the literature, not to commence with the therapy. However, that has put the patient at the risk to the subsequently fatal haemorrhage.

References: 1. Collins PW, et al. Diagnosis and management of acquired coagulation inhibitors. *BJH* 2013; 162:758-773.

Learning points: Prevention of the haemorrhage which could be fatal is of utmost importance at AVFD. According to this and based on our experience, we suggests that multimodal immunosuppressive therapy at these patients should be promptly started not only at the symptomatic patients but also at the patients without evidence of bleeding as well.

12AP05-8**Frozen platelets use in military environment. An alternative in civilian hospitals? Clinical report and Spanish Military Medical Corps experience in Afghanistan**

Navarro-Suay R.¹, Pérez-Ferrer A.², Diaz-Valdés J.R.³, Hernández-Abadía de Barbará A.⁴, López-Soberón E.⁵, Puchades-Rincón de Arellano R.⁶

¹Hospital Central de la Defensa Gómez Ulla / IMIDEF, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Hospital Universitario La Paz, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ³Hospital de Segovia, Haematology, Segovia, Spain, ⁴Hospital Central de la Defensa Gómez Ulla / IMIDEF, Dept of Intensive Care, Madrid, Spain, ⁵Hospital Central de la Defensa Gómez Ulla, Cardiology, Madrid, Spain, ⁶Hospital Central de la Defensa Gómez Ulla / IMIDEF, Research and Development Department, Madrid, Spain

Background: One of the main lessons identified by military physicians deployed in the in Iraq and Afghanistan conflicts is that massive hemorrhage is the principal cause of preventable death in combat. To avoid these deaths, several protocols have been implemented to control bleeding. In all of them, the use of platelet units is recommended.

The half-life of the platelet unit is 5 days and represents a logistical challenge. Allied Medical Corps have proposed different solutions: whole blood, apheresis or frozen platelet (Holland, Australia, Czech Republic and Spain) because increasing up to 2 years the half life of this blood component.

Spanish military medical corps reached this capacity in Afghanistan in 2010, until 2015 sent 47 units of frozen platelets which consumed 21 units (31%).

Case report: Male, 30 years old, an Afghan soldier, who is evacuated to Spanish military hospital in Herat (Afghanistan) after suffering an explosive device attack. He has some traumatic injuries: massive trauma with superior maxillary fracture, left arm and left hand open fractures, multiple lesions in the perianal region, left superior branch of the pelvis fracture, right hemithorax and right arm amputation. It is accompanied by decreased level of consciousness and hemodynamic instability (HR: 130 bpm, AP: 73/48 mmHg). In the primary evaluation, it is cold (34°C), acidotic (pH 7) and coagulopathic (INR 4,5) with lactic acid 9, BE-12 and anemia (Hgb 7 g / dl). The damage control reanimation is started with 11 units of red cells, 7 units of fresh frozen plasma, 2 units of frozen platelets, 1 unit of cryoprecipitate, 1 g of CaCl₂ and 1 g of tranexamic acid. Damage control surgery is performed.

Before evacuation to a higher medical treatment facility, patient presented improvements: HR: 70 bpm, AP: 120/86 mmHg, Temp.: 37 ° C, Hgb 11 mg / dl, pH 7.45, Lactic 2,5, BE 0, INR 1.2.

Discussion: The biggest advantage of frozen platelets use is the logistic, because it increases the average life of the unit up to 2 years and allows the realization of the damage control resuscitation protocols.

Learning points: Frozen platelet units have been used by Spanish military physician in Afghanistan and may be an alternative in civilian environments.

12AP05-9**Anaesthetic management of a patient with a pituitary tumour and combined deficiency of factor VII and IX: controversies of a clinical case**

Oliveira M.I., Caria T., Neto M., Reis A.T.
Centro Hospitalar de Lisboa Ocidental, Dept of Anaesthesiology, Lisbon, Portugal

Background: Inherited bleeding and clotting disorders are rare but sometimes encountered by anaesthetists during emergency or elective procedures. The perioperative management of these uncommon conditions can be challenging.¹

Case report: We report the case of a 28-year-old-man, scheduled for the excision of a pituitary tumour by endonasal approach. His medical history included pan hypopituitarism, β-thalassemia, and mild deficit of factor VII and IX. He has had two surgical interventions for the excision of the tumour and both had to be interrupted due to difficulties in the surgical approach owing to bleeding. This time, with the collaboration of the Immunotherapy Department, it was decided to give recombinant factor VIIa in the anaesthetic induction. During the procedure, due to continuous bleeding, two doses of factor VIIa were given and a low doses aminocaproic acid perfusion was started. Notwithstanding all this measures, due too poor visualization, the surgery was converted in open craniotomy. The coagulation control revealed an important procoagulant state. By the end of the procedure the surgeon noticed bilateral fixed mydriasis and either a thrombotic event or surgical complication was hypothesized. CT- scan revealed no alterations. The patient was transferred to the intensive care unit under mechanical ventilation and fully recovered.

Discussion: Management of patients with factor VII deficiency consists of factor replacement therapy either prophylactically or to treat acute bleeding episode. Levels of more than 10% are usually considered haemostatic¹ although it is difficult to predict the perioperative risk of bleeding due to a poor correlation between FVII activity and severity of bleeding². Treatment with haemostatics and antifibrinolytic agents carries the risk of thrombotic events and close motorization is fundamental.

References:

1. R. Mandhyan, A; Tiwari and G. Cherian; Congenital factor VII deficiency; BJA 2010; Volume 104, Issue 2; Pp. 267-268
2. Yoshida A et al; Anesthetic management of a patient with factor VII deficiency undergoing laparoscopic colectomy: a case report; JA Clinical Reports 2016

Learning points: Providing good surgical conditions while maintaining patient safety can be challenging. In cases in which haemostatics and antifibrinolytic agents are used close monitoring of coagulation status is essential.

Intensive Care Medicine

13AP01-1

Factors and outcomes associated with withdrawal or withholding of life-sustaining therapies in mechanically ventilated brain-injured patients: a French multicenter cohort

Hubert M.¹, Roquilly A.², Seguin P.¹, Asehnoune K.², Feuillet F.³, Nessler N.¹, BIVILI Investigators, ATLANREA Group
¹Pontchaillou Rennes University Hospital, Dept of Anaesthesiology & Intensive Care, Rennes, France, ²Hotel Dieu Nantes University Hospital, Dept of Anaesthesiology & Intensive Care, Nantes, France, ³UFR des Sciences Pharmaceutiques, Clinical Research, Nantes, France

Background and Goal of Study: Knowledge of the factors associated with the decision of withdrawal or withholding life support in severe brain-injured patients is limited, although most part of the deaths may involve such a decision.

Materials and Methods: Using a nationwide French prospective cohort, we aimed to identify factors associated with a decision to withdraw or withhold life support in brain-injured patients requiring mechanical ventilation >24 hours. Then, we analyzed outcomes and time to death in patients with a decision of withdrawal or withholding of life support. The factors associated with withdrawal or withholding of life-sustaining therapies were determined using logistic regression model.

Results and Discussion: In 793 brain-injured patients from 20 French ICUs in 18 university hospitals, a decision of withdrawal or withholding life support was taken in 171 patients (22%), of which 89% were dead at day 90. Out of the 247 (31%) deaths recorded at day 90, 153 (62%) were observed after a decision of withdrawal or withholding life support. Among the 18 patients with a decision and still alive at day 90, 3 patients (2%) presented a Glasgow Outcome Scale (GOS) 2 (moderate disability), 9 patients (5%) a GOS 3 (severe disability) and 5 patients (3%) a GOS 4 (persistent vegetative state). Among the patients who died within 3 months, the mean time between admission to death, when a decision of withdrawal or withholding of life-sustaining therapies was made was 16 ± 17 , vs 18 ± 20 days when no decision was made ($p < 0.9243$). Older age, mydriasis, Glasgow Coma Scale <7, barbiturates use, acute respiratory distress syndrome and worsening lesions on CT-scan were independently associated with withdrawal or withholding of life-sustaining therapies.

Conclusion(s): We provided here factors associated with the decision of withholding or withdrawing life-sustaining therapies, as well as outcomes and delay to death in case of such a decision in a nationwide cohort of brain-injured patients. Additional data such as the type of decision (withholding or withdrawing), information about a next-of-kin consultation, advanced directives or personal beliefs of the patients are lacking and should be recorded in future studies.

13AP01-2

Frequency resonance further improves oxygenation during variable ventilation in experimental ARDS

Huhle R., Güldner A., Kiss T., Bluth T., Koch T., Gama de Abreu M. Universitätsklinikum Dresden, Dept of Anaesthesiology, Dresden, Germany

Rationale: In experimental acute respiratory distress syndrome (ARDS), random variation of tidal volumes (V_T) during volume-controlled ventilation (variable ventilation) improves gas exchange and respiratory system mechanics (stochastic resonance hypothesis). We hypothesized that the positive effects of variable ventilation on lung function may be further improved by periodic V_T variation at specific frequencies, so-called frequency resonance.

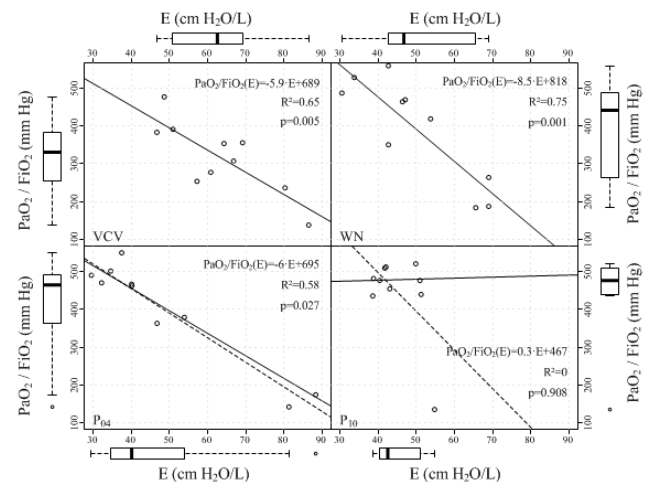
Methods: In anaesthetised and mechanically ventilated pigs, ARDS was induced by saline lung lavage and injurious V_T (double-hit model: repeated lung lavage followed by ventilator induced lung injury). Animals were then randomly assigned to 6 h of ventilation with one of four V_T patterns:

1. random variation of V_T (WN);
2. $P_{0.13}$, periodic V_T variation at a frequency of 0.13 Hz;
3. $P_{0.05}$, periodic V_T variation at a frequency of 0.05 Hz;
4. VCV, conventional non-variable volume controlled ventilation.

In groups with variable V_T , the coefficient of variation was identical (30%). We assessed lung mechanics and gas exchange, and determined lung histologic damage and inflammation.

Results: Compared to VCV, WN, $P_{0.13}$, and $P_{0.05}$ resulted in lower respiratory system elastance (63 ± 13 cm H₂O/L versus 50 ± 14 cm H₂O/L, 48.4 ± 21 cm H₂O/L and 45.1 ± 5.9 cm H₂O/L respectively, $P < 0.05$ all), but only $P_{0.13}$ improved PaO_2/FiO_2 after six hours of ventilation (318 ± 96 vs. 445 ± 110 mm Hg, $P < 0.05$). After 6 h, correlation between respiratory system elastance and PaO_2/FiO_2 was highest in the WN group and decreased with decreasing V_T variation frequency, with the lowest V_T variation frequency showing the lowest correlation (Figure 1). Cycle-by-cycle analysis of lung mechanics suggested inter-tidal recruitment/de-recruitment cycling in $P_{0.13}$. Lung histologic damage and inflammation did not differ among groups.

Conclusion: In this model of experimental ARDS, periodic V_T variation at a specific frequency (frequency resonance) further improved oxygenation, but not respiratory system elastance, during variable ventilation.



(Figure 1. Per group correlation analysis PaO_2/FiO_2 and E at time 6 with linear regression lines of all animals with (—) and without (---) outliers.]

13AP01-3

Effect of PEEP and I:E ratio on cerebral oxygenation in ARDS: an experimental study in anaesthetised rabbits

Lovisari F.¹, Albu G.², Habre W.², Bayat S.²

¹San Gerardo Hospital, University of Milan-Bicocca, Dept of Anaesthesiology & Intensive Care, Monza, Italy, ²University Hospitals of Geneva, Dept of Anaesthesiology, Geneva, Switzerland

Background and Goal of the Study: Although PEEP and inverted I:E ratio have been shown to improve gas exchange in ARDS, both can adversely affect systemic haemodynamics and cerebral perfusion. The impact of these ventilatory settings on cerebral perfusion and oxygenation, which can affect neurological outcome, is not known. The goal of this study was to assess how changes in PEEP and I:E ratio affect systemic and cerebral perfusion and oxygenation in normal and injured lung.

Materials and Methods: The experiments were performed on 6 anaesthetised Chinchilla-Bastard rabbits (3.5 ± 0.3 kg), ventilated in PRVG mode at baseline (TV 6 ml/kg, PEEP 6 cmH₂O, FIO_2 0.4, RR for $PaCO_2 = 40$ mmHg) in random I:E order of 1:2, 1:1 or 2:1. Successively, lung injury was induced by a multiple hit model including IV lipopolysaccharide (300 mcg/kg), whole lung normal saline lavage (100 ml/kg) and 10 min injurious ventilation (TV 10 ml/kg, PEEP 0 cmH₂O FIO_2 1).

The animals were subsequently ventilated in PRVG mode (TV 6 ml/kg, FIO_2 0.4, RR for $PaCO_2 = 40$ mmHg) with PEEP 9 and then 6 cmH₂O in random I:E order. Arterial blood gases, cardiac output (CO measured by PICCO), ultrasonic carotid artery flow (CAF), and changes in cerebral oxygenation using Near Infra-Red Spectrometry (ΔHbO_2), were recorded in each experimental condition.

Results: At baseline, changes in I:E ratio had no significant effect on CO, PaO₂ or ΔHbO₂, but reduced CAF. After lung injury, CAF significantly increased vs. Baseline (52.4±10 vs. 27.8±9.2 ml/min, p<0.05) while PaO₂ (42.2±8.4 vs. 190.2±7.7 mmHg p<0.05) and ΔHbO₂ (-43.5±21.3 p<0.05) decreased.

An increase in PEEP to 9 cmH₂O improved PaO₂ (67.5±19.3, p<0.05) and ΔHbO₂ (-13.8±14.7, p<0.05) vs. PEEP 6, despite a lower CAF, and did not significantly affect CO. Increasing I:E to 2:1 significantly increased PaO₂ only on PEEP 9 (150.5±101.5 mmHg, p<0.05), but reduced CAF (28.4±5.2 vs. 37.1±11.3 ml/min, p<0.05), without significantly affecting ΔHbO₂ or CO.

Conclusions: In rabbits with lung injury, a small increase in PEEP decreased CAF but significantly improved PaO₂, resulting in an improved cerebral oxygenation. Increased I:E ratio further improved PaO₂ depending on PEEP, but reduced CAF, without an overall effect on ΔHbO₂. The effect of ventilation strategies on changes in cerebral oxygenation depend on their combined effects on cerebral perfusion and systemic gas exchange parameters.

13AP01-4

Lung protective ventilation in a non-ARDS setting: a tertiary centre survey and audit

Buyse K., Van der Laenen M., Mesotten D., Ward E.
Ziekenhuis Oost Limburg, Dept of Anaesthesiology & Intensive Care, Genk, Belgium

Background and Goal of Study: Lung protective ventilation (LPV), with tidal volume (TV) 6 ml/kg ideal body weight (IBW), improved outcome in patients with acute respiratory distress syndrome¹. Also after major abdominal surgery LPV (TV: 6-8 ml/kg IBW) reduced the rate of complications². While in guidelines LPV is recommended, its acceptance and compliance rate is yet unclear.

Materials and Methods: A survey among ICU healthcare workers (staff: 31, trainees: 34, nurses: 99) of our 36-bed mixed ICU, assessed their understanding of calculating IBW and determining the initial tidal TV by means of 3 cases (BMI 19, 26, 39). We also assessed their level of LPV approval in a non-ARDS setting.

To audit the daily practice of LPV, a retrospective analysis of ventilator settings was performed in all cardiac surgery patients (n=240) who were admitted to the ICU between June and November 2016. TVs, measured 2 hours after arrival in the ICU, were analysed in correlation with quality cut-offs for LPV: >8 ml/kg IBW and >10 ml/kg IBW.

Results and Discussion: 28 (90%) staff, 28 (82%) trainees and 43 (43 %) nurses responded to the survey. Over all cases 35 (42%), 17 (20%) and 54 (42%) staff, trainees and nurses respectively used TV >8ml/kg. 4 (5%), 0 (0%) and 9 (5%) staff, trainees and nurses respectively used TV >10 ml/kg IBW. Trainees (20%) used less TV of >8ml/kg IBW than staff (42%) and nurses (42%) (P<0.002). 23 (82%), 28 (100%) and 35 (81%) staff, trainees and nurses respectively approved LPV in a non-ARDS setting.

In the retrospective analysis all 240 patients were on volume controlled ventilation. Mean delivered TV was 8.2 ml/kg IBW (+/-SD, ±1). However, 139 (57.9%) patients received TV of >8ml/kg IBW and 16 (6.7%) TV of >10 ml/kg IBW. TV >8 ml/kg IBW occurred in 46 (68%) of obese (68/240) patients (P=0.06). 50/60 (83%) females received TV >8 ml/kg IBW in contrast to 89/180 (49%) males (P<0.001).

Conclusion(s): Although the majority of our ICU healthcare workers advocated LPV in a non-ARDS setting, a too large proportion of patients, notably females and obese, were exposed to high TV.

References:

1. N Engl J Med. 2000;342:1301-8.
2. N Engl J Med. 2013;369:428-37.

13AP01-5

The role of melanocortin Rc agonist BMS-470539 on LPS induced inflammatory cell activation and acute lung injury

Kwak S., Bae H., Jeong S.
Chonnam National University Medical School and Hospital, Dept of Anaesthesiology & Intensive Care, Gwangju, Korea, Republic of

Background and Goal of Study: Despite advances in the management of sepsis and acute respiratory distress syndrome, the mortality rate remains high. Over-activation of inflammatory cells involving macrophages and neutrophils are associated with multiple organ failure under those conditions. Thus, nontoxic molecules that regulate inflammatory cells may provide a novel therapeutic strategy. This study was performed to evaluate the effects of Melanocortin Rc agonist BMS-470539 on LPS-induced acute lung injury and the possible mechanism of action in a murine model.

Materials and Methods: To assess the anti-inflammatory effect of BMS-470539 on LPS induced inflammatory cells activation, RAW 264.7 cells were incubated with various concentrations of BMS-470539 (0, 1, 10, 100 nM) for 1 hour and then incubated with or without LPS (100ng/ml) for 6 hours, and then the amounts of TNF-α and MIP-2 proteins were determined. To elucidate the intracellular signaling pathway, cells were incubated with BMS-470539 (100nM) for 1 hour and then incubated with or without LPS (100ng/ml) for 30 min, and the levels of active, phosphorylated forms of MAPKs (p38, ERK1/2, JNK) were determined.

We also examined the effect of BMS-470539 (20mg/kg, IP) on acute lung injury and mortality of mouse treated with LPS(20mg/kg, IP) to determine whether these effects of BMS-470539 also have in vivo significance.

Results and Discussion: BMS-470539 inhibited the production of TNF-α and attenuated phosphorylation levels of ERK1/2 and JNK, but not p38, in RAW264.7 cells stimulated with LPS. BMS-470539 also attenuated the production of TNF-α and the phosphorylation of ERK1/2 in the lungs of mice administered LPS. BMS-470539 reduced the wet/dry weight ratio, histological severity, and neutrophil accumulation in the lungs and improved mortality after LPS treatment.

Conclusion(s): BMS-470539 attenuated LPS-induced lung injury by suppressing TNF-α production as well as ERK1/2 and JNK activation in macrophage stimulated with LPS.

13AP01-6

Long-term variable controlled ventilation in severe acute respiratory distress syndrome - an experimental randomized controlled study

Güldner A., Kiss T., Bluth T., Braune A., Koch T., Gama de Abreu M.
University of Dresden, Dept of Anaesthesiology & Intensive Care, Dresden, Germany

Background and Goal of Study: Mechanical ventilation with variable tidal volumes (VT) is able to improve lung function and attenuate ventilator induced lung injury (VILI) in acute respiratory distress syndrome (ARDS). Previous investigations on variable ventilation have been limited to mild or moderate ARDS and short periods of mechanical ventilation. Therefore, we hypothesized that 24h of variable ventilation improves lung function and reduces VILI in experimental severe ARDS.

Material and methods: A double hit model of lung injury, lung saline lavage followed by mechanical ventilation with high VT (~20 mL/kg), was used to induce severe ARDS in 14 anesthetized pigs. After lung injury had been established, animals were randomly assigned to variable or conventional volume controlled ventilation with the following ventilatory settings: PEEP and FIO₂ titrated according to the low FIO₂/PEEP table of the ARDS network, and respiratory rate adjusted to arterial pH >7.30. During variable ventilation, mean VT was set at 6 ml/kg and randomly varied (normal distribution, coefficient of variation of 30%), while limiting mean plateau pressure (Pplat) to 30 cmH₂O and max Pplat to 45 cmH₂O. During conventional ventilation, VT was set at 6 ml/kg and Pplat limited to 30 cmH₂O. Gas exchange, hemodynamics and lung mechanics were assessed during 24 hours. Lung aeration was determined by computed tomography (CT) following induction of ARDS and 24h thereafter. Positron emission tomography (PET) was used to assess lung regional [18F] fluorodeoxyglucose ([18F]FDG) uptake, as well as the distribution of perfusion by 68Ga labelled microspheres.

Results: After 24h, the specific uptake rate of [18F]FDG increased in all lung regions while perfusion was redistributed towards ventral and cranial lung regions and a higher amount of non-aerated lung tissue was detected during both, variable and conventional, ventilation. Lung mechanics, gas exchange and hemodynamics did not differ between groups.

Conclusion: Compared to conventional, variable controlled ventilation neither enhanced lung function nor reduced lung inflammation after 24h of mechanical ventilation in this model of severe ARDS.

13AP01-7

Are “off hours” intubations a risk factor for complications during intubation?

Calvo Rey A., Ramas Diez M., Doldán Pérez P.N., Torres Rodríguez D., Taboada Muñiz M., Álvarez Escudero J. *Complejo Hospitalario Universitario de Santiago de Compostela, Dept of Anaesthesiology & Intensive Care, Santiago de Compostela, Spain*

Background and Goal of Study: Several studies have suggested worse outcomes for patients requiring medical care at night or on weekends. The objectives of this study was to compare technical difficulty of intubation and the incidence of complications of in-hours versus off-hours intubated patients.

Materials and Methods: All intubations performed in our Critical Care Unit during a 23-month period were entered into a prospective collected quality control database. Our main outcomes of interest were compare technical difficulty of intubation, and the incidence of major complications of in-hours versus off-hours intubated patients. Off-hours intubations included patients who were intubated at nighttime (8.00 PM-7.59 AM) plus weekends/holidays whereas the in-hours intubations included regular daytime weekdays (Monday to Friday: 8:00 AM-7:59 PM).

Results and discussion: Over the 23-month study period (November 2014-September 2016), a total of 219 patients were intubated, of which 107 (48,8%) were intubated during off hours and 112 (51,2%) were intubated in hours. No difference were observed between the two groups in technical difficulty of intubation and in the incidence of major complications. Results are presented in table 1. Recently Ono et al (2) found an association between off hours and airway-related complications in a community emergency department in Japan. They imply the need to improve consistent care during nights and weekends.

	All (n=219)	In hours (n=112)	Off hours (n=107)	P value
Intubation attempts				
1 or 2	212 (96,8)	107 (95,5%)	105 (98,1)	ns
>=3	2 (0,9)	2 (1,8%)	0 (0)	ns
Adjunct to DL used	43 (19,6)	22 (19,6%)	21 (19,6%)	ns
Cormack-Lehane grade				
1	117 (53,4)	60 (53,6)	58 (54,2)	ns
2a	56 (25,6)	32 (28,6)	24 (22,4)	ns
2b	23 (10,5)	9 (8)	14 (13,1)	ns
3	16 (7,6)	7 (6,2)	9 (8,4)	ns
4	1 (0,5)	1 (0,9)	0 (0)	ns
Intubation complications	90 (41)	43 (38,4)	47 (43,9)	ns
Hypotension	65 (29,7)	34 (30,4)	31 (29)	ns
Hypoxia	40 (18,3)	17 (15,2)	23 (21,5)	ns

[Table 1. Characteristics and procedural complications rates between in -hours and off-hours intubations]

Conclusion: In the present study, “off hours” intubations were not associated with an increase in technical difficulty of intubation and in the incidence of major complications. Further studies are required to confirm these findings.

References:

- Cavallazzi R, Marik PE, Hirani A, et al. Association between time of admission to the ICU and mortality: a systematic review and metaanalysis. *Chest* 2010; 138: 68-75
- Ono Y, Sugiyama T, Chida Y, et al. Association between off-hour presentation and endotracheal-intubation-related adverse events in trauma patients with a predicted difficult airway: a historical cohort study at a community emergency department in Japan. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine* 2016; 24: 106

13AP01-8

Deresuscitation guided by global end-diastolic volume or extravascular lung water in sepsis and ARDS

Fot E., Ushakov A., Smetkin A., Kuzkov V., Kirov M. *Northern State Medical University, Dept of Anaesthesiology & Intensive Care, Arkhangelsk, Russian Federation*

Background and Goal of Study: The aim of our study was to compare the fluid therapy guided by global end-diastolic volume index (GEDVI) or extravascular lung water index (EVLWI) in sepsis and ARDS.

Materials and Methods: Twenty-five patients with sepsis and ARDS, receiving mechanical ventilation more than 24 hours, were enrolled into a prospective randomized study. All patients received invasive hemodynamic monitoring using transpulmonary thermodilution (PiCCO₂, Pulsion, Germany).

Patients were randomized into two groups of fluid therapy guided by either GEDVI (n = 14) or EVLWI (n = 11). Depending on randomization, the patients received active deresuscitation by means of diuretics or renal replacement therapy (RRT) in case of GEDVI >650 ml/m² or EVLWI >10 ml/kg.

The primary goal of deresuscitation was the achievement of fluid balance at 48 hours from 0 to -3000 ml. In case of GEDVI <650 ml/m² or EVLWI <10 ml/kg, the target fluid balance was in range from 0 to 3000 ml. The measurements included hemodynamics and blood gases.

The statistical analysis was performed using Mann-Whitney U-test, Wilcoxon test and chi-squared test. Data are presented as median (25th-75th percentiles). A p value <0.05 was regarded as statistically significant.

Results and Discussion: We found no baseline differences in the studied parameters between the groups. Totally, 55% of patients in the EVLWI group and 21% in the GEDVI group did not require active deresuscitation.

The goal-directed therapy during 48 hours guided by GEDVI decreased EVLWI from 11 (8 - 14) to 9 (8 - 10) ml/kg (p=0.047) and lactate concentration from 2.5 (1.6 - 3.1) to 1.9 (1.3 - 1.9) mmol/L (p=0.03) and tended to improve PaO₂/FiO₂ (p=0.06), reduce plasma creatinine (p=0.05) and number of RRT (p=0.07).

By contrast, in the EVLWI group we observed the increment of EVLWI from 10 (8 - 16) to 15 (9 - 19) ml/kg (p=0.04) without any changes in lactate or oxygenation. The GEDVI group had a trend for more negative target fluid balance during 48 hours: -2545 (-3174 - -680) ml vs. -1475 (-1939 - +757) ml in the EVLWI group (p=0.15). The survival rate and the number of ventilator-free days did not differ between the groups.

Conclusion(s): In sepsis and ARDS, the deresuscitation protocol aiming to maintain GEDVI <650 ml/m² attenuates pulmonary edema and hypoperfusion more efficiently as compared to the fluid management guided by EVLWI alone.

13AP01-9

Estimation of the role of noninvasive positive pressure ventilation (NPPV) and invasive positive pressure ventilation (IPPV) in patients with mild to moderate ARDS, caused by community acquired pneumonia

Yamakova Y.¹, Ilieva V.¹, Petkov R.², Dimitrov Y.¹, Velev B.¹

¹University Hospital of Pulmonary Diseases, St. Sofia, Medical University, Dept of Anaesthesiology & Intensive Care, Sofia, Bulgaria, ²University Hospital of Pulmonary Diseases, St. Sofia, Medical University, First Therapeutic Clinic, Sofia, Bulgaria

Background and Goal of Study: The effectiveness of non-invasive positive pressure ventilation (NPPV) in acute hypoxaemic respiratory failure varies widely because of its heterogeneous etiology. There is not enough evidence to support the superiority of NPPV in comparison to IPPV. But it is established that NPPV in adults with acute respiratory distress syndrome (ARDS) improves the oxygenation, reduces the work of breathing and decreases the incidence of ventilator-associated pneumonia.

The goal of our study is to estimate the value of NPPV in patients with caused by community acquired pneumonia (CAP) mild to moderate ARDS.

Materials and Methods: We observed 55 patients with mild to moderate ARDS, caused by CAP. Patients were separated in two groups: a prospective NPPV group of 33 patients for the period between 01.01.2015 and 01.12.2016 and a retrospective IPPV group of 22 patients in the period between 01.01.2014 and 01.01.2015.

We compared the demographic characteristics, SAPS II score, time of onset of ventilation, results of blood gas analysis on admission, 1st and 24th hour from the start of ventilation, length of ICU stay, days of ventilation and mortality.

Results and Discussion: In comparison to IPPV, NPPV improved gas exchange, avoided intubation in 28 patients and significantly decreased ICU mortality. In table 1. we represent the main results of our study (the mean values of the researched variables with their standard deviation).

Variable	NPPV group	IPPV group	p value
SAPS score	37.9 ± 18.47	30.9 ± 10.34	NS
Respiratory rate on admission	31.44 ± 6.11	29.55 ± 3.9	NS
PaO ₂ /FiO ₂ on admission	135.02 ± 32.44	127.5 ± 23.73	NS
PaO ₂ /FiO ₂ after 1h	148.99 ± 48.6	73.35 ± 19.5	<0.001
PaO ₂ /FiO ₂ after 24h	157.74 ± 68.97	81.82 ± 32.2	<0.001
Onset of ventilation (min after admission)	46.5 ± 12	190.5 ± 50	<0.001
ICU length of stay (days)	7.4 ± 4.1	13.7 ± 3.2	<0.05
Duration of ventilation (days)	4.09 ± 2.7	10.07 ± 2.8	<0.05
Mortality (%)	4.5%	59.1%	<0.001

[Comparison of variables in the two groups]

Conclusion: In severe community acquired pneumonia with mild to moderate ARDS without signs of shock and multi-organ failure early application of NPPV lowers the frequency of intubation, the complications, associated with invasive ventilation, and the overall mortality.

13AP01-10

Quantification of pulmonary inflammation in experimental ARDS using static vs. dynamic positron emission tomography

Braune A., Güldner A., Bluth T., Kiss T., Koch T., Gama de Abreu M., Pulmonary Engineering Group
University Hospital Carl Gustav Carus, Dept of Anaesthesiology & Intensive Care, Dresden, Germany

Background and Goal of Study: Positron emission tomography (PET) imaging using 18F-FDG followed by mathematical modelling of the pulmonary uptake rate of 18F-FDG (K_t) has been frequently used for assessment of pulmonary inflammation in acute respiratory distress syndrome (ARDS). However, dynamic PET covers only a 15cm cranio-caudal field of view and requires 60-75min. It has been shown in patients with liver metastasis that K_t values are highly correlated with tumor-to-blood standard uptake ratios (SUR), derived from the last frame of a 60min dynamic 18F-FDG-PET scan [van den Hoff et al., EJNMMI Research 2013;3(1):77]. We investigated whether K_t values derived from dynamic 18F-FDG-PET scans correlated with SUR derived from static 18F-FDG-PET scans in experimental ARDS.

Methods: Lung injury was induced by saline lavage and ventilation with high tidal volumes in 12 pigs. After injury (day1) and after 24h of mechanical ventilation (day2) 18F-FDG uptake was quantified as K_t using the Patlak analysis of dynamic PET frames 15-75min after 18F-FDG injection. Mean K_t values were calculated for 5 isogravimetric regions along the ventro-dorsal gradient. Static 18F-FDG-PET scans were obtained immediately after dynamic PET scans (77-81min after 18F-FDG injection). Mean SUR values were calculated for the same regions as used for K_t analysis, using plasma activity measurements interpolated for the timepoint of static PET scans.

Correlation between K_t and SUR were investigated by means of linear regression of all regions and animals (n=60) on day1 and day2, respectively, and coefficients of determination (r^2) were compared. 18F-FDG-activity in blood plasma was determined for samples taken during dynamic PET scans. Plasma activities were time-averaged and analyzed for all animals and both days (n=24).

Results: SUR was linearly correlated with K_t within all subregions, both on day1 ($r^2=0.83$) and day2 ($r^2=0.96$). Time-averaged plasma 18F-FDG-activities exhibited an essentially invariant shape across all animals and timepoints, resulting in similar average mean-normalized plasma activities at the timepoint of the static PET scans (0.29 ± 0.04).

Conclusion: For quantification of pulmonary inflammation in experimental ARDS, SUR determined with static PET scanning is a valuable and faster alternative to dynamic PET scanning and Patlak analysis. The relatively high SUR- K_t correlation is likely explained by low inter-study variability of the plasma input function.

13AP02-1

Role of aminophylline in transitioning long term ventilator dependent patients out of the Intensive care unit

Kumar K., Arora M.K., Pandey R.K.

All India Institute of Medical Sciences, Dept of Anaesthesiology & Intensive Care, New Delhi, India

Background: Long-term ventilator dependent (LTVD) patients consume a major chunk of the resources of any intensive care unit (ICU). Shielding them from nosocomial infections and transitioning them out of the ICU is a herculean task that every intensivist confronts day in and out. And to the intensivist despair there is no standard therapy, apart from nutritional and physiotherapy to help the LTVD patients pass the standard spontaneous breathing protocols and thereby, liberation from the ventilator. As Aminophylline has been shown to improve diaphragmatic contractility in humans, we used aminophylline infusion as a strategy to liberate LTVD patients from ventilatory support.

Case report: In the year 2014-15 at our institutional ICU, we administered aminophylline infusion to three patients who had received ventilatory support for more than a month and failed multiple attempts of weaning. All the three were on pressure support ventilation and the pressure support couldn't be reduced despite adequate nutrition and physiotherapy. In these patients, we gave a loading dose of Aminophylline 5mg/kg over 30 minutes in 100ml normal saline and a maintenance infusion at 0.5mg/kg/hr for 48 hours with continuous ECG, ventilatory monitoring, 12 hourly ABG and drug plasma level monitoring. All the three patients had a remarkable decrease in Rapid Shallow Breathing Index (f/V_T) over 48 hours along with slight improvement in paO₂. Pressure support was gradually reduced and all the three patients were liberated off the ventilator by the third day. There were no significant changes in ECG during the infusion period except an increase in heart rate of about 15-20 beats per minute, which got settled after the infusion was discontinued after 48 hours. Finally, the patients were shifted to a step down rehabilitation ward on fifth day.

Discussion: Aminophylline has been shown to directly increase the strength of contraction of diaphragmatic muscles in experimental studies. In this report, we describe the use of aminophylline clinically in LTVD patients to increase their diaphragmatic activity to wean them out of the ventilator.

Learning points Aminophylline infusion can be used as an adjunct for weaning of LTVD patients and ultimately transitioning them out of the ICU.

13AP02-3

Minitracheostomy may facilitate hospital discharge of cardiac surgical patients who require prolonged postoperative mechanical ventilation: a single-centre retrospective cohort study

Katakura Y.¹, Takaki S.¹, Tsuji S.², Yamaguchi Y.¹, Yamaguchi O.¹, Goto T.¹

¹Yokohama City University Graduate School of Medicine, Dept of Anaesthesiology & Intensive Care, Yokohama, Japan, ²Yokohama Minami Kyosai Hospital, Dept of Anaesthesiology, Yokohama, Japan

Background and Goal of Study: Minitracheostomy (MT) facilitates suction of tracheal secretion in the extubated patients. After lung surgery, prophylactic MT has been reported as an effective device to treat or prevent sputum retention. However, its efficacy in cardiac surgical patients remains unknown. The aim of this study was to assess whether prophylactic MT shortens hospital and ICU stays by preventing extubation failure in cardiac surgical patients who needed prolonged mechanical ventilation postoperatively.

Materials and Methods: We retrospectively analyzed the data of those patients who were admitted to the intensive care unit of Yokohama City University Hospital from 2009 to 2016 and needed mechanical ventilation for more than 48 hours after cardiac surgery. The decision to place MT was at the discretion of the clinicians in charge of each case. The patients were classified into two groups: MT group who received MT with extubation and Ex group who were extubated without MT. Primary outcome was the duration of hospital stay, and the secondary outcomes were reintubation rate, ventilator free days (VFD), and the days of ICU stay.

Results and Discussion: Of 120 patients enrolled to the study, MT and Ex groups included 36 and 84 patients, respectively. The median (Interquartile range) duration of hospital stay (days) was similar between the two groups. (MT: 50(36-74) vs Ex: 37 (27-67), p=0.49, Mann-Whitney U test). Cox propor-

tional hazards model revealed that, when compared to the Ex group, the MT group was associated with shorter VFD (MT: 20 (17-22) vs. Ex: 24(23-25), hazard ratio (HR) 3.46(1.86-6.42), $p < 0.001$), longer ICU stay (MT:10(8 to 15) vs. Ex: 5(4-7), HR 2.44 (1.29-4.62), $p = 0.006$), and higher reintubation rate (MT: 13/34(38%) vs. Ex: 10/87(11%), $p = 0.002$).

Conclusion(s): Our data demonstrated that, although the MT group was sicker and had worse secondary outcomes, the primary outcome (the hospital stay) was similar to that of the Ex group. These results suggest that MT may facilitate hospital discharge in patients who need prolonged mechanical ventilation after cardiac surgery.

13AP02-4

Weaning difficulty...what can I do? Role of the ecography in the dissolution of mechanical ventilation

Bellón López de Antón-Bueno B.¹, López Palanca S.²

¹Hospital General Universitario Albacete, Dept of Anaesthesiology & Intensive Care, Albacete, Spain, ²Hospital General Almansa, Dept of Anaesthesiology & Intensive Care, Albacete, Spain

Background: Ultrasonography has been consolidated as an essential tool to assess cardiopulmonary insufficiency in critical care areas, offering innovative applications, such as its potential utility in the weaning process of mechanical ventilation, not only allowing an assessment of lung function, but also of the cardiac, diaphragmatic and quantification functions of pleural effusion.

Case report: A 72-year-old man with a history of left lower lobectomy, severe COPD and severe ventricular dysfunction admitted to a resuscitation unit for polytrauma after aggression. In the lesion balance after Total-Body CT, TBI was assessed with SAH and bilateral contusive foci, fracture of nasal bones, right lung contusion with fracture of 2-6 right costal arches and mild hepatic contusion. The patient arrives at a resuscitation unit in spontaneous ventilation, requiring orotracheal intubation due to a drop in the GCS score and respiratory failure. Important difficulty in weaning mechanical ventilation with percutaneous tracheostomy at the 10th day of admission due to prolonged MV prediction. Outstanding in the evolution is the appearance of repeated right pleural effusions and left atelectasis. The daily evaluation of the chest radiography does not meet drainage criteria (according to thoracic surgery), and a right lung ultrasound is performed, where it is objective and draining up to 1500 ml on several occasions. The patient was decannulated and discharged to the plant at 40 days of admission.

Discussion: In usual practice, both physiology and known causes of weaning failure support the use of ultrasound to identify those patients who are at high risk of failure, so as to optimize physiological function, thus improving the probability of interruption with successful ventilatory support.

References: Ultrasonography evaluation during the weaning process: the heart, the diaphragm, the pleura and the lung. PMayo, G.Volpicelli, N.Lerolle, A.Schreiber, PDoelken and A.Vieillard-Baron. Intensive Care Med 2016.

Learning Points:

- Failure to wean mechanical ventilation is multifactorial; There is a complex interrelationship between pulmonary and cardiac dysfunction.
- We emphasize ultrasound as an essential tool for assessing cardiopulmonary insufficiency in critical care units.

13AP02-5

Dynamic changes of oxidants in severe acute respiratory distress syndrome

Sarkele M.¹, Ozolina A.¹, Ievins T.², Silova A.³, Sabelnikovs O.¹, Vanags I.¹

¹Riga Stradins University, Dept of Anaesthesiology & Intensive Care, Riga, Latvia, ²Paul Stradins Clinical University Hospital, Emergency Care, Riga, Latvia, ³Riga Stradins University, Biochemistry Lab, Riga, Latvia

Background and Goal of Study: Acute respiratory distress syndrome (ARDS) represents a severe respiratory failure characterized by hypoxia and non-hydrostatic pulmonary edema with bilateral opacities on frontal chest radiographs. ARDS occurs within 1 week of a triggering event and might be the result of a direct lung injury, as pneumonia, or an indirect lung injury,

like pancreatitis or sepsis. It is known that disbalance between cell produced oxidants and antioxidants may play a role in pathogenesis and outcome in severe ARDS patients. The goal of this study was to investigate the dynamic changes of the level of oxidants and outcome in patients with acute respiratory distress syndrome.

Materials and Methods: Patients were included according to the criteria: mechanical

lung ventilation 24 hours in patients over 18 years of age and acute severe pneumonia, pancreatitis or sepsis. The study was approved by the Ethics Committee of Rīga Stradins University. Patients with ARDS were monitored for seven days. The ARDS was diagnosed according to the Berlin definition criteria. Blood samples were taken on the 1st and 4th day after inclusion. Medians and interquartile ranges (IQR) were calculated for biomarker serum levels. The Wilcoxon Signed Rank Test was used for testing significant differences of dependent events and the Mann-Whitney U Test for respective independent events. Statistical significance was assumed $p < 0.05$. Statistical calculations were performed using the SPSS 21.0 programme.

Results and Discussion: Seventy five patients were observed, including 16 with severe ARDS. Statistically significant dynamic changes were shown for MDA, from median value of 2[2-3] μM in the 1st day and 2[1-2] μM on the 4th day ($p = 0.01$, Wilcoxon Signed Rank Test). Level of the biomarker nitric oxide decreased from 26.4[18.3-51.2] μM on the 1st day to 20.4[10.1-40.9] μM on the 4th day and this change was significantly different ($p = 0.03$, Wilcoxon Signed Rank Test). Nine patients of 16 with severe ARDS were not survived. Non-survivors had significantly higher level of the oxidant TBS_MDA (11.5[8.2-16.1] μM) at the 1st day if compare with survivors, where the level of TBS_MDA was 4.6[3.2-7.1] μM ($p = 0.03$, Mann-Whitney U Test).

Conclusions:

1. Increased level of TBS_MDA is related with the poor outcome in severe ARDS patients.
2. There are dynamic changes in level of oxidants, that shows their potential predictive value in patients with developing ARDS.

13AP02-6

Selenium and glutathione peroxidase levels in patients with acute respiratory distress syndrome

Tincu R.¹, Cobilinschi C.¹, Tincu I.², Ghiorghiu Z.¹, Macovei R.A.¹

¹Emergency Clinical Hospital of Bucharest, Dept of Anaesthesiology & Intensive Care, Bucharest, Romania, ²Grigore Alexandrescu' Emergency Children Hospital, Emergency Department, Bucharest, Romania

Background and Goal of Study: Selenium has a critical role in antioxidant response. It is implicated in over 25 selenoproteins. Low plasma selenium concentration was observed in critical ill patients due to systemic inflammation and it is associated with decrease of antioxidant capacity. We were aimed to determine the selenium and glutathione peroxidase (GPX) levels in patients with acute respiratory distress syndrome (ARDS) and the correlation with systemic inflammatory response.

Materials and Methods: We performed a prospective study including 30 patients with moderate ARDS (according to Berlin criteria), as study group, admitted in Critical Care-Toxicology Unit for suicide attempt. For comparison we selected 26 patients without ARDS. We excluded cases that could interfere with antioxidant response. The outcome variable were ARDS severity (use Berlin criteria), selenium level, C-reactive protein (CRP) level, body mass index (BMI) for nutritional status, glutathione peroxidase. Blood samples were obtained at the moment of diagnosis.

Results and Discussion: Serum selenium concentrations on admission were 69.45 ± 24.6 ng/mL in ARDS patients, significantly lower than in non-ARDS group, 99.66 ± 21.22 ng/dL, $P < 0.001$. In the study group, 5 patients experiments severe ARDS, having the lowest selenium and GPX levels, $p < 0.005$. Poor nutrition status, represented by BMI lower than 20, was correlated with low levels of selenium ($R^2 = 0.205$, $P < 0.005$). Moreover, on multivariate analysis, low serum selenium was inversely associated with CRP levels ($P < 0.5$) and lactate severe concentration ($P < 0.05$). GPX levels were significantly higher in non-ARDS group than in ARDS patients, OR=2.43, 95% CI 0.99-2.55.

Conclusion(s): Low serum selenium levels in patients with respiratory diseases are correlated with poor nutritional status and systemic inflammatory response on admission. Critical illness stress induced immune suppression is implicated in development of sepsis. ARDS severity modify anti-oxidant selenium mediated response.

13AP02-7

Autosurfactant treatment of acute postoperative respiratory failure

Mustafin A., Mustafin A., Sagimbayev A.

Medical University Astana, Dept of Anaesthesiology & Intensive Care, Astana, Kazakhstan

Background: Autosurfactant replacement therapy is used by us to increase the extensibility of the lung parenchyma. In his introduction took place a clear reduction of the aerodynamic resistance of the airways and increase in tidal volume.

Materials and Methods: Autosurfactant therapy was performed in 20 patients with clinical signs of acute postoperative respiratory failure. Bronchoalveolar lavage (BAL) was obtained from healthy subsegmental bronchi of the lungs, before surgery in an amount of 40-50 ml., it was filtered through a layer of sterile gauze, centrifuged at low temperature for 10 minutes. The supernatant was used for the study of surface-active properties (PAS) of the alveolar surfactant and therapy autosurfactant. Surface Tension (PN) BAL examined by the Wilhelmy scales. In addition, the bronchoalveolar washings examined the content of total lipids, phospholipids, protein and albumin. For the treatment of acute postoperative respiratory failure autosurfactant used with good surface-active properties, where PN minimum was 24 ± 3.0 mN / m.

Results: After introduction autosurfactant there was an increase in tidal volume by 10.3%, decreased aerodynamic drag as you exhale 11.8%, increased lung complians 21.4%. These changes of respiratory function were accompanied by a decrease in work of breathing to overcome the elastic resistance of the lungs. The bronchoalveolar washings obtained from healthy lung areas before surgery, lung surfactant was kept at its optimum biochemical composition, which has good adsorption and distribution, efficient clearance mechanism phospholipids as it is the patient's own surfactant. There are practically no negative qualities of exogenous surfactant. We also took into account that the lavage fluid, according to the literature, the optimal therapy. Autosurfactant replacement therapy is used by us to increase the extensibility of the lung parenchyma. In his introduction took place a clear reduction of the aerodynamic resistance of the airways and increase in tidal volume.

Conclusion: Autosurfactant therapy may prevent the development of ARDS in the development of acute postoperative respiratory failure in the immediate period after surgical. Exogenous surfactant may cause allergic reactions. However autosurfactant not antigenic properties with respect to the recipient and can not cause allergic reactions, because of their biochemical composition, it is the same as in the recipient.

13AP02-8

Metabolic reprogramming by inhibition of prolyl hydroxylases protects alveolar epithelial cells from LPS-neutrophil-induced energy derangements and cell death

Tojo K., Tamada N., Nagamine Y., Ota S., Goto T.

Yokohama City University Graduate School of Medicine, Dept of Anaesthesiology & Intensive Care, Yokohama, Japan

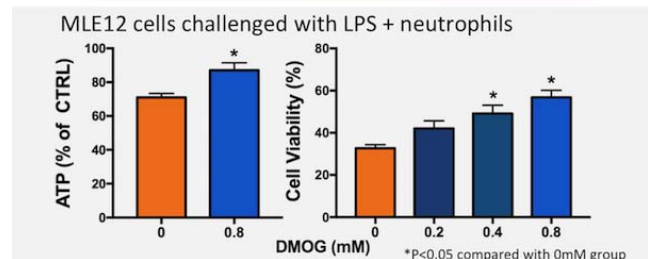
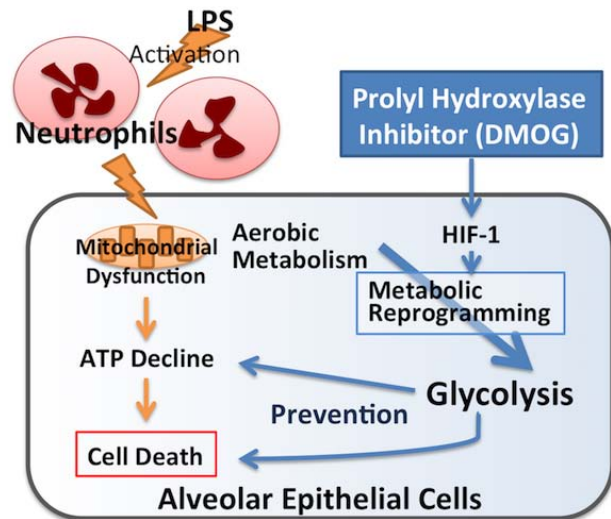
Background and Goal of Study: ARDS causes mitochondrial dysfunction and energy derangements in lungs. We have reported that inhibition of prolyl hydroxylases (PHD), which act as a cellular oxygen sensor, protects alveolar epithelial barrier from LPS-induced injury. The protective effect of PHD inhibition may be mediated by metabolic reprogramming via HIF (hypoxia inducible factor), which shifts energy metabolism from oxidative phosphorylation to glycolysis. In this study, we have investigated the effects of DMOG, a PHD inhibitor, on LPS-neutrophil-induced energy derangements and cell death, and whether the effect is mediated by metabolic reprogramming.

Materials and Methods: Neutrophils isolated from mice were added to MLE12 cells, a murine alveolar epithelial cell line, with or without LPS. 1h prior to the neutrophil challenge, DMOG or vehicle was added to the culture medium. 24h later, cell viability, membrane permeability, and ATP levels were quantified. To clarify the effects of DMOG is dependent on metabolic reprogramming via HIF activation, HIF siRNA transfection or glycolysis inhibition by 2-DG was performed. Moreover, we investigated the effects of DMOG on lung ATP and epithelial cell death in LPS-induced lung injury mice.

Results and Discussion: Neutrophil challenge with LPS to MLE12 cells decreased cellular ATP levels and caused non-apoptotic cell death. DMOG increased cellular lactate production, medium acidification, and glucose con-

sumption, and attenuated the ATP decline and cell death. The protective effect of DMOG was abolished by HIF-1a knock down or glycolysis inhibition by 2-DG, suggesting that metabolic reprogramming via HIF-1 attenuates the cell death. Moreover, intratracheal administration of DMOG to mice attenuated LPS-induced ATP decline in lung tissue and suppressed increase in an epithelial cell death marker, CK18 M65, levels in BALF

Conclusion: PHD inhibition protected lung epithelial cells from LPS-neutrophil-induced energy derangements and cell death through metabolic reprogramming. Metabolic reprogramming from oxidative phosphorylation to glycolysis may be a novel approach to protect alveolar epithelial cells from ARDS.



[Figure]

13AP02-9

Baclofen as adjuvant to weaning from mechanical ventilation in a patient with intractable hiccup. A case report

Gritti P., Ferri F., Martchenko S., Bortolotti G., Longhi L.G., Lorini F.L.

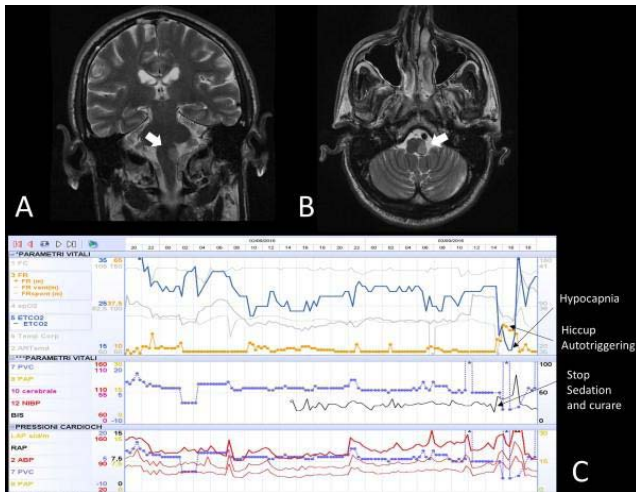
ASST Papa Giovanni XXIII° Bergamo, Dept of Anaesthesiology & Intensive Care, Bergamo, Italy

Background: Lateral medullary syndrome (LMS), better known as Wallenberg syndrome is a pattern of neurologic symptoms due to the tissue ischemia and necrosis of the lateral part of the medulla in the brain. This syndrome is characterized by sensory deficits affecting the trunk and extremities on the opposite side of the infarction and sensory deficits affecting the face and cranial nerves on the same side.

Rarely LMS can resulting in violent and incoercible hiccups.¹

Here we report a case of a patient with a LMS and intractable hiccup who was unweaned by mechanical ventilation until oral baclofen was administered.

Case report: A 50-year-old man was admitted to emergency department with an impaired sensation over left half face vertigo, nystagmus, hiccups, nausea and vomiting. He was also dysphagic, with an impaired sensation over left half face, and contralateral hemibody. Due to the magnitude of the dysphagia and hiccups patient presented an aspiration pneumonia and as a result of respiratory failure required intubation. A further MRI showed an acute left sided dorsal lateral medullary infarct (fig. A,B).



[Fig 1 A, B, C]

However due to violent hiccups mechanical ventilation of the patient resulted impaired, requiring continuous curare administration and impeding the weaning and extubation of the patient (fig C). The hiccups was intractable with the common metoclopramide, chlorpromazine, alprazolam, midazolam, omeprazole and gabapentin.

The patient reported resolution of hiccups 3 hours after 10 mg oral baclofen administration.

Discussion: One of the symptoms that occur due to LMS syndrome are hiccups which involves 14% of patients.¹ The hiccups can be so severe that causes dysphagia, aspiration pneumonia and dis-adaptation to mechanical ventilation. Unfortunately there are very few successful medications available to mediate the inconvenience of constant hiccups. Baclofen, an analog of GABA, decreases the excitability and inhibits the hiccup reflex.

References: M Park et al. Lesional location of lateral medullary infarction presenting hiccups. *J Neurol Neurosurg Psychiatry*. 2005;76: 95-8

Learning points: Baclofen could be effective in treating persistent hiccups following LMS syndrome.

13AP02-10

PaO₂ and PaO₂/FiO₂ are prognostic indicators for patients treated by extra corporeal life support after out hospital cardiac arrest

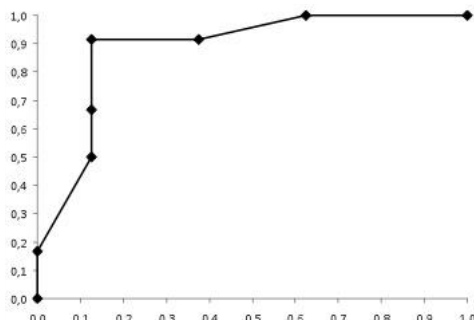
Jouffroy R., Philippe P, Maraffi T, Baud F, Carli P, Vivien B.

APHP - Hôpital Necker Enfants Malades, Dept of Anaesthesiology & Intensive Care, Paris, France

Background and Goal of Study: Detrimental effects of hyperoxia during CPR are well established [1-3] but were not studied in patients treated by extra corporeal life support (ECLS) after out hospital cardiac arrest (OHCA).

The aims of this study was to examine whether values of PaO₂ or PaO₂/FiO₂ (P/F) taken immediately (H0), at 3hours (H3) and 6 hours (H6) after starting ECLS indicate mortality in patients treated by ECLS after OHCA.

Materials and Methods: We performed a retrospective observational study in intensive care unit including 20 consecutive patients. Arterial blood samples were obtained on admission and every 3hours after starting ECLS

[ROC curve for PaO₂ 3hours after ECLS initiation]

Results and Discussion: Both PaO₂ and P/F samples on admission have good prognostic abilities at H0 (area under the curve on receiver operating characteristic analysis of 0.89, 0.68 respectively) and at H3 (area under the curve on receiver operating characteristic analysis of 0.80, 0.72 respectively) and moderate abilities at H6 (area under the curve on receiver operating characteristic analysis of 0.44, 0.65 respectively). The value of the PaO₂ at H0, H3 and H6 after starting ECLS with the best predictive ability was a PaO₂ greater than 200mmHg and the corresponding value for P/F greater than 240.

Conclusion(s): PaO₂ and PaO₂/FiO₂, measured at H0, H3 and H6 after starting ECLS for refractory OHCA can be used to predict outcome of patients under ECLS after OHCA. PaO₂ is more sensitive and more specific than PaO₂/FiO₂ at H0 and H3 to identify patients who have a high risk for mortality. These variables underline the potential toxicity of high dose of oxygen. A max value of PaO₂ greater than 200mmHg during the first 6 hours seems to be a target during treatment of OHCA treated by ECLS.

References:

1. Vereczki. *J Cereb Blood Flow Metab*. 2006
2. Fiskum. *Ann N Y Acad Sci*. 2008 3. Hazelton. *J Neurotrauma*. 2010

13AP03-1

Influence of bacterial resistance on mortality in intensive care units: a registry study from 2000 to 2013

Bonnet V.¹, Pasqualini L.¹, Dupont H.², Kipnis E.³, Hanouz J.-L.¹, Fischer M.-O.¹

¹University Hospital Caen, Dept of Anaesthesiology & Intensive Care, Caen, France, ²University Hospital Amiens, Dept of Anaesthesiology & Intensive Care, Amiens, France, ³University Hospital Lille, Dept of Anaesthesiology & Intensive Care, Lille, France

Background and Goal of Study: Bacterial resistance to antibiotics is a daily concern in intensive care units and represent a major public health challenge in every country, with the emergence of pan-drug resistant bacteria. However, few data are available concerning clinical consequences of in-vitro defined resistances. This wide retrospective study aimed at comparing in-hospital mortality of intensive care infections, according to bacterial resistance profile.

Materials and Methods: Health-care associated infections are monitored in a national prospective registry, managed by the Investigation and Surveillance of Healthcare-Associated Infections Network (RAISIN). Data included in the registries from 2000 to 2013 were analyzed. Sub-group analysis was performed using one-way ANOVA.

Results and Discussion: Among the 87931 patients retrieved, 10001 presented a health-care related infection, including 3092 resistant germs (36.7% (95%CI [35.7-37.7])). Infections were caused by gram negative bacilli in 54.7% (95%CI [53.6 - 54.8]) of cases and gram positive cocci in 30.0% (95%CI [29.0-31.0]) of cases. Gram negative bacilli presented the highest rate of resistance (52.8% 95%CI [51.3-54.3]), in comparison to Gram positive cocci (48.1% 95%CI [46.3 - 49.9]).

In-hospital mortality was higher in case of infection if the germ had antibiotic resistance (51.9% 95%CI [50.1-53.7] vs 45.5% 95%CI [44.2-46.8], p<0.001) and critical care length of stay was longer (33.5 ± 26.0 vs 29.5 ± 22.9 days, p<0.001). These results remained significant after SAPS II matching (p<0.001), and were identical in the gram negative bacilli and gram positive cocci sub-groups.

Comparing patients according to their origin before admission, no difference of mortality was found. However, more resistant bacteria were found in patients coming from intensive care units (45.8% 95%CI [41.5-50.1]) or conventional units (39.3% 95%CI [37.6-41]) than from home (33.5% 95%CI [32.1-34.9]) or long term care or rehabilitation centres (33.5% 95%CI [28.8-38.2]). Central venous catheter infections were associated to the highest rate of resistance ((75.0% 95%CI [63.2-86.8]), in comparison to pneumopathies (48.2% 95%CI[46.6-49.8]), bacteraemia (48.7% 95%CI[45.3-52.1]) and urinary tract infections (40.8% 95%CI[37.5-44.1]).

Conclusion: Bacterial resistance is associated with a higher ICU mortality and increased length of stay, regardless of germ or origin of the patient.

13AP03-2

Adjuvant potential of angiotensin-(1-7) in attenuating organ dysfunction in septic rats with peritonitis

Tsao C.-M.¹, Liao M.-H.², Wu C.-C.²

¹Taipei Veterans General Hospital and National Yang-Ming University, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China, ²National Defense Medical Center, Department of Pharmacology, Taipei, Taiwan, Republic of China

Background and Goal of Study: Sepsis is a systemic inflammatory reaction that may lead to multiple organ damage, shock and death. The renin-angiotensin system consists of two opposing axes; the 'classical axis' mediated primarily by angiotensin II (Ang II), and the 'alternative axis' mediated mainly by angiotensin-(1-7) (Ang-(1-7)). Ang-(1-7) is a counter-regulatory mediator of Ang II, which also appears to be protective against cardiovascular disease. In addition, Ang-(1-7) has been proposed to improve acute lung injury and fibrosis induced by endotoxin. However, its effect on multiple organ injury induced by sepsis remains unclear. Therefore, this study was to evaluate the Ang-(1-7) effect on the development of multiple organ dysfunction in septic rats and to explore the possible mechanism.

Materials and Methods: Cecal ligation and puncture (CLP) was performed to induce a polymicrobial sepsis-peritonitis model in male Wistar rats. Subsequently, the animals were randomly assigned to receive an intravenous infusion of Ang-(1-7) (1 mg/kg for 1 h) or an equivalent volume of vehicle (0.9% saline) solution at 3 and 6 h after surgical procedure. All hemodynamic and biochemical parameters were measured during the 24-h observation.

Results and Discussion: In septic rats, Ang-(1-7) attenuated hypotension, vascular hyporeactivity to norepinephrine, as well as the elevated serum level of blood urea nitrogen, creatinine and alanine aminotransferase. However, these improvements were not noted in CLP rats after single infusion of Ang-(1-7) at 3 h alone. In addition, Ang-(1-7) improved the CLP-induced hypoperfusion in the tongue. Superoxide levels in the lung and liver were also attenuated by Ang-(1-7) in CLP rats. Moreover, Ang-(1-7) administration was associated with significantly higher survival (60% vs. 41% at 24 h after CLP; $P < 0.05$).

Conclusion: Ang-(1-7) prevented circulatory failure, alleviated multiple organ dysfunction, and decreased the mortality rate in septic rats receiving CLP. These beneficial effects of Ang-(1-7) may be attributed to reducing tissue superoxide levels. Therefore, Ang-(1-7) could be a potential therapeutic adjuvant in the early sepsis.

13AP03-5

The association of neutrophil gelatinase-associated lipocalin with inflammation, organ dysfunction and survival in surgical sepsis

Bojic S.¹, Kotur-Stevuljevic J.², Memon L.³, Toskovic B.⁴, Simic-Ogrizovic S.⁵

¹Clinical Hospital Centre Bezanijska Kosa, Dept of Anaesthesiology & Intensive Care, Belgrade, Serbia, ²Faculty of Pharmacy, Belgrade University, Department of Medical Biochemistry, Belgrade, Serbia, ³Clinical Hospital Centre Bezanijska Kosa, Clinical Chemistry Laboratory, Belgrade, Serbia, ⁴Clinical Hospital Centre Bezanijska Kosa, Dept of Surgery, Belgrade, Serbia, ⁵University of Belgrade, School of Medicine, Belgrade, Serbia

Background and Goal of Study: Neutrophil gelatinase-associated lipocalin (NGAL), an established biomarker of acute kidney injury (AKI), is also an emerging biomarker of inflammation. Systemic inflammation has a pivotal role in the pathogenesis of organ dysfunction in sepsis. We aimed to explore, for the first time, the association of NGAL with inflammation, organ dysfunction and survival in surgical sepsis.

Materials and Methods: This prospective, observational study included 153 major abdominal surgery patients divided into sepsis group ($n = 53$), operated controls ($n = 50$) and not-operated controls ($n = 50$), matched by age, gender, comorbidities and type of surgery. Occurrence of AKI, use of renal replacement therapy (RRT), vasopressors/inotropes, mechanical ventilation and 28-day survival were noted. Blood and urine samples from the patients with sepsis were collected daily during 96 h following admission to intensive care

unit (ICU) and once from the controls. We measured serum (s-) and urine (u-) NGAL, white blood cell (WBC) count, C-reactive protein (CRP), procalcitonine (PCT), lactate, total bilirubin, platelet count and international normalized ratio (INR). Sequential Organ Failure Assessment (SOFA) and Acute Physiology and Chronic Health Evaluation II (APACHE II) score were calculated.

Results and Discussion: Significantly higher sNGAL and uNGAL levels were observed at all time points in patients with sepsis compared to both control groups as well as in operated controls compared to not-operated controls. During 96 h following ICU admission, higher NGAL levels were found in septic patients with AKI ($P_{\text{sNGAL}} = 0.008$, $P_{\text{uNGAL}} = 0.004$), on RRT ($P_{\text{sNGAL}} = 0.032$, $P_{\text{uNGAL}} = 0.042$) and vasopressors/inotropes ($P_{\text{sNGAL}} = 0.001$, $P_{\text{uNGAL}} < 0.001$) but not in mechanically ventilated ($P_{\text{sNGAL}} = 0.908$, $P_{\text{uNGAL}} = 0.968$). sNGAL correlated with WBC count, CRP, lactate and bilirubin levels (Tau-b = 0.136, 0.320, 0.378 and 0.183, respectively) but not with PCT, platelet count and INR. NGAL correlated with APACHE II (Tau-b_{sNGAL} = 0.319, Tau-b_{uNGAL} = 0.432) and SOFA (Tau-b_{sNGAL} = 0.246, Tau-b_{uNGAL} = 0.374) scores.

Higher levels of this biomarker were associated with shorter 28-day survival (Log-rank_{sNGAL} = 0.007, Log-rank_{uNGAL} < 0.001).

Conclusions: Higher NGAL levels were associated with inflammation, AKI, RRT, use of vasopressors/inotropes, higher lactate and bilirubin levels as well as with poor survival in surgical sepsis.

13AP03-6

A novel strategy toward developing CO prodrugs and its therapeutic applications

Ke B.

West China Hospital of Sichuan University, Dept of Anaesthesiology, Chengdu, China

Background and Goal of Study: CO is an endogenous signaling molecule, with a tremendous amount of pharmacological effects, such as cytoprotection,^[1] organ protection,^[2] anti-inflammation,^[3] and anti-cancer^[4]. However, CO represents a very difficult case in prodrug preparation because it is gaseous and toxic. Non-gaseous forms of CO-delivery remains a considerable challenge. Herein, We described a strategy to prepare CO-prodrugs for the therapeutic applications.

Materials and Methods: Using an intramolecular reaction, a series of compounds were designed and synthesized. Cell culture anti-inflammatory assay and a colitis/sepsis mouse models were employed to evaluate the biological effects for CO prodrugs.

Results and Discussion: ELISA assay results demonstrated that these CO prodrugs with different CO release rates can dose-dependently inhibit LPS-induced TNF- α secretion in RAW 264.7 cells. CO prodrug also showed the significant protective effects against TNBS induced colitis and sepsis in mice. In colitis model, CO prodrug can improve survival rate (75% vs 48% for TNBS group), shortened colon length, increased colon thickness, improved injury score, and inhibited the MPO content and TNF- α level in colon. In sepsis model, CO prodrug also improve survival rate (68% vs 30% for sepsis group).

Conclusion(s): By taking advantage of chemical reactions and optimizing entropic factors, we have successfully developed a series of CO-prodrugs that are stable during storage, and yet readily release CO with tunable release rates under near physiological conditions. The effectiveness of the CO-prodrug system in delivering a sufficient quantity of CO for possible therapeutic applications has been demonstrated using cell culture assay and animal experiment. This study fully demonstrated the proof of concept, and lays foundation for further CO biological applications.

References:

1. K. G. Raman, J. E. Barbato, E. Ifedigbo, B. A. Ozanich, M. S. Zenati, L. E. Otterbein, E. Tzeng, *J. Vasc. Surg.* **2006**, *44*, 151-158.
2. L. E. Otterbein, F. H. Bach, J. Alam, M. Soares, L. H. Tao, M. Wysk, R. J. Davis, R. A. Flavell, A. M. Choi, *Nat. Med.* **2000**, *6*, 422-428.
3. L. K. Wareham, R. K. Poole, M. Tinajero-Trejo, *J. Biol. Chem.* **2015**, *290*, 18999-19007
4. B. Wegiel, D. Gallo, E. Csizmadia, C. Harris, J. Belcher, G. M. Vercellotti, N. Penacho, P. Seth, V. Sukhatme, A. Ahmed, P. P. Pandolfi, L. Helczynski, A. Bjartell, J. L. Persson, L. E. Otterbein, *Cancer Res.* **2013**, *73*, 7009-7021.

13AP03-7

Effects of glycyrrhizin on myeloid cells of the heart and lungs in lipopolysaccharide-induced septic mice

Son I., Kim S.-H.

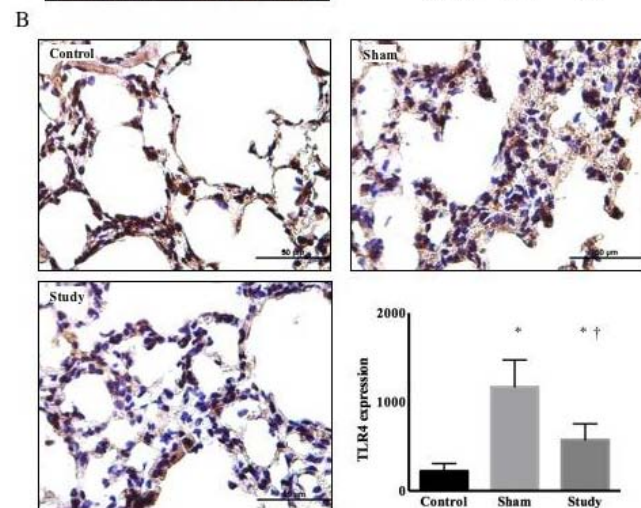
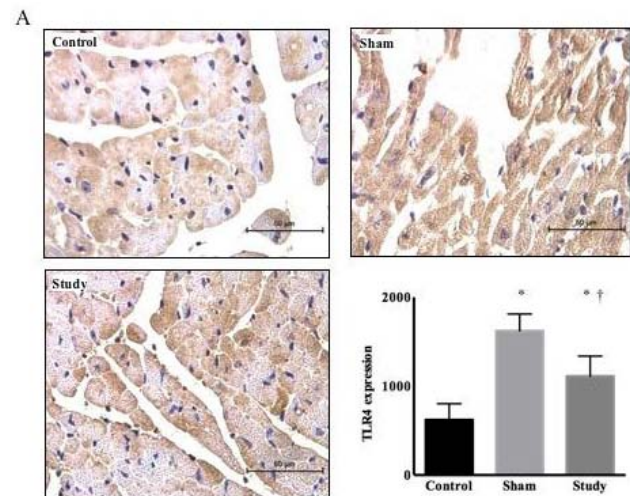
Konkuk University Medical Center, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: This study investigated the effects of glycyrrhizin (GR) on the ratio of myeloid-derived suppressor cells (MDSCs) to cluster of differentiation (CD)11b+Gr1 myeloid cells in the heart and lungs in lipopolysaccharide (LPS)-induced septic mice.

Materials and Methods: Mice were divided into three groups: Control, Sham, and Study. After intraperitoneal injection of phosphate-buffered saline for the Control group, LPS for the Sham group, and a combination of LPS and GR for the Study group, fluorescence-activated cell sorting was utilized to evaluate cytokines and immune cells in the blood, heart, and lungs. Histopathologic analysis of Toll-like receptor (TLR)4 was also performed.

Results and Discussion: The cytokine amounts in the Sham and Study groups were significantly higher than in the Control group; however, that in the Study group was significant lower than in the Sham group. The ratio of MDSCs to CD11b+Gr1 myeloid cells in the Study group was significantly higher than in the Sham group but was significantly lower than in the Control group. The Sham and Study groups had significantly higher injury scores than the Control group.

Interestingly, the Study group had a significantly lower injury score in the lungs than the Sham group, although there was no significant difference between the two groups with respect to the heart. The staining intensity of TLR4 showed the same pattern as that of cytokines in the heart and lungs. TLR4 staining was significantly lower in the Study group than in the Sham group but was higher than that in the Control group.



[TLR4]

Conclusion(s): GR exhibited protective effects on the heart and lungs in LPS-induced septic mice. The effects were associated with an elevated ratio of MDSCs to CD11b+Gr1 myeloid cells and the inhibition of cytokine release and TLR4 expression after GR injection.

References: Wu CX, He LX, Guo H, Tian XX, Liu Q, Sun H. Inhibition effect of glycyrrhizin in lipopolysaccharide-induced high-mobility group box 1 releasing and expression from RAW264.7 cells. *Shock* 2015; 43: 412-21.

Acknowledgements: This study was supported by Konkuk University.

13AP03-8

Inventory of infections related to central venous catheters in a Moroccan medical resuscitation department

Ezzouine H., Dghoughi S., Benslama A.

University Hassan II - Faculty of Medicine and Pharmacy, Dept of Anaesthesiology & Intensive Care, Casablanca, Morocco

Background and Goal of Study: Central venous catheters (CVCs) are very commonly used in hospital care. Catheter-related infection (CRI) is the leading complication and the second leading cause of nosocomial infections in intensive care. This work is a descriptive and analytical retrospective study of documented infections related to the central venous catheters, spread over a period of one year, from January 2015 to December 2015, carried out in the medical resuscitation department of the Ibn Rushd Hospital in Casablanca, Morocco. Its objective is to determine the incidence and microbiological profile of CRIs.

Materials and Methods: Included were all patients with central venous catheterization, with or without bacteraemia, after hospitalization in the medical resuscitation unit of Ibn Rochd Hospital for more than 48 hours.

Results and Discussion: The incidence rate was 6.78% with a female predominance of 51.9%. Gram negative bacilli were the most frequently isolated germs 40.5% with the top of the list *Acinetobacter Baumannii* and *Klebsiella pneumoniae* with an equal rate of 26.6%, followed by gram positive cocci 35.1% represented by coagulase staphylococci Negative 84.6%. The yeasts were found in 18.5% of the cases.

The majority of the patients presented with a single germ: 74.1%. The association of germs was found in 25.9% of the cases, dominated by the association of 2 germs

Conclusion(s): *Acinetobacter Baumannii* and *klebsiella pneumoniae* are the main germ associated to catheter-related infection in our unit. It is important to note that the lack of information on the CVC application files is a factor in the proper follow-up of these infections. Indeed, a checklist must be used as a "memo tool" which will make it possible to secure the installation of the CVC and to minimize risks related to human hazard.

13AP04-1

Sub-clavian vein variations to predict fluid responsiveness

Abraham P., Giraud R., Siegenthaler N., Bendjelid K.

HUG, Geneva, Dept of Anaesthesiology & Intensive Care, Genève, Switzerland

Objective: This study investigate whether the respiratory variation in SCV diameters (SCVV) could be related to fluid responsiveness in mechanically ventilated patients.

Design: Mono-centric prospective study of Fluid responsiveness (FR).

Settings: Hopitaux Universitaires de Genève, Intensive Care Unit.

Patients: Inclusion criteria were patients, age 18 years old or older, sedated and mechanically ventilated monitored by the PiCCO™ system and who needed a fluid challenge. Patients with active bleeding and/or expected to survive less than 24 hours were excluded. Patients were recruited consecutively during working hours over a 1 year period. Responders (R) were defined as patients who increased their CI $\geq 15\%$ after Fluid challenge.

Intervention: A 10-min fluid bolus of 500 mL of 0.9% saline. Cardiac Index and dynamic parameter (SVV, PPV) measured by PiCCO system and classical hemodynamic parameters recorded at baseline and at the end of the Fluid challenge. ultrasound measurements obtained by a subclavian long axis view (maximum and minimum diameter of the subclavian vein). Then were calculate a SCV collapsibility index. A cut off value for SCVV to predict FR was determined with receiver operating curves (ROC) analysis.

Measurements and Main Results: Twelve patients (43%) were fluid responders. At baseline, SCV Collapsibility index were greater in responders than in non-responders (27.3 ± 5 vs 7.4 ± 5 $p < 0.001$) respectively.

Diagnostic performance for SCV Collapsibility index showed cutoff value of 13.4 for a sensitivity of 100% and a specificity of 90.91% and a Likelihood ratio for a positive result of 11. Other parameters modification Δ SV, Δ PP, HR and MAP, did not bring information to predict or diagnose FR. Correlation between CI variation and SCV Collapsibility index were $\text{Coeff} = 0.76$ $P = < 0.001$ $R^2 = 0.72$.

Conclusions: SCV Collapsibility index is a reliable, non-invasive parameter to predict FR at the bedside of the mechanically ventilated critically ill patients in this pilot study.

References:

Veillard-Baron A, Chergui K, Rabiller A, Peyrouset O, Page B, Beauchet A, et al. Superior vena caval collapsibility as a gauge of volume status in ventilated septic patients. *Intensive Care Med* [Internet]. 2004 Sep [cited 2016 May 10];30(9).

Bendjelid K, Romand J-A. Fluid responsiveness in mechanically ventilated patients: a review of indices used in intensive care. *Intensive Care Med*. 2003 Mar;29(3):352-60.

13AP04-3

Myostatin in intensive care unit acquired weakness

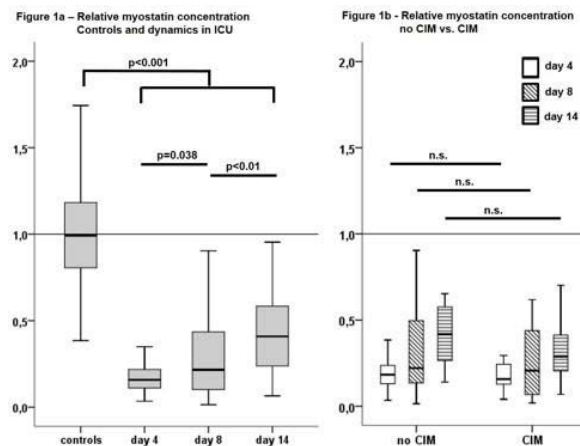
Wollersheim T.¹, Carbon N.¹, Fielitz J.², Mai K.³, Spranger J.³, Weber-Carstens S.³

¹Charité - Universitätsmedizin Berlin, Dept of Anaesthesiology & Intensive Care, Berlin, Germany, ²ECRC Experimental Clinical Research Center, Research and Development Department, Berlin, Germany, ³Berlin Institute of Health (BIH) Berlin, Dept of Intensive Care, Berlin, Germany

Background and Goal of Study: Intensive Care Unit (ICU) Acquired Weakness (ICUAW) is a common complication in the critically ill. Development occurs very early. Myostatin is known as a regulator in skeletal muscle growth and degradation. Until now it is unknown whether myostatin plays a role in ICUAW.

Our aim was to investigate whether ICUAW is associated with increased myostatin concentration in serum, as well as its dynamic changes.

Materials and Methods: We included 75 ICU patients and 91 healthy controls. The ICU patients were on high risk for ICUAW, as selected by a SOFA score ≥ 9 . Informed consent for study participation was provided. Blood samples of day 4, 8 and 14 from ICU patients, and once from controls, were investigated via ELISA for the measurement of myostatin concentrations. Values from healthy controls were normalized to 1.0. Electrophysiological testing of the ICU patients with dmCMAP separated patients with excitable muscle membrane ($> 3\text{mV}$) from those with non-excitable muscle membrane ($< 3\text{mV}$), as a marker for Critical Illness Myopathy (CIM). Ethic vote (Charité EA 2/041/10).



[Figure 1. no CIM: dmCMAP $> 3\text{mV}$, CIM dmCMA $< 3\text{mV}$, n.s.: not significant]

Results and Discussion: Baseline characteristics of ICU patients and health controls do not differ significantly. MRC at first day of being adequate awake was 3.0 IQR (2.0/3.7).

First: At all time-points myostatin concentration of ICU patients was decreased compared to health controls ($p < 0.001$).

Second: Lowest concentrations we found at day 4 with significant increases to day 8 and 14.

Third: We did not find significant differences between patients with or without CIM.

A massive decrease earliest investigated at day four remains unclear whether myostatin has an impact on skeletal muscle weakness, or whether it represents a compensatory mechanism after very early muscle wasting.

Conclusion: For the first time, we show that myostatin levels were reduced in ICUAW patients with a slight recovery during ICU stay. The role of myostatin remains unclear and requires further investigation.

Acknowledgements: TRG grant by BIH given to SWC and JF TW is participant in the Clinical Scientist Program granted by the Berlin Institute of Health (BIH).

13AP04-4

Critically ill medical patient outcomes after discharge from intensive care - the prospective longitudinal 'CIMPOD' study of Malta's national ICU survivors

Grech A., Abela C.

Mater Dei Hospital, Dept of Anaesthesiology & Intensive Care, Msida, Malta

Background and Goal of Study: Survival after critical illness invariably represents some degree of short term success, however the literature base for general & local intensive care unit (ICU) practice in particular exhibits lacunae for awareness of other post-ICU outcomes. Primary aims were to describe national prevalence of post-ICU mortality, urgent readmission, functional & emotional outcomes. Secondary goals included identification of potential predictors for risk stratification.

Materials and Methods: Consecutive adult ICU survivors were eligible over a 4 week recruitment period having spent > 24 hours in our national 20 bed ICU facility. Age, gender & duration of ICU stay were recorded and retrospective acute physiology and chronic health evaluation (APACHE-II) illness severity scores calculated. 55 patients were followed up at intervals of 1 month, 3 months & 6 months after ICU discharge. Health related quality of life was evaluated via EuroQOL EQ-5D-3L and emotional outcomes via the Hospital Anxiety and Depression Scale.

Results and Discussion: Mortality was noted in 16.4% at 1 month after ICU discharge, reaching 20% at 6 months. A majority of patients (60%) exhibited no urgent readmission to state hospital services within 6 months. Mean overall health status perception on EQ-5D-3L visual analogue scale improved from 58.59 (± 15.12) at 1 month to 68.07 (± 16.18) at 6 months. Anxiety and depression scores showed positive correlation throughout, with 22.7% and 11.36% of participants ultimately demonstrating positive screening for anxiety & depression respectively. Regression models implicated age in prediction of health perception and gender in anxiety screening. Length of ICU stay was linked to post-ICU anxiety, depression & health status perception at 1 month. APACHE-II scores demonstrated significant potential as predictors of mortality and readmission across the 6 months post-ICU.

Conclusion(s): The preliminary CIMPOD post-ICU study represents one of the first of its kind in Maltese practice. Mortality & readmission may reflect a portion of less ill ICU admissions in the first instance due to lack of local high dependency beds, yet outcomes nevertheless show future research potential. Relationship modelling presents scope for risk stratification, with APACHE-II uniquely promising. Similar study protocols with greater numbers are suggested for future focus, with consideration of introduction of sickness scoring to Maltese practice recommended.

13AP04-5**Evaluation of Glasgow Coma Scale after non-cardiac and non-neurologic surgery among intensive care patients**

Silva D.¹, Choupina B.², Lopes A.¹, Casimiro L.G.¹, Santos A.¹, Abelha F.¹

¹Centro Hospitalar São João E.F.E., Dept of Anaesthesiology, Porto, Portugal, ²Faculty of Medicine / University of Oporto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Glasgow Coma Scale (GCS) is a simple, objective and fast method of evaluating patients' neurologic state. There are several severity of disease score systems that include GCS as a neurologic indicator. Although it was demonstrated that it has prognostic value alone, there are few studies about GCS in evaluation of outcome of surgical patients in Intensive Care Unit.

The aim of this study was to evaluate the prognostic value of GCS in a cohort of patients admitted to a surgical intensive care unit (SICU) and identify risk factors for lower GCS in postoperative period.

Materials and Methods: After study approval by the institutional ethics committee, an observational retrospective study was conducted. Patients submitted to non-cardiac, non-neurologic elective and emergency surgery admitted at SICU (from Jan 2006 to July 2013) were included. Exclusion criteria: age <18 years old; length of stay <12h; patients readmitted in the context of initial admission in the study period. Patients were divided in two groups according to their GCS at SICU admission, GCS \geq 9 and GCS<9. Patient's demographics, intraoperative and postoperative data were collected. Descriptive analysis was performed and the Mann-Whitney U test, Fischer's exact test or Chi-square were used. Univariate and multivariate analyses were done with logistic binary regression with calculation of an Odds Ratio and its 95% Confidence Interval.

Results and Discussion: From a total of 4565 patients, 4398 were included. There were 54 (1.23%) patients with GCS<9. These patients were more often admitted for non-elective surgery ($p<0.001$). The group with GCS<9 had more often a revised cardiac risk index >2 ($p<0.001$), but the only score's item that differ between groups was history of congestive heart disease ($p=0.001$). They were more likely to be admitted on mechanical ventilation, with higher FiO₂ and higher PaO₂ ($p<0.001$). Patients who had GCS<9 at admission to SICU had a higher incidence of major cardiac events (9.3% vs 2.3%, $p<0.001$), had a longer stay in SICU (43 hours vs 20 hours, $p<0.001$) and 14.8% of these patients died at SICU ($p<0.001$). Characteristics independently associated with a GCS<9 were: PaO₂ (OR 1.02, $p<0.001$) and APACHE II (OR 1.38, $p<0.001$).

Conclusion(s): PaO₂ and APACHE II were considered independently associated with GCS<9. Patients with GCS<9 had higher incidence of major cardiac events, stayed longer in the SICU and had a higher mortality rate.

13AP04-6**Mortality predictors (SAPS II versus APACHE II) in a intermediate respiratory care unit**

Molines A., Muñoz J.L., Cuquerella V., Resalt-Pereira M., Berrio D.L., Pérez A.

Hospital General Universitario de Elche, Dept of Anaesthesiology & Intensive Care, Elche, Spain

Introduction: Severity scoring systems have been developed over last three decades. The Acute Physiology and Chronic Health Evaluation (APACHE) and the Simplified Acute Physiology Score (SAPS) are two of the most widely used scoring systems in the critical care unit. Few studies have been carried out on intermediate respiratory care units in terms of prognostic systems than can really provide a mortality prediction in this context.

The aim of our study is to evaluate the correlation APACHE II and SAPS II with mortality during the hospital staying in all patients who were admitted in our Respiratory intermediate care unit.

Design: A prospective observational study of all patients, consecutively admitted in our respiratory intermediate care unit, from January to December 2013. SAPS II and APACHE II scores were calculated, and mortality was recorded during the hospital stay. Inclusion criteria were adults (>18 year old), requiring NIV, or high-risk surgery patients requiring postsurgical respiratory monitoring. All statistical analysis were performed using SPSS version 20.0 (SPSS Inc, Chicago, IL). A p value <0.05 was considered statistically signifi-

cant. Receiver Operating characteristic (ROC) curve analysis was performed, and the respective areas under the curve (AUC) were calculated to evaluate the predictive value of SAPS II and APACHE II.

Results: The study included 239 patients. Hospital mortality rate was 14,60% (5,42% were surgical patients, while the rest were clinical, 9,18%). The mean values of Severity scoring systems were higher in favour of the deceased group, both for the total sample and for groups according to their origin, observing higher scores for SAPS II and APACHE II in the medical group, with $p<0.05$. When the area under the curve (AUC) was performed in the total sample, no significant differences were seen between SAPS II (AUC 0,757) and APACHE II (AUC 0,753). However, when analysing by origin, in medical patients were better for APACHE II (APACHE II 0,806 y SAPS II 0,784), but in surgical patients a difference was found in favour of SAPS II (AUC for APACHE II 0,699 y SAPS II 0,755).

Conclusions: We found a better AUC of APACHE II than SAPS II in medical patients. We found a better AUC of SAPS II for surgical patients. This study has limitations: relatively small sample size, and all patients were from a single-centre study. A multi-centre study with a larger sample size are needed to confirm these preliminar results.

13AP04-7**A case of Herpes Simplex Encephalitis (HSE): a fleeting trick**

Maugeri J., Pintaudi S.

ARNAS Garibaldi, Dept of Anaesthesiology & Intensive Care, Catania, Italy

Background: HSE affects high morbidity/mortality, despite early targeted therapy, often due to delayed diagnosis.

Case report: A83-year-old male presents to ED with drowsiness and fever for 6days. Physical examination on admission shows fever (39°C), GCS12 (E3-V4-M5), no focal or meningeal signs; normal WBC, mild increase PCT, CT scan acutely negative. After 24 hours are noticed: seizures; GCS worsening (E1-V1-M5); on CTscan flattening of cerebral surface in right temporo-polar area; on MRI diffuse signal alteration in hippocampal, temporal, fronto-insular, periorlandic parietal, thalamic and right fronto-parasagittal areas, with limited restriction in DWI/ADC without contrast-enhancement. Patient is moved to ICU, intubated and receives rachicentesis for multiple tests, including HSV-DNA by PCR.

MEROPENEM 1gx3, LEVOFLOXACINE 500mgx2, AMPICILLINE/SULBACTAM 3gx4 and ACYCLOVIR 750mgx3 are empirically initiated. Positive PCR confirms HSE and, after 9 days, the patient comes back to GCS10 (E4-M6). On day21st tracheostomy is performed for difficult weaning and ACYCLOVIR is stopped. On day 30th with GCS12 (E4-V2-M6) but still pathological MRI, the patient is referred to rehabilitation. Nevertheless a new neurological worsening is noticed and repeated liquoral PCR confirms viral activity; ACYCLOVIR full dose is given, to be suspended 20days later, after negative rachicentesis, with residual lower limbs hyposthenia.

Discussion: HSE is a rare, damaging disease, with mortality rate15-20% [1] mostly due to delayed diagnosis. MRI suggests it [2] but only HSV-PCR on liquor confirms it. The British Guidelines [3] suggest intravenous ACYCLOVIR (10mg/kg 3/daily) to be started in case of an initial instrumental suspect of viral encephalitis and to be continued for 14-21days.

In some continuing viral replication could occur despite therapy: new HSV-DNA-PCR on liquor is recommended to verify resolution of disease.

References:

- Hjalmarsson A, et al. Herpes simplex encephalitis in Sweden, 1990-2001: incidence, morbidity and mortality. *Clin Infect Dis*. 2007;45:875-80
- Tien RD, et al. Herpesvirus infections of the CNS: MR findings. *AJR* 1993; 161:167-76
- Solomon T, et al. Management of suspected viral encephalitis in adults- Association of British Neurologists and British Infection Association National Guidelines. *Journal of Infection* 2012;64:347-73

Learning points: Early diagnosis of HSE and anticipating its recrudescence is suspected by MRI and permitted by liquoral HSV-DNA-PCR. Following HSE guidelines allows best recovery of the patient.

13AP04-8**Predictors of in-hospital mortality in a multi-ethnic Southeast Asian surgical intensive care unit**

Yong J.K.¹, Wong W.E.J.¹, Sim M.A.², Soh C.R.³, Ti L.K.⁴, Chew T.H.S.⁵

¹Yong Loo Lin School of Medicine, National University of Singapore, Dept of Anaesthesiology, Singapore, Singapore, ²National University Health System, Department of Anaesthesia, Singapore, Singapore, ³Singapore General Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore, ⁴Yong Loo Lin School of Medicine, National University of Singapore and National University Health System, Department of Anaesthesia, Singapore, Singapore, ⁵Singapore General Hospital and Duke-National University of Singapore Graduate Medical School, Dept of Anaesthesiology, Singapore, Singapore

Background and Goal of Study: Although rapid advancements have been made in intensive care management, the mortality of patients admitted to the Intensive Care Unit (ICU) ranges from 7% to 40%.^{1,2} With a rapidly aging population and increasing complexity of surgeries, demand for intensive care is expected to rise. Previous predictors of surgical ICU mortality include emergency surgery, high Acute Physiology and Chronic Health Evaluation II (APACHE) score, low Glasgow Coma Scale (GCS) and mechanical ventilation.³

However, this is still unclear in the context of a Southeast Asian general surgical ICU (SICU). Thus, we aimed to investigate the incidence and risk factors of in-hospital mortality in a Southeast Asian multi-ethnic surgical intensive care population.

Materials and Methods: Following IRB approval, we retrospectively obtained data from 858 postoperative patients admitted to a single-center SICU of a tertiary hospital from February 2015 to October 2016. Patient demographics and clinical covariates were collected. APACHE scores were calculated on the first day of admission. Stepwise logistic regression was performed to determine independent predictors of in-hospital mortality.

Results and Discussion: The in-hospital mortality rate was 20.6%. Mean age was 61.2±15.8, and 54.7% were male. Patients who were more likely to die were older, Malay, had higher APACHE scores, lower GCS, anemia, haemodynamic and metabolic instability, and elevated creatinine. Multivariate analysis showed age (OR=1.024, 95%CI=1.006-1.042), APACHE score (OR=1.076, CI=1.038-1.114), hypotension (OR=1.699, CI=1.029-2.804), hypernatremia (OR=2.064, CI=1.066-3.996), hypokalemia (OR=1.713, CI=1.002-2.927), acidosis (OR=1.567, CI=1.005-2.442) and elevated creatinine (OR=1.003, CI=1.001-1.004) to be independent predictors of mortality. Patients who died also stayed in the SICU on average of 3 days longer, utilizing more ICU resources.

Conclusion(s): Postoperative patients who are older, with higher APACHE scores, haemodynamic and metabolic instability, and elevated creatinine are more likely to die despite ICU care. Strategies targeting modifiable risk factors such as expedient treatment of acute kidney injury and early prophylactic dialysis should be evaluated and may improve patient outcomes.

References:

1. Siddiqui S. Indian J Crit Care Med. 2015 Dec;19(12):726-727
2. Alansari MA et al. Saudi J Anaesth. 2016 Oct-Dec;10(4):409-413
3. Uzman S et al. Hippokratia 2016 Jan-Mar;20(1):38-43

13AP04-9**Abdominal compartment syndrome - a rare complication of veno-venous extracorporeal membrane oxygenation for primary graft dysfunction following lung transplantation**

Valeanu L., Stefan M., Andrei S., Augustin P.
Centre Hospitalier Universitaire Bichat Claude Bernard, Dept of Anaesthesiology & Intensive Care, Paris, France

Background: Primary graft dysfunction (PGD) is a severe form of ischemia reperfusion syndrome developing after lung transplantation (LT). Extracorporeal membrane oxygenation (ECMO) can be used for hemodynamic failure following PGD, but the massive fluid overload needed for adequate pump flow can lead to development of abdominal compartment syndrome (ACS).

Case report: A 46 kg, 54 years old female underwent bipulmonary LT for emphysema. Ischemia time for the lungs was 8 hours, with a 4 hours ex vivo lung perfusion. There was no need for ECMO assistance during transplantation, but 8 liters of crystalloids and an infusion of 150 µg/kg/min noradrenaline were administered. The transesophageal echocardiography showed normal biventricular function and severe hypovolemia. After ICU admission, the patient developed grade 3 PGD with persistent vasoplegic shock and was assisted with a veno-venous femoro-jugular ECMO 2 hours later. After initial successful hemodynamic resuscitation, impaired venous return and pump flow of less than 1 l/min were noted. Correct cannula position was confirmed. During the first 4 hours, 20 liters of crystalloids were administered and the noradrenaline dose increased to 750 ng/kg/min. Mesenteric ischemia, septic shock and anaphylactic shock were ruled out. After measuring an intra-abdominal pressure of 40 mmHg, decompressive laparotomy for ACS was performed in the ICU, 4 hours after admission. Following decompression, the pump flow increased to 4 l/min. The multiple organ dysfunction progressively ameliorated, the ECMO was explanted on day 3 and the abdominal wall was closed on day 6. Extubation was possible on day 14 and the patient left the ICU after a 5 weeks stay, with no evidence of graft rejection.

Discussion: PGD can develop rapidly after LT and the need for assistance using ECMO is documented¹. The massive vasoplegic shock necessitates resuscitation with large doses of fluids and vasoconstrictors for adequate pump flow, which leads to formation of tense ascites and development of ACS, which will then worsen on its own the venous return and pump flow.

References: ¹Augustin P et al. Abdominal compartment syndrome due to extracorporeal membrane oxygenation in adults. Ann Thorac Surg 2010; 90: e40-41.

Learning points: Measurement of intra-abdominal pressure should be considered in case of inappropriate venous return and pump flow after massive fluid overload and decompressive laparotomy should be realized as soon as possible.

13AP04-10**High short- and long-term mortality in major non-cardiac surgical patients admitted to the intensive care unit**

Ekeloef S.¹, Thygesen L.C.², Gögenur I.¹

¹Zealand University Hospital, Dept of Surgery, Koege, Denmark,

²University of Southern Denmark, National Institute of Public Health, Copenhagen, Denmark

Background and Goal of Study: Patients undergoing major non-cardiac surgery represent a significant proportion of admissions to the intensive care units (ICU) and utilize large amounts of resources. The aim of this study was to present mortality data and identify risk factors associated with 30-days, 90-days and 1-year mortality after major non-cardiac surgery in patients admitted to the ICU.

Materials and Methods: A register based study including patients aged 18+ years admitted to the ICU at four Capital Region hospitals in Denmark between January 2005 and December 2014. Patients were included if admitted to the ICU within 30-days of major surgery with a minimum stay of 24 hours in the ICU unless deceased. Patients were identified through the Danish National Patient Register. Multivariate logistic regression analyses were performed to identify independent risk factors of mortality.

Results and Discussion: The study included 3,311 non-cardiac surgical patients admitted to the ICU after surgery. Urological surgery accounted for 10.2%, orthopaedic surgery for 18.4% and abdominal surgery for 71.3%. Emergency surgery accounted for 74.5% of the operations. Median lengths of stay in the ICU was 2.0 days (Q1-Q3, 1.0-4.0). Invasive ventilation was applied in 56.7% of the patients while 16.2% received haemodialysis. 30-days, 90-days and 1-year mortality was 38%, 45% and 51%, respectively. Age, Charlson comorbidity index, emergency operation, abdominal and orthopaedic surgery independently increased 30-days, 90-days and 1-year mortality. Few studies have specifically reported on outcomes in ICU patients undergoing major non-cardiac surgery. Besides age and co-morbid status, the urgency and type of surgery were independent prognostic factors. The majority underwent primary emergency surgery and had a significantly reduced short- and long-term survival compared with the elective patient group.

Conclusions: Short- and long-term mortality in non-cardiac surgical patients in the ICU remains high especially when admitted after emergency surgery. Future research should focus on improving the perioperative risk stratification to provide optimal perioperative care and improve the observed poor outcome.

13AP04-11**Audit of ITU record documentation: Introducing CMART scoring system: be smart use CMART**

Abbas M.¹, Vidgeon S.²

¹St Helier Hospital NHS Trust, Dept of Intensive Care, London, United Kingdom, ²Croydon University Hospitals NHS Trust London, Dept of Intensive Care, London, United Kingdom

Background and Goal of Study: Medical records are a fundamental part of a doctor's duties in providing patient care. The records form a permanent account of a patient's illness. Their clarity and accuracy is paramount for effective communication between healthcare professionals and patients. The maintenance of good medical records ensure that a patient's assessed needs is met comprehensively [1]. It is also an integral part of good clinical governance structure and for medico-legal requirements. In this audit we analysed our medical record keeping for its accuracy and information contained. The aim of the study was to check appropriate record keeping of daily ITU assessment and management plan.

Materials and Methods: We selected 20 random ITU patient daily record sheaths from January to December 2014. We used CRABEL and modified CRABEL medical record audit toolkit to score our performance [2]. We recorded the shortfalls and created our own audit scoring system named "CMART". From June to December 2015 we re-audited our record keeping performance. We compared outcome of both performances. Statistical significance between compared groups was estimated using independent sample "t" test and Chi-square test.

Results and Discussion: The new CMART recording system covers all aspects of information required for patients admitted to ITU. There is significant improvement in record keeping [$p=0.03$] with CMART system.

The CMART system is designed to cover all the information required my ITU team. Previous systems were developed my medical or surgical specialties for their own patient population. The patients admitted to ITU have their unique critical needs that were not captured by others systems.

Conclusion(s): We recommend using CMART system for ITU documentation. This can be adopted to an electronic version.

References:

1. BMJ and GMC guidelines
2. Ann R Coll Surg Engl 2001 Jan;83(1):65-8

13AP04-12**Pheochromocytoma crisis presenting with cardiogenic shock**

Pérez de Lis Novo M.¹, Filgueira Davila E.², Gonzalez Bermudez I.³, Vidal Seoane M.¹, Areal I.⁴, Carballo C.⁵

¹Complejo Hospitalario Universitario A Coruña, Department of Anaesthesiology and Perioperative Medicine, A Coruña, Spain, ²Hospital Povisa, Dept of Anaesthesiology & Intensive Care, Vigo, Spain, ³Hospital Alvaro Cunqueiro, Dept. of Cardiology, Vigo, Spain, ⁴Hospital Alvaro Cunqueiro, Dept of Anaesthesiology, Vigo, Spain, ⁵Hospital Alvaro Cunqueiro, Dept of Intensive Care, Vigo, Spain

Background: Pheochromocytoma is a rare neuroendocrine tumor with a highly variable clinical presentation. We describe a case of pheochromocytoma crisis presenting with cardiogenic shock.

Case: A 40-year-old woman complaining of intense chest pain associating diaphoresis and signs of peripheral hypoperfusion was admitted in our hospital. Her vital signs were: BP 65/40 mmHG; HR 40 beats/min; RR 30 breaths/min; Sat O₂ 70%. The patient was intubated and connected to mechanical ventilation. A chest X-ray showed bilateral alveolar infiltrate. Initially, EKG revealed only sinus tachycardia, but then ST segment elevation was observed in leads I, II, aVL, V1-V6. Transthoracic echocardiogram revealed severe global left ventricular systolic impairment (<10%). Coronary angiography showed normal coronary. The recurrence of paroxysmal episodes characterized by a sudden increase in BP, cold sweating, and nausea allowed us to hypothesize a pheochromocytoma. This diagnostic hypothesis was first supported by elevated urinary catecholamines and by CT showing a large (8.8x8.3 cm), left suprarenal mass.

Once the patient had been haemodynamically stabilized and was under α - and β -blocker therapy, she was referred for surgery and a left adrenalectomy was successfully performed.

Discussion: Pheochromocytomas are rare neuroendocrine tumors secreting catecholamines that arise from chromaffin cells of the sympathetic nervous system.

Although 9% to 12% of pheochromocytoma patients initially present with cardiac complications, cardiogenic shock and cardiac arrest in these patients are rare.(1) The cause of cardiomyopathy is thought to be chronic tachycardiomyopathy and coronary vasospasm. Cardiomyopathy is usually transient and reversible with treatment. The therapeutic management of a pheochromocytoma has two major objectives: controlling pheochromocytoma crisis and preparing the patient for surgical intervention.

13AP05-1**Does hyperoxemia since pre hospital emergency medicine influence prognostic in patients with septic shock?**

Jouffroy R., Castres Saint Martin L., Philippe P., Idialisoa R., Carli P., Vivien B.

APHP - Hôpital Necker Enfants Malades, Dept of Anaesthesiology & Intensive Care, Paris, France

Background and Goal of Study: Deleterious effects of prolonged hyperoxemia exposition are well established especially after cardiac arrest and brain trauma [1]. Reactive oxygen species (ROS) induce inflammation and structural and functional transformation of lipids and proteins as DNA which can lead to cellular death. Definition of hyperoxemia is not consensual despite a threshold of 100mmHg partial for the British Thoracic Society retient comme seuil une PaO₂ supérieure à 100mmHg [2]. The aim of this study was to determine if there is an association between level of PaO₂/FiO₂ ratio (P/F) and mortality at day 28 (D28) in patients with septic shock requiring mechanical ventilation since pre-hospital cares.

Materials and Methods: We performed a monocentric retrospective observational study in a adult intensive care unit (ICU) including 45 patients with septic shock admitted in ICU requiring mechanical ventilation since pre-hospital stage. PaO₂ was measured at ICU admission of patients with septic shock requiring mechanical ventilation and sedation since pre-hospital care.

Results and Discussion: Origins of sepsis were mainly pulmonary (72%) and urinary (16%). The average P/F ratio at the time of admission in ICU was 200±88mmHg. P/F ratio was associated with 28-day mortality in patients admitted in ICU for septic shock requiring mechanical ventilation since pre-hospital stage. When P/F ratio is higher than 225, the D28 mortality risk is multiplied by 3.9: OR=3.9 [1.3 - 12.2]; ($p=0.04$). When P/F ratio was lower than 200, we observed an 85% decrease of D28 mortality: OR=0.15 [0.04 - 0.47] ($p=0.0077$).

Conclusion(s): In this study, we observed a strong association between hyperoxemia during pre-hospital cares and D28 mortality for patients admitted into ICU for septic shock requiring mechanical ventilation since pre-hospital stage. A P/F ratio lower than 200 at ICU admission of patients with septic shock requiring mechanical ventilation and sedation seems to be a target. PaO₂ is a parameter that could be obtained simply and quickly to adjust oxygen dose since pre hospital care and to avoid toxic effects of hyperoxemia. In order to confirm those results and to define the "target" value of the oxygen dose for those patients, larger multicentric prospective studies should be performed.

References:

1. Damiani et al. Critical Care 2014
2. O'Driscoll et al. Thorax 2011

13AP05-2**Outcomes in an elderly septic surgical patients cohort**

Perez Gonzalez A., Martin Alfonso S., Lopez del Moral Lopez O., Almudi Ceinos D., Rico Feijoo J., Aldecoa Santullano C. Hospital Universitario Rio Hortega, Dept of Anaesthesiology & Intensive Care, Valladolid, Spain

Background and Goal of Study: To determine differences in mortality of postsurgical septic patients according to age groups, as well as their association with different factors such as renal failure, renal replacement therapy and / or mechanical ventilation. We also want to know the severity of illness measured by SOFA score and its impact in elderly mortality.

Materials and Methods: Observational, retrospective study, which included patients admitted to the ICU (intensive care unit) of the University Hospital of Río Hortega, Valladolid, >48 h, with criteria for sepsis, or septic shock from January 2011 to January 2016.

We studied 246 patients: 87 patients <65 years old, 70 between 66-75 years old, 77 between 76-85 years old and 22 >85 years old. Statistical analysis: Chi-Square test was used for the relationship between the qualitative variables and Student's T-test for the quantitative variables.

We determined the variables: age, sex, diagnosis: sepsis or septic shock, SOFA score at 24 h and during the first 7 days of ICU stay, APACHE II, comorbidities (<2 and >2) mechanical ventilation, RRT, days in ICU, mortality in ICU as well as 28 days, 6 months and 1 year after discharge.

Results and Discussion: 28.57% of the patients older than 85 years died during the period of admission into the Unit and no statistical significance was found for this data (p 0.139). Also, a mortality rate of 56% was determined at 28 days, being higher in the older age group significantly (p 0.05).

We observed a mortality of 44.74% at 28 days in the group of patients with more comorbidity compared to a 24.84% mortality in those patients who presented only one associated comorbidity factor, this difference being significant (P 0.02). One year mortality was also higher in the elderly group with a 62% rate (p 0.05). We also found that the severity of illness measured by SOFA was associated with an increased mortality rate (p<0.05).

Conclusion: Recent studies show a mortality rate higher than 65%. But until the date, no cohorts of surgical septic patients have been published. In our study, mortality was increased according to comorbidity (p 0.05), which may be an independent factor of mortality, and not only age, as reported in previous studies. We did not obtain as high values of mortality in elderly patients >85 years as those reported before. Therefore, we believe that new prospective studies with a larger sample size should be carried out to confirm these data.

13AP05-3

Pharmacokinetic/pharmacodynamic (PK/PD) evaluation of caspofungin in a population of critically ill septic patients

Adembri C., Villa G., Loriga B., Novelli A., Rosi E., Tofani L.
University of Florence, Dept of Anaesthesiology & Intensive Care, Florence, Italy

Background and Goal of Study: Major alterations in the PK/PD of antimicrobial drugs are well documented in critically ill septic patients, but few data are available for the echinocandins. The aims of the present study were: *i)* to describe the alterations of caspofungin PK in critically ill septic patients and *ii)* to carry out a PK/PD analysis in order to assess if the optimal targets are reached.

Materials and Methods: Both surgical and medical ICU patients receiving caspofungin as empirical/targeted therapy were enrolled if: aged ≥ 18 years and diagnosed in severe sepsis or septic shock. Seven plasma samples (before dose and 1,2,4,8,12 and 24h) and four urine samples (0-6h, 6-12h,12-18h,18-24h) were collected within the 24 hours following the first dose of caspofungin. Plasma and urine concentrations were measured with a validated High Performance Liquid Chromatography (HPLC) method. PK/PD analysis was performed using SAS 9.3 software.

Results and Discussion: Twelve patients entered the study. The mean age and weight were 62.75 years and 85.75 Kg, respectively. The main PK data, expressed as mean (range; \pm SD) values, were as follows: peak plasma concentration (C_{max}) 10.04 (2.63-35.07; \pm 9.18) mg/L; trough plasma concentration (C_{min}) 1.74 (<0.6-6.58; \pm 1.73) mg/L; area under the curve (AUC_{0-24}) 88.39 (21.04-287.9; \pm 74.26) mgYh/L; volume of distribution (Vd) 13.62 (1.86-45.8; \pm 12.45) L. According to the PK analysis, a high inter-individual variability occurred and patients can be divided into 2 significantly different groups (A and B). The PK/PD index, expressed as mean AUC/MIC ratio, was 149.96 in group A and 557.13 in group B (p<0.01, one-way ANOVA). Finally, patients showed a higher mean urinary recovery as unchanged drug when compared to healthy volunteers: 15.27% versus 2-3%. The mean value of the urinary recovery of caspofungin in group A was almost twice as high as that in group B: 19.85% and 10.69%, respectively.

Conclusions: High inter-individual variability was observed for caspofungin PK in the critically ill septic patients, with some of them having significant lower plasma concentrations and increased urinary recovery compared to healthy volunteers. This phenomenon has consequences on the possibility to reach the optimal PK/PD targets and suggest that TDM for caspofungin should be performed in the ICU setting.

13AP05-4

Effect of ultrasound and contrast microbubbles on amikacin diffusion in lung and muscle tissues in a rabbit model

Remerand E.¹, Espitalier F.¹, Darrouzain F.², Novell A.³, Piver E.⁴, Bouakaz A.³

¹CHU de Tours, Inserm U930, Université de Tours, Dept of Anaesthesiology & Intensive Care, Tours, France, ²CHU de Tours, CNRS UMR 7292, Université de Tours, Laboratoire de Pharmacologie-Toxicologie, Tours, France, ³Inserm U930, Université de Tours, Research and Development Department, Tours, France, ⁴CHU de Tours, INSERM UMR 966, Université de Tours, Laboratoire de Biochimie et Biologie Moléculaire, Tours, France

Background and Goal of Study: Pneumonias are challenging to treat with intravenous (iv) antibiotics (ATBs) because of poor diffusion in the lung tissue. The sonoporation combines ultrasound waves and iv gas microbubbles. Experimentally, it increases tissular and cellular diffusion of numerous drugs. We hypothesized that sonoporation may increase ATBs diffusion (like amikacin) in rabbit lung and muscle tissues, used as a proof of concept.

Materials and Methods: Six adults New Zealand rabbits were anesthetised (sevoflurane, iv sufentanil, propofol, atracurium), mechanically ventilated and conditioned (venous and arterial lines). Amikacin (15 mg/kg) was infused iv during 30 minutes. A right laparophrenotomy was performed. The rabbit was positioned on his right side, and sodium chloride was instilled in the right lung. The right lung condensation was confirmed using ultrasound. A single element transducer (about 5 mm diameter beam) was placed in close contact with the right lung lower lobe through the laparophrenotomy. Then, a first bolus of MM1 microbubbles (350 mL) was injected. One minute after, a 3 minutes insonation was applied (1 MHz, 600 kPa). The transducer was then placed in contact with a shaved anterior leg. A 2nd microbubbles bolus was injected, followed by a 3 minutes insonation of the leg. Sixty minutes after amikacin infusion, rabbits were exsanguinated. Both lungs and a muscle sample on each anterior leg were collected, grinded and centrifuged. Amikacin and protein concentrations were measured in the supernatants. After correction of the dilution effect, amikacin concentrations were compared between sonicated and non-sonicated supernatants of tissues.

Results and Discussion: In the lungs, sonoporation increased amikacin concentration by 20%. In the muscles, sonoporation increased amikacin concentration by 110%. The sonoporation increased ATBs diffusion in both tissues, but with a different extent. This may be due to model features: in the sonicated lung, the whole lung tissue (mixing sonicated and non-sonicated tissues) was collected and analysed, while in the sonicated muscle, only the tissue crossed by the ultrasound beam was collected and analysed. The difference between amikacin concentrations in sonicated and non-sonicated tissues were therefore minimised in the lung analysis.

Conclusion(s): Sonoporation increase ATBs concentration in lung and muscle tissues and may open new therapeutic fields against infection.

13AP05-5

Assessing national guidelines for secondary intra-abdominal infection empiric antimicrobial therapy: review of the bacteriology and antimicrobial susceptibility in a spanish tertiary-level hospital

Moreno Martínez C.E., Garcia Bernedo C.A., Benitez Cano A., Sadurní Sardá M., Bermejo Martínez S., Carazo Cordobés J.
Hospital del Mar, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain

Background and Goal of Study: Extended-spectrum β -lactamase-producing Enterobacteriaceae in community-acquired and carbapenem-resistant Enterococcus faecium in health care-associated intraabdominal infection are the main future problems we could face in a near future due to its increasing incidence in our environment.

National guidelines for secondary intra-abdominal infection recommend the use of β -lactam or β -lactamase inhibitor combination for community-acquired and carbapenem for health care-associated intra-abdominal infection¹.

The goal of the study is to assess the suitability of the empiric antimicrobial therapy recommended by national guidelines for secondary intra-abdominal infection in our institution.

Materials and Methods: A retrospective clinical review was conducted in our institution during the last year. We reviewed bacteriology of patients with secondary peritonitis and positive intraoperative culture. We reviewed antimicrobial susceptibility to the main agents used for empiric community-acquired and health care-associated intra-abdominal infection.

We used ampicillin to determine carbapenem susceptibility in *Enterococcus* species².

Results and Discussion: 130 patients with secondary intra-abdominal infection and positive intraoperative culture were identified (83 community-acquired and 47 health care-associated).

Enterobacteriaceae species remain the major pathogens in community-acquired infections; 13% of these patients were not susceptible to β -lactam or β -lactamase inhibitor combination.

Enterobacteriaceae species also remain the major pathogens in health care-associated infection but *Enterococcus* species are isolated in 60% of the cases. 25% of these patients were not susceptible to carbapenem because of ampicillin-resistant *Enterococcus* species.

Conclusion(s): Community-acquired patients are tolerably covered with the current empiric treatment but high incidence of carbapenem-resistant *Enterococcus* species demands the use of linezolid, daptomycin or vancomycin.

References:

1. Guirao X, Arias J, Badía JM, García-Rodríguez JA, Mensa J, Álvarez-Lerma F, Borges M, Barberán J, Maseda E, Salavert M, Llinares P, Gobernado M, García Rey C. Recommendations in the empiric anti-infective agents of intra-abdominal infection. *Rev Esp Quimioter.* 2009 Sept;22(3):151-72.
2. Jones RN. Prediction of enterococcal imipenem susceptibility using ampicillin or penicillin MICs: more evidence for a class concept. *J Clin Microbiol.* 2001 Oct;39(10):3810-1.

13AP05-6

Clinical use of presepsin and CRP in diagnosis and prognosis of sepsis - the influence of BMI and age

Moise A., Guran C.-T., Balescu-Arion C., Mincu N., Stelea G.

Prof. Dr. D. Gerota Hospital, Dept of Anaesthesiology & Intensive Care, Bukarest, Romania

Background and Goal of Study: Following last year observational prospective study presented at Euroanesthesia 2015, we continued to enroll ICU septic versus healthy subjects, measuring Presepsin and CRP at admission and, when possible, after 72 hours, for compare the value of these markers in separating sepsis and other causes of systemic inflammatory response syndrome (SIRS) in relationship with the age and Body Mass Index (BMI).

Materials and Methods: 120 consecutive suspected sepsis patients and 40 healthy subjects were enrolled into the study for six months in the ICU, after ethical approval, according to inclusion criteria. Point of care methods - Presepsin (PATHFAST, Medience Corporation), and CRP levels (quantitative test, nephelometry, Beckman Coulter) were measured in patients with suspected systemic bacterial infection. The statistical distribution of Presepsin and CRP values was also analysed by age and BMI (the control group showed significant differences at BMI over 30 and for subjects older than 45). The cutoff value of presepsin for discrimination sepsis and non-infective SIRS was chosen to be 400 pg/ml (deducted from our local experience).

Results and Discussion: We found for healthy subjects (mean of age 46.62 y, BMI 27.4, mean of presepsin 85.86pg/ml) lower absolute values of presepsin in women vs men, but without statistical significance (83.10pg/ml vs 91.59pg/ml). Septic patients had higher presepsin 1442.10 \pm 2196.58) and CRP values, with statistical significance between survivors and deceased for the first marker. In septic group, presepsin variation was significant in younger (ages 20-39, mean 1998.55 \pm 3276.47 vs 515.40 \pm 371.20 vs 1382.65 \pm 1929.80) and obese patients (BMI higher than 30, mean 2150 \pm 3079.89 vs 853.17 \pm 590.24 vs 1510.58 \pm 2825.80). Sex group variation presents a tendency towards significance.

Conclusion(s): Presepsin is quick to differentiate septic from non-septic patients, survivors from non-survivors, but may be influenced by high BMI

References: Xin Zhang, Dan Liu, You-Ning Liu, Rui Wang and Li-Xin Xie. The accuracy of presepsin (sCD14-ST) for the diagnosis of sepsis in adults: a meta-analysis. *Critical Care* 2015, 19:323.

13AP05-7

Nosocomial pneumonia with multiresistant germs and probabilistic antibiotic therapy in Medical Resuscitation: year 2013-2014

Ezzouine H., Slimani Y., Benslama A.

University Hassan II - Faculty of Medicine and Pharmacy, Dept of Anaesthesiology & Intensive Care, Casablanca, Morocco

Background and Goal of Study: Nosocomial pneumonia remains a major complication occurring in an intensive care setting, especially in artificially ventilated patients. Their incidence is constantly increasing, despite the regular appearance of new therapeutics. This is due to changes in patient care and recruitment practices.

It is a retrospective descriptive and analytical study carried out at the Medical Reanimation Service of the Ibn Rushd Hospital in Casablanca, spread over a period of 12 months, between January and December 2014.

Materials and Methods: We analyzed all the bronchial samples taken in the Diagnosis of nosocomial pneumonia. The statistical analysis was carried out using SPSS 22.0 and EXCEL 2011.

Results and Discussion: An incidence of 37.9% The average age of patients in our series was 43.30 years with extremes ranging from 16 to 83 years. 66.4% of the patients included in the series were male The most widely prescribed antibiotics for initial probabilistic antibiotic therapy were: Amikacin (53% of prescriptions), Imipenem (52% of prescriptions), Colimycin (49% of prescriptions) and Rifampicin (38% % Of prescriptions).

Of the patients in our series, 75.7% received antibiotic therapy within 24 hours of admission and 24.3% after 24 hours. The average duration of treatment in our patients was 14.3 days. Our patients could not benefit from a therapeutic de-escalation. The factors associated with mortality in intensive care were sought in univariate analysis.

A value of $p < 0.05$ was considered as the threshold of significance. Charlson scores, APACHE II scores, SAPS II, SOFA, duration of intubation, sedation, The late occurrence of pneumonia were factors correlated with excess mortality.

Conclusion(s): Nosocomial pneumonia with multiresistant germs and probabilistic antibiotic therapy in Medical Resuscitation are a great dilemma for intensivists in the daily practice. Some data are more correlated to mortality even if a probabilistic antibiotherapy managed earlier for nosocomial pneumonia as Charlson score, APACHEII, SAPS II, SOFA, duration of intubation and sedation and the timing of occurrence pneumonia.

13AP05-8

Anidulafungin for prevention of intraabdominal candidiasis in high risk surgical patients

Pérez de Lis Novo M., Vidal Seoane M., Rama-Maceiras P.,

Lopez M., Rey T., Pensado Castiñeiras A.

Complejo Hospitalario Universitario A Coruña, Department of Anaesthesiology and Perioperative Medicine, A Coruña, Spain

Background and Goal of Study: Thirty to forty percent of patients with recurrent gastrointestinal perforation/anastomotic leakage or other severe abdominal process develop intraabdominal invasive candidiasis (IC). A corrected Candida colonization index (CCI) > 0.4 is a powerful predictor of IC. Fluconazole prevents intraabdominal IC in this setting, but azole-resistant Candida species are emerging. The aim of this study was to explore the efficacy and safety of anidulafungin for prevention of intraabdominal IC in high-risk surgical patient.

Materials and Methods: Retrospective non-comparative single-center study in consecutive adult surgical patients with abdominal septic shock. Preventive anidulafungin therapy was given until resolution of the surgical condition. Candida colonization index, occurrence of intra-abdominal IC and adverse events were monitored.

Results and Discussion: One hundred and fifty patients were studied: 85 (57%) had recurrent gastrointestinal perforation/anastomotic leakage and 10 (7%) acute necrotizing pancreatitis. The median duration of preventive anidulafungin therapy was 14 days (range 3-50). Anidulafungin was successful for prevention of intraabdominal IC in 120/150 patients (80%[1]). No drug-related adverse event requiring anidulafungin discontinuation occurred. One hundred and fourteen patients (76%) survived at 30-days.

Conclusion(s):

- The use of an echinocandin is recommended for hemodynamically unstable patients or with a history of recent fluconazole exposure.
- Anidulafungin may be efficacious and safe for prevention of intraabdominal candidiasis in high- risk surgical patients.
- This needs to be further investigated in randomized trials.

13AP05-9**Epidemiology and mortality of invasive candidiasis in high risk surgical patients**

Vidal Seoane M., Pérez de Lis Novo M., Yañez A., Martínez S., Fernandez Carballal M.F., Pensado Castiñeiras A.
Complejo Hospitalario Universitario de A Coruña, Department of Anaesthesiology and Perioperative Medicine, A Coruña, Spain

Background and Goal of the Study: Invasive candidiasis (IC) is a frequent and life-threatening infection in critically ill patients. The aim of this study was to evaluate the epidemiology of IC, the antifungal susceptibility of etiological agents and mortality of IC in high- risk surgical patients.

Materials and Methods: A retrospective review of consecutive adult surgical patients with abdominal septic shock between June 1, 2014 and April 30, 2016, was conducted. Preventive anidulafungin therapy was given until resolution of the surgical condition. Mortality was evaluated at end of hospital stay and 30 days.

Results and Discussion: During this period, a total of 30 cases of IC were identified. 11 women (38%) and 19 men (62%), with a mean age of 66 years (range 35-85). All cases of IC were patients with secondary peritonitis and severe sepsis or septic shock. *C. albicans* accounted for 53.0% of the isolates, followed by *C. parapsilosis* (30%), *C. glabrata* (16%), *C. krusei* (6%), and *C. tropicalis* (3%). Thus, the ratio of non-*Candida albicans* (14) to *C. albicans* (16) was 1:1.1. In 16% of the isolates, the causative *Candida* was less susceptible or resistant to fluconazole. Resistance to other antifungals was uncommon. Overall, the crude mortality rate in the was 33%; while, it was 50% in patients with candidemia. Early and late mortality were 26 and 6 %, respectively.

Conclusion(s): Non-*albicans Candida* species reach almost half of the *Candida* isolates.

Resistance to azoles should be considered when starting an empirical treatment.

Mortality of invasive candidiasis in ICU remains high and adequate antifungal therapy is necessary to lead a good outcome.

References: Andes DR, Safdar N, Baddley JW, Playford G, Reboli AC, Rex JH, Sobel JD, Pappas PG, Kullberg BJ, Mycoses Study Group. Impact of treatment strategy on outcomes in patients with candidemia and other forms of invasive candidiasis: a patient-level quantitative review of randomized trials. *Clin Infect Dis.* 2012;54(8):110-22.

13AP06-1**The protective role of Macrophage Migration Inhibitory Factor (MIF) in acute kidney injury after cardiac surgery**

Averdunk L.¹, Bernhagen J.², Bucala R.³, Boor P.⁴, Djurdjaj S.⁴, Stoppe C.¹

¹RWTH Aachen University, Dept of Anaesthesiology & Intensive Care, Aachen, Germany, ²Ludwig-Maximilians-University Munich, Research and Development Department, Munich, Germany, ³Yale University, Department of Internal Medicine, New Haven, United States, ⁴RWTH Aachen University, Department of Pathology and Department of Nephrology, Aachen, Germany

Background: Acute kidney injury (AKI) is a common complication after cardiac surgery, which is triggered by inflammation and oxidative stress. Within inflammation, macrophage migration inhibitory factor (MIF) represents a stress-regulating cytokine that may protect from myocardial ischemia-reperfusion (I/R) injury, by reducing oxidative stress. Therefore, we tested the hypothesis, if MIF is protective against AKI by cytoprotective and antioxidant effects.

Methods: Serum and urine samples were collected from 60 patients scheduled for cardiac surgery with aortic-cross-clamping. The concentrations of MIF and urinary neutrophil gelatinase-associated lipocalin (NGAL) were quantified.

In vivo, one- or two-sided renal ischemia was induced for 30 min in wildtype (WT) and MIF^{-/-} mice. After 6 or 24 h, serum creatinine, tubular injury, cleaved caspase-3 positive cells and phosphorylated mixed lineage kinase domain-like (pMLKL) positive tubuli were quantified. The oxidative markers glutathione (GSH) and thiobarbituric acid reactive substances (TBARS) were measured. Primary murine tubular (pmTEC) cells were treated with MIF or PBS under hypoxic conditions. LDH, GSH and TBARS were measured.

Results: We found that cardiac surgery triggered a significant increase in MIF serum levels that inversely correlated with urinary levels of NGAL ($p=0.01$; $r=-0.4088$), indicating a protective role of MIF. Patients with high circulating MIF levels 12 h after surgery had a significantly reduced risk for the development of AKI (rel. risk reduction 0.72, $p=0.03$). After renal I/R injury, MIF^{-/-} mice showed a significantly aggravated extent of renal failure (increased creatinine) due to increased tubular cell injury. We found more cleaved caspase-3 positive, apoptotic, ($p=0.003$) and pMLKL positive, necroptotic, cells ($p=0.001$) in MIF^{-/-} mice. Additionally, oxidative stress was strikingly increased indicated by reduced GSH and increased TBARS, a marker of lipid peroxidation and ferroptosis. Treatment of pmTEC with MIF *in vitro* confirmed its cytoprotective (LDH) and antioxidant (GSH, TBARS) effects.

Conclusion: Our data suggest a novel, renoprotective role of MIF in pathogenesis of AKI in patients after cardiac surgery by counteracting programmed cell death pathways and oxidative stress that could open therapeutic perspectives to reduce the incidence of AKI.

13AP06-3**Decreased tissue COX5B expression and mitochondrial dysfunction during sepsis-induced kidney injury in rats**

Hinkelbein J.¹, Böhm L.¹, Braunecker S.², Adler C.³, De Robertis E.⁴, Cirillo F.⁴

¹University of Cologne, Dept of Anaesthesiology & Intensive Care, Cologne, Germany, ²Kings College London, Dept of Intensive Care, London, United Kingdom, ³University of Cologne, Cardiology, Cologne, Germany, ⁴University of Naples "Federico II", Department of Neurosciences, Reproductive and Odontostomatological Sciences, Napoli, Italy

Background and Goal of Study: Sepsis is defined as a life-threatening organ dysfunction due to a dysregulated host response to infection. Sepsis is the dominant cause of acute kidney injury (AKI), accounting for nearly 50% of episodes of acute renal failure. Signaling cascades and pathways within the kidney are largely unknown. However, analysis of these molecular mechanisms may enhance knowledge on pathophysiology and possible therapeutic options, but may also suggest possible biomarkers to early identify sepsis in clinical course. The present study investigates changes of protein expression in kidney tissue in a cecal ligation and puncture (CLP) model of rat sepsis during a time-course of 24 or 48 hours.

Materials and Methods: 26 male Wistar rats were assigned either to a sham group (control, N=6) or sepsis group (N=20; cecal ligation and puncture model, 24 and 48 hours after CLP). Surviving rats (n=12) were decapitated at 24 hours (early phase; n=6) or 48 hours (late phase; n=6) after CLP and kidneys removed for proteomic analysis. 2D-DIGE and DeCyder 2D Software (T-Test, $p<0.01$) were used for analysis of significantly regulated protein spots. MALDI-TOF in combination with peptide mass fingerprinting (PMF) as well as Western Blot analysis were used for protein identification. Bioinformatic network analyses (STRING, GeneMania, and PCViz) were used to describe protein-protein interactions.

Results and Discussion: A total of N=18 rats were used for analysis. 12 spots were identified with significantly altered proteins ($p<0.01$) in the three analyzed groups. Two spots could not be identified. From the remaining 10 spots, four different proteins were found significantly changed among the groups: major urinary protein (Mup5), cytochrome c oxidase subunit B (Cox5b), myosin-6 (Myh6) and myosin-7 (Myh7). Using the string software, a significant correlation with the proteins was found for mitochondrial energy production and electron transport.

Conclusion(s): COX5B could be a promising biomarker candidate since a significant association was found during experimental sepsis in the present study. For future research, COX5B should be evaluated as a biomarker in both human urine and serum to identify sepsis.

13AP06-4**TIMP-2 and IGFBP-7 for early detection of major surgery associate acute kidney injury: a systematic review & meta-analysis**

Ray B.R., Kundu R.

All India Institute of Medical Sciences, Dept of Anaesthesiology & Intensive Care, Newdelhi, India

Background and Goal of Study: Acute kidney injury (AKI) following major surgery increases short and long term mortality. Recently biomarkers have been used for early detection of AKI after major surgeries. Combination of Urinary insulin-like growth factor-binding protein 7 (IGFBP-7) and tissue inhibitor of metalloproteinase-2 (TIMP-2) {both urinary cell-cycle arrest biomarkers}, have been identified as one of the most sensitive & specific biomarkers for predicting surgery-associated acute kidney injury; however, variable performance characteristics have been reported. We therefore performed a meta-analysis to investigate the diagnostic accuracy of urinary [TIMP-2]×[IGFBP-7] in early diagnosis of AKI.

Materials and Methods: An electronic search was carried out with PUBMED, Cochrane Library, and Web of science, Medline and ClinicalTrials.gov database up to 1st November 2016. The diagnostic performance of [TIMP-2]×[IGFBP-7] for the prediction of AKI in major surgeries carrying high risk of perioperative AKI, was evaluated using pooled estimates of sensitivity, specificity, likelihood ratio, and diagnostic odds ratio (DOR), as well as summary receiver operating characteristic curves (SROC).

Results and Discussion: Five studies involving 578 patients were included in the meta-analysis. The pooled sensitivity and specificity of Urinary [TIMP-2]×[IGFBP-7] values obtained within postoperative day one, with corresponding 95% confidence intervals (CI) were 0.818 {95% CI: 0.714 - 0.897} & 0.470 {95% CI: 0.425 - 0.516}, respectively. The pooled positive likelihood ratio (PLR) was 1.652 {95% CI: 1.158 - 2.356} and the pooled negative likelihood ratio (NLR) was 0.366 {95% CI: 0.152 - 0.879}. The pooled DOR was 5.212 {95% CI: 2.409 - 11.278} using random effects model. The area under the curve (AUC) for SROC to summarize diagnostic accuracy was 0.72.

Conclusion(s): Urinary [TIMP-2]×[IGFBP-7] appears to be a promising biomarker with reasonably good predictive ability to identify early postoperative AKI after major surgery. However, due to significant heterogeneity, further randomized controlled trials with larger sample size and defined objectives could definitively establish the thresholds for Urinary [TIMP-2]×[IGFBP-7] in different patient cohorts.

13AP06-5**Risk factors for Acute Kidney Injury in a South East Asian General Surgical Intensive Care Unit**Wong W.E.J.¹, Yong K.J.¹, Tham Y.Y.S.¹, Soh C.R.², Lian Kah T.³, Chew T.H.S.⁴*¹National University of Singapore, Dept of Anaesthesiology, Singapore, Singapore, ²Singapore General Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore, ³National University Health System, Dept of Anaesthesiology, Singapore, Singapore, ⁴Singapore General Hospital, Dept of Anaesthesiology, Singapore, Singapore*

Background and Goal of Study: Postoperative Acute Kidney Injury (AKI) occurs in 1.0-7.5% of patients admitted to the General Surgical Intensive Care Unit (GSICU), and is associated with poor patient outcomes¹. Studies have identified age and diabetes¹ as predictors of AKI. With a rapidly aging population and increasing incidence of diabetes in South East Asia, this study aims to determine the risk factors for postoperative AKI in such a population.

Methodology: Following institutional review board approval, we retrospectively obtained data from 792 patients admitted to the GSICU of a tertiary hospital from 2015-2016. Patient demographics, clinical factors, and perioperative data were collected.

Patients with pre-existing renal failure were excluded.

The primary outcome was AKI, as defined by Acute Kidney Injury Network criteria. The secondary outcome was in-hospital mortality. Univariate analysis was done using Pearson chi-square test for categorical variables, and independent sample t-test for quantitative variables. Variables with p<0.10 were included in multivariate stepwise logistic regression analysis.

Results and Discussion: Incidence of AKI was 17.3%. Univariate analysis showed patients with AKI were more likely to be older, diabetic, have cardiac pathology, pre-operative renal dysfunction and perioperative hemodynamic instability. Postoperatively, they were noted to have lower haematocrit (HCT), higher APACHE II scores, and electrolyte disturbances.

Multivariate analysis revealed diabetes(p=0.031, odds ratio (OR) 1.634, 95% confidence interval (CI) 1.046 - 2.554), bradycardia(p=0.014, OR 3.115, 95% CI 1.071 - 9.085), lower HCT (p<0.001, OR 0.931, 95% CI 0.900 - 0.963), lower bicarbonate levels (p<0.015, OR 0.943, 95% CI 0.900 - 0.989), and elevated potassium levels(p=0.039, OR 1.382, 95% CI 1.017 - 1.878) to be independent risk factors.

Patients with AKI had a significantly higher mortality rate of 25.9% compared to 16.4% (p=0.009).

Conclusion: Postoperative AKI is a common complication in our ICU and is associated with increased mortality rates. Targeting modifiable risk factors such as anemia, hemodynamic and metabolic derangements may reduce incidence of AKI.

References: Kheterpal, S., K. K. Tremper, M. Heung, A. L. Rosenberg, M. Englesbe, A. M. Shanks and D. A. Campbell, Jr. (2009). "Development and validation of an acute kidney injury risk index for patients undergoing general surgery: results from a national data set." *Anesthesiology* 110(3): 505-515.

13AP06-6**Utility of novel oxidative stress biomarkers in diagnosis and prognosis of sepsis-associated acute kidney injury**Bojic S.¹, Kotur-Stevuljevic J.², Memon L.³, Toskovic B.⁴, Simic-Ogrizovic S.⁵*¹Clinical Hospital Centre Bezanijaska Kosa, Dept of Anaesthesiology & Intensive Care, Belgrade, Serbia, ²Faculty of Pharmacy, Belgrade University, Department of Medical Biochemistry, Belgrade, Serbia, ³Clinical Hospital Centre Bezanijaska Kosa, Clinical Chemistry Laboratory, Belgrade, Serbia, ⁴Clinical Hospital Centre Bezanijaska Kosa, Dept of Surgery, Belgrade, Serbia, ⁵University of Belgrade, School of Medicine, Belgrade, Serbia*

Background and Goal of Study: Oxidative stress has a pivotal role in the pathophysiology of sepsis-associated acute kidney injury (SA-AKI). Total oxidant status (TOS), total antioxidant status (TAS) and oxidative stress index (OSI) are emerging biomarkers of oxidative stress. We aimed to investigate their utility as diagnostic and prognostic biomarkers of SA-AKI.

Materials and Methods: This prospective observational study compared 53 major abdominal surgery patients with sepsis divided into SA-AKI (n = 37) and non-SA-AKI (n = 16) group to 50 controls without sepsis matched by age, gender, comorbidities and type of surgery. Blood and urine samples from the septic patients were collected on admission to Intensive Care Unit (ICU) and 24, 48, 72 and 96 h later and once from the controls. Levels of TOS, TAS, urea, creatinine and neutrophil gelatinase-associated lipocalin (NGAL) were measured. OSI, Sequential Organ Failure Assessment (SOFA) and Acute Physiology and Chronic Health Evaluation II (APACHE II) scores were calculated. The study was approved by institutional ethical committee.

Results and Discussion: During 96 h following admission to ICU, septic patients with SA-AKI had, unexpectedly, lower TOS and OSI but similar TAS compared to septic patients without SA-AKI (linear mixed models: P_{TOS} = 0.006, P_{OSI} = 0.001, P_{TAS} = 0.070). Septic patients with SA-AKI also had lower TOS and OSI compared to controls (P<0.05 at all time points). TAS, TOS and OSI were indirectly correlated to urea, creatinine, NGAL, SOFA and APACHE II score. TOS and OSI were, unlike TAS, good diagnostic biomarkers of SA-AKI (the areas under the receiver operator characteristic curve were 0.732 (0.564 - 0.901), 0.720 (0.547 - 0.893) and 0.666 (0.495 - 0.837), respectively). Lower TOS and OSI were associated with shorter survival of septic patients (Log rank: P_{TOS} <0.001, P_{OSI} = 0.045). TAS was not, however, a significant predictor of survival (Log rank: P_{TAS} = 0.918).

Conclusions: Unexpectedly, SA-AKI was associated with lower TOS and OSI. TOS and OSI were, unlike TAS, good diagnostic and excellent prognostic biomarkers of SA-AKI.

13AP06-8**Nephrotoxicity in adult patients undergoing hyperthermic intraperitoneal chemotherapy and cytoreductive surgery**

Etulain Santos M.J., Canal Alonso M.I., Gago Quiroga S., Cabrerizo Torrente P., Jiménez De La Fuente C., Zaballos Garcia M. *General University Hospital Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*

Background and Goal of Study: Cytoreductive surgery associated with hyperthermic intraperitoneal chemotherapy (CRS + HIPEC) may alter postoperative renal function, causing an impact in morbidity, mortality and cost of this procedure. Our aim was to examine the association of postoperative changes in renal function according to RIFLE criteria in patients who underwent CRS+HIPEC. RIFLE is a new definition of acute kidney injury classification based on changes in serum creatinine levels or the duration and severity of decline in the urine

Materials and Methods: After committee approval, a retrospective cohort study was performed evaluating patients undergoing HIPEC from 2011 to 2015. Postoperative renal function was assessed using serial serum creatinine measurements and was based on serum creatinine changes from preoperative values, according to the risk, injury, failure, loss, end-stage kidney (RIFLE) classification.

Results and Discussion: We evaluated 257 patients, ASA I-III with a mean age of 56 ± 11 years. The median and range of the peritoneal carcinomatosis index was 13(6-23). HIPEC time was 30 min in 44% of patients, 60 min in 35% of cases and in a 21% of patients HIPEC time lasted 90 min. Postoperative acute changes in renal function were observed in 29 patients (11.1%); (Risk: n=10; Injury: n=9; Failure: n= 8; Loss: n=2). Relative to the antineoplastic agent, no changes in renal function were observed in patients who received mitomycin C (n=62); 7 of 101 patients who received oxaliplatin presented renal changes; 21 of 92 (22.8%) of patients who received cisplatin presented renal dysfunction (p<0.0001). We did not observe differences in renal dysfunction in the years evaluated.

Conclusions: Postoperative nephrotoxicity can complicate CRS/HIPEC. Permanent renal dysfunction was not a common complication (0.8%) in our cohort. Cisplatin was the principal chemotherapy agent associated with renal dysfunction in patients undergoing CRS/HIPEC

References:

*TC Chua et al. Should the Treatment of Peritoneal Carcinomatosis by Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy Still be Regarded as a Highly Morbid Procedure? A Systematic Review. *Ann Surg* 2009;249: 900-7.

**Bellomo R et al. Acute renal failure, Definition, outcome measures, animal models, fluidtherapy and information technology needs: The Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. *Crit Care*. 2004;8(4):R204-R212

13AP06-9**Beneficial role of hydrogen sulfide in renal ischemia reperfusion injury in rats**

Lim D.G.¹, Park S.H.², Choi E.K.³

¹Kyungpook National University, Dept of Anaesthesiology & Pain Medicine, Daegu, Korea, Republic of, ²Kyungpook National University Hospital, Dept of Anaesthesiology & Pain Medicine, Daegu, Korea, Republic of, ³Yeoungnam University, College of Medicine, Dept of Anaesthesiology & Pain Medicine, Daegu, Korea, Republic of

Background and Goal of Study: Hydrogen sulfide (H₂S) is an endogenous gaseous molecule with important physiological roles. It is synthesized from cysteine by cystathionine γ-lyase (CGL) and cystathionine β-synthase (CBS). Here, we examined the benefits of exogenous H₂S on renal ischemia reperfusion (IR) injury as well as the effects of CGL or CBS inhibition. Furthermore, we elucidated the underlying mechanism of the action of H₂S in the kidney.

Materials and Methods: Thirty male Sprague-Dawley rats were randomly assigned to five groups: sham, renal IR control, NaHS treatment, a H₂S donor (100 μmol/kg), and CGL or CBS inhibitor administration group. Blood urea nitrogen (BUN) and serum creatinine (Cr), renal tissue malondialdehyde (MDA),

superoxide dismutase (SOD), histological changes, apoptosis, and expression of MAPK family members (extracellular signal-regulated kinase (ERK), c-Jun N-terminal kinase (JNK), and p38) were evaluated.

Results and Discussion: The effects of NaHS treatment were characterized based on decrease in serum BUN and Cr levels and attenuation of histological damage followed by renal IR injury. The administration of NaHS led to attenuation of oxidative stress as determined by decreased MDA, preserved SOD, and reduced apoptotic cells. Additionally, NaHS also prevented renal IR induced MAPK phosphorylation. The CGL or CBS group showed increased MAPK family activity, but there was no significant difference in the IR control group.

Conclusion(s): These findings indicate that exogenous H₂S can attenuate renal damage followed by IR injury. Moreover, the proposed beneficial effect of H₂S is, in part, due to anti-oxidative stress induced by modulation of the MAPK signaling pathways.

References:

Guo D. et al. *Eur J Pharmacol* 2014;725:70.

Xu Z. et al. *Am J Physiol Renal Physiol* 2009;297:27.

13AP06-10**Chronobiology of sepsis. I. Relationship between sepsis course and urinary excretion of 6-sulfatoxymelatonin**

Acuña Fernández C.¹, Solera Marín J.¹, Acuña Castroviejo D.², Darias Delbey B.¹, Nodarse Medina J.¹, Rusanova I.²

¹Hospital Universitario de Canarias- Tenerife, Dept of Anaesthesiology, San Cristobal de la Laguna, Spain, ²Universidad de Granada, Centro de Investigación Biomédica, Granada, Spain

Background and Goal of Study: Sepsis courses with a shift of the circadian system that affects the melatonin production, which correlated with sleep/wake dysfunction. Melatonin administration recovered mice from septic shock and multiorgan failure, increasing their survival. In septic patients, melatonin administration significantly improved the circadian clock alteration. Moreover, melatonin reduction may be related to the oxidative stress and immune response during sepsis. The aim of this study was to analyze urinary excretion of 6-sulfatoxymelatonin (6-SM), the main metabolite of melatonin, and to compare it with the IL-1β, IL-6, IL-8, TNFα, IL-10 levels, and oxidative status during sepsis.

Materials and Methods: Healthy subjects, non-septic controls and septic patients were evaluated. 6-SM was measured by a commercial ELISA kit; plasma cytokines were determined with Affimetrix's ProcartaPlex Simplex Kits, and plasma lipid peroxidation (LPO) and protein oxidation (AOPP) were spectrophotometrically measured. Hematological and biochemical data, and clinical scores of the patients, were analyzed.

Results and Discussion: Proinflammatory cytokines, LPO, and AOPP increased during sepsis and normalized in patients recovered from sepsis. The urinary 6-SM decreased in sepsis and increased when the patients recovered from sepsis, suggesting changes in the synthesis and/or metabolism of melatonin and, thus, changes in the circadian profile of melatonin. 6-SM excretion correlates negatively with SOFA and positively with procalcitonin in septic patients. The significant increased levels of melatonin that accompanies the recovery of sepsis, together with the normalization of the pro-inflammatory cytokines levels and of the hyperoxidative status of septic patients once they were recovered from sepsis, may also support a beneficial effect of melatonin on the sepsis course, as it was demonstrated in both experimental and clinical endotoxemia.

Conclusion(s): Our data suggest that the existence of a negative correlation between sepsis and melatonin production, which reflects an alteration in the circadian system, supporting antiseptic properties of the indoleamine elsewhere reported.

References: Garcia, JA et al. *FASEB J* 2015, doi: 10.1096/fj.15-273656; Mundigler, G, et al. *Crit Care Med* 2002, 30, 536-540.

Acknowledgements: This research has been partially supported by grants CB16-10-00238, and PI13-00981 from the ISCIII, Spain, and from Pfizer S.L.U., Madrid, Spain.

13AP07-1**Accuracy of pleth variability index compared with inferior vena cava diameter to predict fluid responsiveness in mechanically ventilated patients**Pişkin Ö.¹, Öz İ.İ.²¹Bulent Ecevit University, Dept of Anaesthesiology & Intensive Care, Zonguldak, Turkey, ²Bulent Ecevit University, Dept. of Radiology, Zonguldak, Turkey

Background and Goal: The goal of hemodynamic stabilization is to help make tissue oxygenation adequate in target organs. Intravenous fluid administration is the first step in correcting tissue perfusion. Recently noninvasive and bedside methods have become increasingly important. We aim to compare the performance between 2 methods which names Pleth variability index (PVI) and IVC distensibility index (dIVC).

Materials and Methods: After the approval of our institutional review board 72 patients were included in this study. The hemodynamic measurements were performed before and after passive leg raising (PLR). Measurements were obtained, including central venous pressure (CVP), PVI, dIVC and cardiac index (CI). Both CI and dIVC measurements were evaluated by transesophageal probe and 5 MHz convex probe respectively (Esaote My Lab 30, Genoa, Italy). Patients with a >15% increase in CI attributable to the PLR maneuver were defined as 'volume responders'. Patients with no change or a change of <15% were defined as 'nonresponders'. The dIVC measurements were taken using M-mode, 2 cm from junction between the right atrium and the inferior vena cava. The PVI was measured by Masimo Radical-7 monitor, Masimo®. Data are expressed as n (%) or standard deviations (SD). The significance at p<0.05.

Results and Discussion: The CVP provided 70% sensitivity and 53.1% specificity at a threshold value of ≤7 mmHg and was not statistically significant (p=0.066), with an AUC = 0.622 (0.500-0.724). The dIVC at a threshold value of >23.8% provided 80% sensitivity and 87.5% specificity to predict fluid responsiveness and was statistically significant (p<0.001), with an AUC = 0.928 (0.842-0.975). The PVI at a threshold value of >14% provided 95% sensitivity and 81.2% specificity to predict fluid responsiveness and was statistically significant (p <0.001), with an AUC = 0.939 (0.857- 0.982).

In this study, our results shows that non-invasively assessed PVI and IVC distensibility index (dIVC) were good predictors of fluid responsiveness to after passive leg raising (PLR) in all intensive care unit (ICU) patients under mechanical ventilation. And also invasively assessed central venous pressure (CVP) as a static variable of cardiac preload was a poor predictor of fluid responsiveness.

Conclusion: Both PVI and dIVC can be used as a noninvasive method that can be easily applied at the bedside in determining fluid responsiveness in all patients with mechanical ventilation in intensive care.

13AP07-2**The effect of albumin and crystalloids administration on global end-diastolic volume - Prospective comparative study**Owada G.¹, Takaki S.², Mihara T.², Hamada T.², Yamaguchi O.², Goto T.²¹Yokohama City University, Dept of Anaesthesiology, Yokohama, Japan, ²Yokohama City University, Dept of Anaesthesiology & Intensive Care, Yokohama, Japan

Background and Goal of Study: It is generally expected that colloids expand the intravascular volume more effectively than do crystalloids. This assumes normal permeability of the vascular wall, which is inevitably increased by inflammation caused by surgery. We sought to elucidate whether colloid and crystalloid administered at various time points after a major surgery exert differential effects on the intravascular volume.

Materials and Methods: We conducted this prospective comparative cross-over study at the Yokohama City University Hospital from March 2015 to November 2016. We enrolled those patients who underwent oral and pharyngeal tumor resection. 100ml of 25% albumin and 500ml of crystalloids (glutathione-bicarbonate Ringer's solution) were administered at a 6-hour interval on each day from postoperative day 1 to 3, and the Global End Diastolic Volume Index (GEDI) was measured before and after each fluid administration using the Volume View catheter (Edwards Life Sciences). The change ratio

((post-pre)/pre) of GEDI was compared by t-test analysis. Generalized linear mixed models were used to evaluate factors responsible for the changes in GEDI after fluid administration.

Results and Discussion: The total numbers of GEDI measurements were 53 times albumin and 65 times crystalloid in 25 patients. When each fluid were compared across three days, the change ratios of GEDI were similar (Mean Difference (95% CI): -1.4 (-5.1 to 2.3), p=0.30). Also on each day, there were no significant differences between albumin and crystalloid, Day1:1.5(-3.2 to 7.2) vs. 0.55(-3.8 to 6.9), p=0.61). Day2:6.1(1.0 to 9.4) vs. 4.3(-2.5 to 13.0), p=0.57. Day3:1.3(-11.1 to 4.3) vs. -5.1(-9.3 to 5.5), p=0.48. In the generalized linear mixed models, postoperative day and CRP significant influenced GEDI (Day: -3.8(-7.4 to -0.2), p=0.05 and CRP: 0.5(0.0 to 0.9), p=0.05, respectively). In this study, albumin and crystalloid administration have similar effect for hemodynamic change in the inflammatory status during perioperative status. We may not need to select type of fluid for volume expansion during perioperative status.

Conclusions: In perioperative status, it is no differences crystalloid and albumin infusion for GEDI. On the other hand, the number of days elapsed after the operation and CRP had significant effects.

References:N England J Medicine. 2004; 350: 2247-56.
N England J Medicine. 2013; 369: 1243
N England J Medicine. 2011; 364: 2483-95.**13AP07-3****Relative value of pressures and volumes in assessing fluid responsiveness in children: the role of systolic cardiac function**Jacquet-Lagrèze M.¹, Tiberghien N.², Hanna N.², Javouhey E.³, Fellahi J.-L.²¹Hôpital Louis Pradel, Dept of Anaesthesiology & Intensive Care, Bron, France, ²Hospices Civils de Lyon, Hôpital Louis Pradel, Dept of Anaesthesiology & Intensive Care, Lyon, France, ³Hospices Civils de Lyon, Hôpital Femme Mère Enfant, Dept of Intensive Care, Lyon, France

Background and Goal of Study: According to Laplace's Law, pressures and volumes may both contribute to end-diastolic wall stress as a measure of cardiac preload [1]. The purpose of this study was to evaluate the relative value of filling volumes (EDVi) and pressures (E/e') for predicting the fluid responsiveness, according to systolic cardiac function in children during acute circulatory failure.

Materials and Methods: Patients under eight years old, during acute circulatory failure and necessitating fluid administration were analyzed. An exhaustive cardiac echography was performed initially and the stroke volume index (SVI) was measured before and after volume expansion (10 ml/kg over 10 minutes). Patients were responders if their stroke volume index (SVI) increased by at least 15% and splitted in low LVEF (≤50%) or normal LVEF (>50%). R software with pROC package was used to performed descriptive and analytic statistics. p<0.05 was considered significant.

Results and Discussion: Thirty children of 17± 22 months old were included. Fluid responsiveness occurred in 6/14 fluid challenges (low LVEF) and in 8/16 fluid challenges (normal LVEF).

Pressure-based approach: For low and normal LVEF, the ROC_{AUC} for E/e' were 0.83 (95% CI: 0.56-1) and 0.73 (95% CI: 0.39-1), respectively. The best threshold for E/e' in low LVEF was 7.9.

Volume-based approach: For low and normal LVEF, the ROC_{AUC} for EDVi were 0.69 (95% CI: 0.37-1) and 0.74 (95% CI: 0.4-1), respectively. The best threshold in normal LVEF was an EDVi below 19 ml/m². Our study illustrates the curvilinear left ventricular pressure-volume relationship at end-diastole and its up-left shift during impaired inotropic function. Volume is the main determinant of preload when inotropism is conserved whereas pressures is the main determinant of preload when inotropism is altered.

Conclusion(s): When LVEF is low, E/e' seems more accurate than EDVi for predicting fluid responsiveness. Conversely, EDVi seems more accurate than E/e' when LVEF is normal, and reciprocally as predicted by the slope of end diastolic pressure volume curve. Those both static approaches remain of poor diagnosis value.

References: Cardiac filling volumes versus pressures for predicting fluid responsiveness after cardiovascular surgery: the role of systolic cardiac function ; Ronald J Trof ; Crit. Care. 2011.

13AP07-4

Impaired autophagosome clearance contributes to neuronal death after ischemia/reperfusion injury triggered by cardiac arrest in neonatal piglets

Cui D.¹, Zhang X.¹, Jiang W.¹, Ewa K.², Ramond C. K.²

¹Shanghai Sixth People's Hospital Affiliated with Shanghai Jiaotong University, Dept of Anaesthesiology, Shanghai, China, ²Johns Hopkins University, Dept of Anaesthesiology & Intensive Care, Baltimore, United States

Background and Goal of Study: Dysregulation of autophagy contributes to neuronal cell death in several neurodegenerative diseases and traumatic brain injury^[1]. Recent studies suggest that autophagy played protective roles in the cerebral ischemia^[2] and reperfusion^[3] phases, whereas reperfusion after cardiac arrest stimulates neuronal autophagy activation with BECLIN-1 upregulation and is implicated in causing neuronal cell death. We examined autophagic flux through the macroautophagy pathway as a determinant of the neurodegeneration induced by cardiac arrest.

Materials and Methods: HI was produced with 45-min hypoxia and 7-min airway occlusion in 3-5-day-old piglets. Markers of autophagic (LC3, Beclin-1, PI3KC3, ATG12-ATG-5, p-ULK1, SQSTM1/p62), lysosomal (LAMP2, cathepsin B, cathepsin D), and cell death signaling (caspase-9, caspase-12, AIF, RIP1, RIP3, MLKL, PAGM5) were studied via immunohistochemistry, immunoblotting, and histochemistry in piglet brains. Autophagy was impaired in cultured mouse cortical neurons treated with chloroquine (10 μ mol/l) with or without rapamycin (5 μ mol/l) for 1d in the presence of Z-VAD-fmk (20 μ mol/l), cyclosporine A (20 μ mol/l), or vehicle control. Cell viability was assessed using MTT assay.

Results and Discussion: LC3-II, Beclin-1, PI3KC3, ATG12-ATG-5, and p-ULK1 increased by 1.5-6 h. Autophagosomes accumulated in cortical neurons by 1d owing to enhanced autophagy (early stages) and then to decreased autophagosome clearance (indicated by LC3, Beclin-1, and p62 accumulation). Autophagy flux impairment was attributable to lysosomal dysfunction (evidenced by low LAMP2, cathepsin B, and cathepsin D levels at 1d). Ubiquitin levels increased at 1d. Autophagosome and p62 accumulated predominantly in neurons at 1d, with p62 puncta occurring in affected cells. Beclin-1 colocalized with markers of caspase-dependent and caspase-independent apoptosis and necrosis in neurons. Mouse neonatal cortical neurons treated with rapamycin and chloroquine showed increased cell death and increased autophagosomes but not autolysosomes. In vitro cell death was attenuated by cyclosporine A.

Conclusion(s): Neonatal HI initially increased autophagy and later impaired autophagosome clearance, resulting in delayed cortical neuronal death.

References:

1. Sarkar et al. Autophagy.2014 Nov 11:0.
2. Zhang et al. Autophagy.2014 Oct 1;10:1801-13.
3. Zhang et al. Autophagy. 2013 Sep;9:1321-33.

13AP07-5

The systolic and diastolic function of left ventricle after applying PEEP A transesophageal echo study

Margaritis A.¹, Patsouras D.², Bolosi M.¹, Ygropoulou O.¹, Rizos D.¹, Papadopoulos G.³

¹General Hospital of Ioannina ,G. Hatzikosta', Dept of Intensive Care, Ioannina, Greece, ²General Hospital of Ioannina ,G. Hatzikosta', Dept of Cardiology, Ioannina, Greece, ³University Hospital of Ioannina, Dept of Anaesthesiology, Ioannina, Greece

Background and Goal of Study: The use of PEEP in patients under mechanical ventilation is a common practice. The heart function may be affected negatively after applying high levels of PEEP. The goal of this research was to study the effect of low and moderate levels of PEEP in diastolic and systolic function of left ventricle (LV).

Materials and Methods: The study protocol was approved by the local Ethics Committee. 14 patients aged 70,36 \pm 13,19 (mean \pm SD) under pressure control mechanical ventilation and with a stable hemodynamic status were studied. In order to accomplish the research we used transesophageal echocardiography (two-dimensional, pulsed Doppler, tissue Doppler) and a total of 6 parameters were recorded: the stroke volume (SV) and the ejection fraction

(EF) of LV, the waves E, A, the fraction E/A of transmitral flow (pulsed Doppler) and the fraction E/E' (tissue Doppler). Measurements were made initially with 0 PEEP, then 10 minutes after applying 5cmH₂O PEEP and again 10 minutes after applying 10cmH₂O PEEP

Results and Discussion: After applying 5cmH₂O PEEP no statistically significant changes were observed. After applying 10cmH₂O PEEP statistically significant changes were observed in:

- SV from 85,574 \pm 29,34ml to 74,131 \pm 31,9ml, p=0,005
- Wave E from 0,734 \pm 0,15m/s to 0,618 \pm 0,104m/s, p=0,0083
- Fraction E/A of transmitral flow from 1,023 \pm 0,378 to 0,878 \pm 0,23, p=0,044 and
- EF from 51,415 \pm 10,67 to 58,043 \pm 9,3, p=0,01

The wave A and the fraction E/E' of transmitral flow did not change.

After applying 10cmH₂O PEEP the reduction of wave E was due to reduced preload of LV with any diastolic dysfunction, because the fraction E/E' did not change. Also, a marginal increase of systolic function of LV was observed. However, the stroke volume of LV was reduced. Therefore, the effect of the reduced preload in cardiac output (CO) was proportionally greater than the increase of ejection fraction.

Conclusion: After applying 5cmH₂O PEEP the function of left ventricle was not affected, while after applying 10cmH₂O PEEP a reduction of CO was observed.

References:

1. Pinsky MR: The hemodynamic consequences of mechanical ventilation:an evolving story. Intensive Care Med 1997, 23:493-503
2. Haney M, et al: Myocardial systolic function increases during positive pressure lung inflation. Anesth Analg 2005, 101:1269-74

13AP07-6

Transoesophageal echocardiographic evaluation of positioning of central venous catheter determined by Peres' formula and radiologic landmark based technique

Kim I.S.

Kangdong Sacred Heart Hospital, Hallym University Medical Center, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: The lower superior vena cava (SVC) near the junction with the right atrium (RA) is considered the ideal location for the central venous catheter tip to ensure proper perioperative function and prevent injuries. We determined the catheter insertion depth with a new formula using the sternoclavicular joint and the carina as landmarks, with 1.5 cm safety margin. The accuracy of tip positioning with radiologic landmark based technique (R) and Peres' formula (P) was compared in this study using transoesophageal echocardiography.

Materials and Methods: Real-time ultrasound guided central venous catheterization was done through the right internal jugular or subclavian vein. Patients were randomly assigned to either the P group (n=93) or the R group (n=95). The optimal catheter tip position was considered within 2 cm above and 1 cm below the RA/SVC junction. Catheter tip position, abutment, angle to the vascular wall and flow stream were evaluated on bicaval view.

Results and Discussion: Distance from skin insertion point to the RA/SVC junction and determined depth of catheter insertion were more strongly correlated in the R group (17.4 [1.2] cm and 16.7 [1.5] cm, r=0.821, P<0.001) than in the P group (17.3 [1.2] cm and 16.4 [1.1] cm, r=0.517, P<0.001), with z=3.96 (P<0.001). More tips were correctly positioned in the R group than in the P group (74.2% vs 92.6%, P=0.001). Abutment, tip angle to the lateral wall >40°, and disrupted flow stream were comparable between the groups.

Conclusion(s): The catheter tip was positioned more accurately with radiologic landmark based technique than Peres' formula.

References:

1. Fletcher SJ, Bodenham AR. Safe placement of central venous catheters: where should the tip of the catheter lie? Br J Anaesth 2000; 85: 188-91.
2. Vesely TM. Central venous catheter tip position: a continuing controversy. J Vasc Interv Radiol 2003; 14: 527-34.
3. Peres PW. Positioning central venous catheters-a prospective survey. Anaesth Intensive Care 1990; 18: 536-9.
4. Stonelake PA, Bodenham AR. The carina as a radiological landmark for central venous catheter tip position. Br J Anaesth 2006; 96: 335-40.
5. Loukas M, Tubbs RS, Tongson JM, et al. The clinical anatomy of the crista terminalis, pectinate muscles and the teniae sagittalis. Ann Anat 2008; 190: 81-7

13AP07-7**Heart-lung transplantation: review of last eleven patients performed at Hospital Puerta de Hierro**

Álvarez A., Abdallah N.A., Del Campo A., Del Valle S., Albajar A., García J.

Hospital Puerta de Hierro Majadahonda, Dept of Anaesthesiology & Intensive Care, Majadahonda, Spain

Background: Heart-lung transplantation is the last option for patients with cardiac and pulmonary terminal illness. We have carried out this study in order to examine our results of heart-lung transplantation.

Materials and Methods: A descriptive and retrospective study of the indications, the main complications in ICU and early mortality of the last 11 heart-lung transplantations performed at Hospital Puerta de Hierro between 2008 and 2016. It is not possible to analyze the total amount of 36 transplants performed because of the change of hospital.

Results and Discussion: : The main indications of heart-lung transplantations are the acquired cardiovascular disease that develop pulmonary hypertension, followed by congenital heart disease¹. In the 11 cases the indications were: congenital heart disease (3), cystic fibrosis with extended idiopathic dilated cardiomyopathy (2), idiopathic dilated cardiomyopathy (2), idiopathic pulmonary artery hypertension (2) and secondary pulmonary artery hypertension (2).

The main intra-surgery complications registered were bleeding and politransfusion¹. In our serie, 9 patients required politransfusion, one of them being the only patient who died while in surgery, and 2 needed reintervention.

The main postoperative complications are related with lungs¹. In our case, 3 patients suffered from primary myocardial dysfunction, developing cardiogenic shock refractory to medical treatment and mechanical assistance, which produced their death during the first days in ICU. Out of the 7 remaining patients, 6 of them showed respiratory failure due to: ventilator - associated pneumonia (2), hemothorax (1) diaphragmatic dysfunction (3), having to carry out a tracheostomy on 4 of them. 3 of the patients showed invasive candidiasis: One *Candida Glabrata* resistant to echinocandin, which produced the death of the patient 4 months after, and two *Candida Albina*s. There was also 1 case of positive blood culture for *Chryseobacterium Indologenes* treated with Ceftolozane and tazobactam IV as well as with nebulized vancomycin.

Conclusions: Heart - lung transplantation is not a technically complex surgery, being the coordination of times, the bleeding, and the postoperative management the main challenges. Nevertheless, it is the best long term therapeutic option for this patients.

References: Idrees J, Pettersson G. State of the Art of Combined Heart-Lung Transplantation for Advanced Cardiac and Pulmonary Dysfunction. *Curr Cardiol Rep.* 2016;4:18-36

13AP07-8**Impact of fluid balance on mortality of patients treated with veno-arterial extra corporeal membrane oxygenation**

Besnier E.¹, Boubeche S.¹, Gay A.², Doguet F.², Veber B.¹, Dureuil B.¹

¹Rouen University Hospital, Dept of Anaesthesiology & Intensive Care, Rouen, France, ²Rouen University Hospital, Dept of Surgery, Rouen, France

Background and Goal of Study: Veno-Arterial Extra Corporeal Membrane Oxygenation (VA ECMO) is a mechanical support for refractory cardiogenic shock. Mortality observed for these patients remains high. Contrary to sepsis or ARDS, the impact of fluid balance is little studied, despite an intense inflammation and the need for fluid resuscitation.

The purpose of this study was to identify fluid balance as a predictor for mortality in patients under VA ECMO.

Materials and Methods: Single-center, retrospective and observational investigation in the cardiac surgical ICU of Rouen University Hospital. Patients requiring VA ECMO between March 2013 and May 2016 were included. Pregnant women, patient under 16 years old, patients deceased before 24 hours of admission in ICU and ECMO for ARDS were excluded. The primary outcome was the relationship between 1-day fluid balance and 28-day mortality. Secondary outcomes were the association with other biological and clinical pertinent characteristics during first day: RIFLE score, use of Renal Replacement Therapy (RRT) and troponins, bilirubin, transaminases and cre-

atinin during first 24h. Logistic regression (logit model) and Fisher or T-test were performed with MedCalc software. Univariable analysis presenting a p value <0.1 were included in the multivariable analysis with a backward procedure (p<0.05 was considered significant). Results are presented with mean or odds-ratio with 95% confidence intervals.

Results and Discussion: 88 patients were included. Overall 28-day mortality was 53%. In dead patients, fluid balance at 1-day was higher (48.6 [30.9-66.3] vs 13.8 [4-23.6] mL/kg, p<0,0001) and troponins were 5-fold higher (11469 [5829-17109] vs 2098 [1134-3060] ng/L, p=0,002). Multivariable analysis identified fluid balance >8.8 mL/kg (OR=7.4 [2-27.2]), IGS >69 (OR=5.6 [1.7-18.1]), MDRD (OR=0.9 [0.95-0.99]) and troponin elevation >2611 ng/mL (OR=5.8 [1.9-17.7]) as statistically associated with mortality.

Interest for fluid management is growing in critical patients. Nevertheless, no study has yet investigated its impact in selected patients with cardiogenic shock treated with VA ECMO. Our study suggested a possible association between fluid overload and mortality.

Conclusion(s): Fluid management is a key therapy during VA ECMO but fluid overload could be associated with worsen outcomes. Further studies are warranted before considering fluid restriction trials.

13AP07-9**Diastolic dysfunction in intensive care unit: a pilot study in the general intensive care unit of l'aquila - Italy**

Biancofiore V.¹, Salve G.¹, Ciccozzi A.¹, Angeletti P.M.², ProF. Marinangeli F.¹, Zugaro A.¹

¹Università degli studi dell'Aquila, Dept of Anaesthesiology & Intensive Care, L'Aquila, Italy, ²Ospedale Mazzini di Teramo, Dept of Anaesthesiology & Intensive Care, Teramo, Italy

Diastolic Dysfunction (DD) is a known cause of heart failure, related to frequent systemic diseases in ICU patients; but the real prevalence of DD in ICU remains uncertain.

The aim of this prospective observational study is to investigate the prevalence of DD in a general ICU, and to value the relationship between DD and expected mortality (according to SAPS-2 score) and diagnosis on admission. All patients admitted in our ICU were part of the study, except patients whose recovery lasts less than 24h, patients with atrial fibrillation and patients with thoracic trauma. We collected anamnestic data, vital signs, SAPS-2 score and admission diagnosis. 4 TTE views (PSLAX, PSSAX, A4C, SC) were studied; a score was assigned to each view (2=optimal, 1=suboptimal, 0=unviewable) to identify the best one. Presence/absence of DD was studied through E/A transmitralic flow (presence if <1); relationship between DD and hypertension, age, gender, expected mortality and admission diagnosis was analyzed. The differences between the two groups (presence/absence of DD) were analyzed with t-test, with χ^2 -test and fisher exact for categorical variables. Data were collected in an Excel® table and processed with a statistic package: STATA/IC 12.0.

Our sample consisted of 110 patients, 64 males and 46 females, with an average age of 64,5 years. 59 patients had hypertension. Diagnoses on admission were multifactorial shock, cardiac arrest, respiratory failure, neurosurgical, polytrauma and septic shock. 59 patients (66,3%) had DD; DD resulted statistically related with hypertension (P=0.001) and old age (P<0.0001), as already known in literature. Relation between DD and all the mentioned admission diagnosis, resulted statistically relevant (P=0.016). Expected mortality (P=0.087) and gender (P=0.49) resulted not statistically related to DD. The study also revealed that the best TTE view was A4C followed by PSLAX. 52,27% of our patients had at least 2 optimal views, only 5,45% had none.

To conclude, this study underlines that DD is a frequent cause of heart failure in ICU patients, related to old age, hypertension and diagnosis on admission. Identify a DD is useful in terms of therapy and patient's outcome. The 2 main TTE views (PSLAX, A4C) are viewable also in mechanically ventilated and not mobilized patients; it allows obtaining a wide range of information about heart function. A bigger sample should be needed to study more detailed relations between DD, treatments and outcome.

13AP08-2

A novel approach to treatment of haemorrhagic cerebral vascular accidents

Godeanu S.C.¹, Stanculescu E.-L.¹, Popescu M.², Grintescu I.M.¹

¹Emergency Clinical Hospital of Bucharest, Dept of Anaesthesiology & Intensive Care, Bucharest, Romania, ²Clinical Hospital Colentina, Dermatology, Bucharest, Romania

Background: Cerebral vascular accidents (CVA) represent one of the most common causes of death in Europe, and it is also a major cause of severe disability and morbidity. The main risk factor is high blood pressure, studies have shown that oxidative stress is significantly higher in this group of patients.

Case report: A 64-year old female was admitted to our clinic in aphasia, very drowsy, GCS=7 (E1V1M5), divergent strabismus of both eyes, bilateral eyelid ptosis, BP = 220/120 mmHg. MRI scan has shown a haemorrhagic area in the central area of the mesencephalon, extending into the cerebral peduncles and into both thalamic regions, measuring 1.5/3 cm and also numerous cavernomas in both basal nuclei, highly suggestive of a ruptured cavernoma. Allopathic treatment as per protocol for haemorrhagic CVA was commenced, along with a phytotherapy treatment, comprised of 10 ml/ kg Hippophae rhamnoides fresh juice three times daily, and six tablets of a Urtica Dioica 200 mg, Taraxacum Officinalis 80 mg, Allium Ursinum 30 mg, Ranunculus Ficaria 30 mg, Rumex Alpinus 30mg, two tablets three times daily.

Discussion: The patient's neurological status improved gradually, being taken off the mechanical ventilation a week after admission. A CT scan after 14 days following admission showed massive resorption of the haemorrhage. The patient was discharged at thirty days since admission, alert, with no neurological deficit apart from the eyelid ptosis. Hippophae rhamnoides contains over 190 bioactive substances and has a very strong antioxidant effect, antithrombotic, neuroprotective, immunostimulating effect, increases capillary resistance and has some antibacterial effects as well. We believe that the phytotherapeutic cocktail has contributed to the improvement of the cerebral circulation, stabilisation of the vascular endothelium, decrease of the cerebral oedema, antiinflammatory and antioxidant effect. Legal consent has been obtained from the legal caregiver.

Learning points: The nervous system is very sensitive to oxidative stress (evaluated through ceruloplasmin and malondialdehyde serum levels) and has very scanty defense systems (glutathione peroxidase in very low levels). Following the complementary treatment we have noticed an obvious clinical improvement due to its strong antioxidant and neuroprotective effects. Further research is however needed to quantify these benefits.

13AP08-3

Feasibility of administering 50% xenon economically for 72 hours in neonates using an ambient pressure automated delivery system and closed breathing circuit

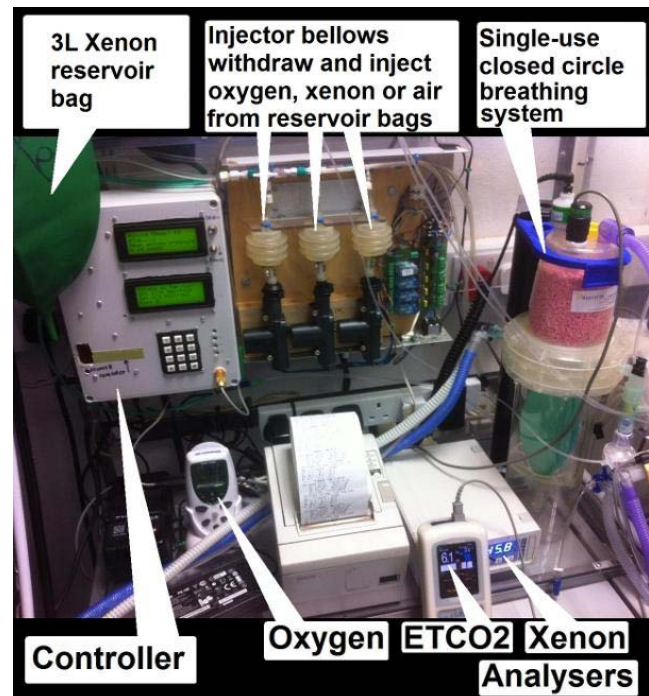
Dingley J.¹, Thoresen M.², Lee-Kelland R.², Liu X.², Okano S.², Chakkarapani E.²

¹ABM University Health Board, Swansea, Dept of Anaesthesiology, Swansea, United Kingdom, ²University of Bristol, Neonatal Neuroscience, Bristol, United Kingdom

Background and Goal of Study: Therapeutic hypothermia (TH) for 72h is a recognised treatment for neonatal encephalopathy (NE). Xenon (Xe) is a promising adjunct neuroprotectant to TH. Delayed initiation (~10h of life) of 30% xenon with TH did not alter early MRI biomarkers of later adverse neurodevelopment.[1] However, inhaled Xe for the entire 72h TH period may enhance brain protection. Xe costs \$30/L but tissue uptake is slow, favouring a closed circuit with automated gas mixture control. To eliminate costly leaks from a controller supplied with pressurised Xe we developed an ambient pressure fresh gas addition system. We investigated the feasibility of using this to economically administer Xe with or without TH for 72h.

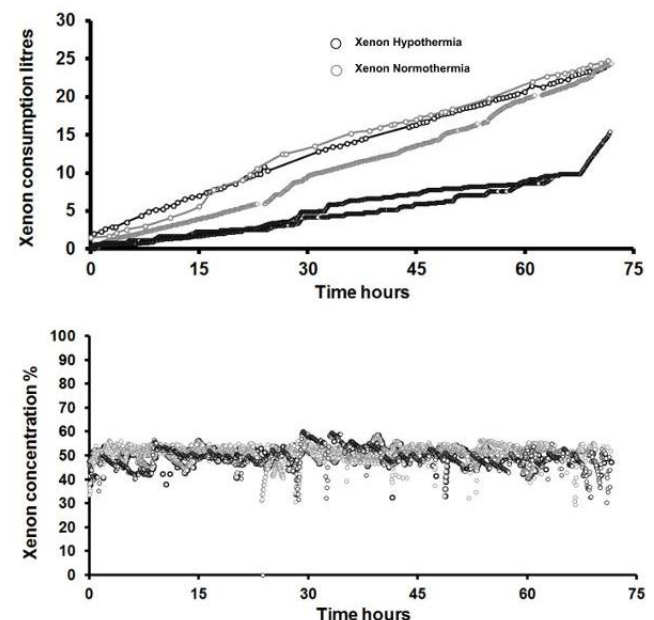
Materials and Methods: Five newborn pigs were anaesthetised and ventilated via a cuffed tracheal tube, with (N=4) or without (N=1) a global hypoxic-ischaemic insult, then randomised to receive 50% inhaled Xe under hypothermia (T_{rectal} 35°C, N=3) or normothermia (T_{rectal} 38.5°C, N=2) for 72h with background propofol and fentanyl. A microcontroller acquired xenon / oxygen concentrations from sensors in a single-use closed circuit neonatal breathing

system (Fig 1). [2] Into this circuit it injected 18ml boluses of oxygen, air or xenon from ambient pressure reservoir bags, to achieve set target concentrations. We report Xe consumption and concentration during this period.



[Fig 1. Automated gas controller & breathing system]

Results and Discussion: Mean (SD) hourly Xe consumption was 0.28 L/h (0.1) (Fig 2A), mean (SD) hourly Xe concentration was 49.6% (1.64) (Fig 2B). Median (IQR) % difference in achieving target Xe concentration was 4.2% (2.9, 7.8).



[Fig 2. Xenon consumption and concentration vs time]

Conclusion(s): The automated controller functioned as intended maintaining an inhaled Xe concentration close to the 50% target for 72h at a xenon gas cost of \$8.4/h.

References:

1. Lancet Neurol 2015 S1474-4422(15)347-6
2. Anesth Analg 2009 109(2)451-60

13AP08-4**Use of prothrombin complex concentrates (PCC) for rapid reversal in neurosurgical patients with oral anticoagulant related intracranial haemorrhage in a government restructured hospital: a retrospective study**

Foo C.W.¹, Wong Y.L.¹, Cao K.T.T.S.¹, Wong H.², Lim Z.S.³

¹Tan Tock Seng Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore, ²Tan Tock Seng Hospital, Pharmacy, Singapore, Singapore, ³National University of Singapore, Yong Loo Lin School of Medicine, Singapore, Singapore

Background and Goal of Study: Neurosurgical patients that sustained oral anticoagulant (OAC) related intracranial haemorrhage (ICH) can potentially develop haematoma expansion (1), which is strongly associated with a poorer outcome. Early use of PCC in Neuroscience Intensive Care Unit (NICU) can allow for faster OAC-related ICH reversal and this can translate into better outcome of patients. We aim to review the efficacy of protocolised use of PCC in this group of patients. In our hospital, 3- Factor PCC is stored within the NICU with the aim of early administration. We carried out a retrospective medical record review of from neurosurgical patients with OAC-related ICH admitted to NICU from 01 Jan 2013 to 30 June 2015.

Materials and Methods: The electronic medical records were reviewed and the following data were analysed: admission characteristics, dose and timing of PCC given, INR data, GCS and outcomes in ICU and at 30 days.

Results and Discussion: A total of 62 patients with OAC-related ICH were included in the review and 56 patients received PCC. Mean age was 67.8. 4 (6.46%) patients were taking rivaroxaban pre-admission and the rest were on warfarin. As part of the protocol, fresh frozen plasma and vitamin K were also administered. Mean dose administered was 41.9units/kg.

Of 56, 44 patients (78.6%) were able to receive PCC within 2H and 98.2% received PCC within the ICU. 49/54 (90.7%) patients achieved INR <1.5 within 30 minutes. 4 (7.14%) patients needed a repeated dose of PCC after 30minutes. 8 (12.9%) patients required haematology consult.

19 patients underwent surgery and the mean time to operation was 9 hours. Only 1 patient developed thrombotic event related to PCC.

Length of stay in NICU was 4.78 days. Mortality in ICU was 21% and for outcome at 30 days, 32.3% were discharged and 40.3% were either in the general or rehabilitation ward.

Conclusion(s): With increasing aged population and with more use of warfarin and novel oral anticoagulants, it is prudent to reverse the anticoagulation early in order to reduce mortality. A protocolised management with PCC allows for early and rapid reversal of OAC-related ICH and can potentially lead to better outcomes and minimizing worsening of the bleed.

References:

1. Rosand J, Eckman MH, Knudsen KA, Singer DE, Greenberg SM. The effect of warfarin and intensity of anticoagulation on outcome of intracerebral hemorrhage. *Arch Intern Med* 2004; 164:880-884.

13AP08-5**Neurological outcome of survivors of out of hospital cardiac arrest treated in the cardiothoracic intensive care unit in a London Major Teaching Hospital**

Dumont M.W.¹, Moore M.², Crerar-Gilbert A.³

¹St George's University of London, Medical School, London, United Kingdom, ²St George's University Hospitals, Dept of Intensive Care, London, United Kingdom, ³St George's University Hospital, Dept of Intensive Care, London, United Kingdom

Background and Goal: While survival from out of hospital cardiac arrest (OOHCA) has been improving and is near 50% in our institution [1], neurological outcomes of the survivors are less known.

This study aims to:

- determine the level of dependency and neurological deficit of the survivors of OOHCA on discharge from Cardiothoracic Intensive Care (CTICU)
- determine the neurological outcome of the survivors at the point of hospital discharge

Materials and Methods: The retrospective cohort investigation was conducted at St. George's University of London Hospital, which is designated heart attack centre. It comprised of patients admitted to CTICU between March

2014 and February 2016, after suffering an OOHCA. The demographic data and the information on level and change of dependency was collected from the CTICU "ward-watcher" database. The dependency scale is:

A and B -able to live without/with minor assistance respectively;

C and D - requiring major/total assistance.

Cerebral Performance Categories (CPC):

1-2 Good/Moderate

3-4 Severe Disability/Coma

5 died

Results and Discussion: Of survivors 34/94 (36.2%) showed no change in dependency. 75/94 (79.8%) had dependency rating of A or B. On discharge from the hospital, 41/94 (43.6%) patients scored CPC 1, 17/94 (18.1%) CPC 2, 7/94 (7.4%) CPC 3 and 1/94 (1.1%) CPC 4. 28/94 (29.8%) had insufficient data to score. Analysis shows that 83% of patients who survive are discharged with a CPC 1-2. Patients were discharged to one of seven medical or surgical wards. 78/94 patients (83.0%) were discharged home.

Conclusions:

- Patients who survive an OOHCA are discharged from CTICU with low level of dependency and low neurological deficit.
- Over 60% of patients who survived demonstrated CPC 1-2 suggesting good potential to return to an independent and professional life.
- To determine whether this potential is realised a follow up at 6 and 12 months is planned.

References:

1. Antonakaki D, Crerar-Gilbert A. Out of hospital cardiac arrest patient's outcome. Abstract ESA congress 2016.
2. Jennett B, Bond M *Assessment of outcome after severe brain damage*, Lancet 1975

13AP08-7**Outcomes of intensiv treatment of patients in deep coma**

Konareva T., Malyshev Y.P., Baykova E.E.

Scientific Research Institute - Krasnodar Regional Hospital named after the Professor S.V. Ochapovsky, Dept of Anaesthesiology & Intensive Care, Krasnodar, Russian Federation

Background and Goal of Study: To analyze the results of intensive treatment of deep coma and to establish the criteria for affordable differences between the initial condition of the survivors and dead patients.

Materials and Methods: The study included 210 patients in a deep coma, associated with: combined trauma (CT) - 70 (33.5%); isolated traumatic brain injury (iTBI) - 49 (23.5%); stroke ischemic type (IT) - 9 (4%) and hemorrhagic type (HT) - 73 (35%), hypoxic-ischemic encephalopathy (HIE) - 9 (4%). Criteria for inclusion of patients in the study: 3 points for the Glasgow coma scale (GCS) at admission. Retrospectively, the patients were divided into groups: 1st (n = 101) - with fatal outcome, 2nd (n = 109) - patients with a relatively favorable outcome (level of consciousness of 4 or higher on GCS).

Results and Discussion: Of the 70 patients with CT 32 (46%) patients survived, of the 49 patients with iTBI - 31 (63%) patients survived. Of the 9 patients with stroke IT 6 (67%) patients survived, and of 73 patients with stroke HT - 32 (44%) patients survived. Finally of 9 patients with HIE all except one survived. The study revealed significant differences between groups. The first group of MAP and ejection fraction were lower by 8% (p <0,05) than in the second group. Fluctuation pH of the surviving patients was normal, but in the 2nd group under the limit of norm, while BE was according -2,7 (-6,7 0,7) and -1,3, (-3,9-1,1) (p < 0,05), which is a tendency to acidosis (adverse prognostic sign).

Modification of the central regulation of water-salt metabolism was more significant in the 2nd group: Na⁺ at the level of 4% (p <0,05) higher and the daily urine output was 4550 (2800,0-7400,0) ml/day against 3300 (2200,0-5200,0) ml / day (p <0,05) in the 1st group. The level of troponin in the blood of the dead patients was 0.17 (0,030-1,010) ng/ml, and in the survivors group- 0.09 (0,020-0,600) ng / ml (p <0,05). The rate of dopmin infusion was 20% (p <0,05) higher in patients of the 1st group, they also had a tendency to hypothermia.

Conclusion(s): For a deep coma outcome prognosis in time of admission of the patient to the hospital the most informative differences: BE by 52%; Troponin levels by 47%; daily urine output by 27%; dopmin dose by 20%. Patients with combined trauma and hemorrhagic stroke have more unfavorable outcome than others.

13AP08-8

The priorities of early tracheotomy in patients with severe traumatic brain injury, in prolonged mechanical ventilation

Kerci M.¹, Baftiu N.², Muzha D.³, Sulaj E.³, Ohri I.⁴, Kurti B.³

¹Medicine University of Albania, Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ²Clinical Centre of Pristine, Dept of Anaesthesiology & Intensive Care, Prishtin, Kosovo, Republic of, ³Trauma Hospital University, Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ⁴Medical University of Albania, Dept of Anaesthesiology & Intensive Care, Tirana, Albania

Background and Goal of Study: Tracheotomy technique offers numerous advantages such as shortening the duration of mechanical ventilation (MV), shorter stay in intensive care unit (ICU) and reduce mortality in patients with traumatic brain injury. The aim of the study is to assess comparative performance of the early tracheotomy to late tracheotomy.

Materials and Methods: The study examined two groups of traumatic patients admitted at the ICU with severe brain injury, comma level ≤ 8 GCS. First group (early tracheotomy): 102 patients, ages between 4-89 years old with a middle age 38 ± 8.6 years, 40 or 39.2% females and 62 or 62.8% males with neurological status evaluation ≤ 8 GCS. In this group tracheotomy is applied 4 up to 7 days after beginning of MV. Second group (late tracheotomy): 86 patients in a period of time between 2012-2015, ages between 4-88 years old with a middle age 36 ± 9.9 years, 32 or 37.2 females, 54 or 62.8 males with neurological status ≤ 8 GCS. To this group the tracheotomy is applied 7 days after beginning MV.

Results and Discussion: In the first group the average duration of MV was 11 days, in the second group was 19 days, as the duration of sedation was on an average of 8 days for the first group and 12 days for the second group. Mortality was higher in the II group with 37.25% against 48.8% in the I group, while the nasocomial pneumonia in the first group were present in 42 cases, and in the second group was 62 cases. The average ICU stay was 16 days for the first group and 24 for the second group, another variable are the costs, which means more expenses in the II group. As appears from the results of this study, the difference is significant, like the other authors.

Conclusion(s): From this study we can conclude that with early tracheotomy we can reduce the MV time, sedation duration and the doses used, and the nasocomial pneumonia, it helps the management of the patient by the medical staff, reduce the stay in ICU, and the percentage of mortality in the I group vs late tracheotomy. We can see even an decrease of the costs.

References:

- Nieszkowska A, Combes A, Luyt CE, Trouillet JL, Gilbert C, Chastre J. Impact of tracheostomy on sedative drugs consumption, sedation level and comfort of mechanically ventilated ICU patients. *American Journal Critical Care Medicine*. 2005;2:A794
- Sugerman HJ; Randomised, prospective trial of early tracheotomy. *Journal Trauma*. 1997;43:741-747.

13AP08-9

Massive intracerebral hemorrhage escaped detection by cerebral oximetry

Felli A., Shkirtladze-Dworschak K., Opfermann P, Dworschak M, Medical University of Vienna, Dept of Anaesthesiology & Intensive Care, Vienna, Austria

Background: Cerebral oximetry employing near infrared spectroscopy (NIRS) is a non-invasive brain monitor. It is predominantly used to detect imminent alterations in the cerebral circulation that require urgent action to avoid major injury.

Case report: A 50 year old female patient was admitted to our intensive care unit after heart transplantation because of arrhythmogenic cardiomyopathy. The initial course was uneventful; she could be extubated on the following day and required only moderate inotropic support. Five days later, however, extracorporeal membrane oxygenation (ECMO) had to be instituted following cardiopulmonary resuscitation because of low cardiac output due to acute transplant rejection. At the same time, bilateral NIRS monitoring was begun, which depicted % values in the low to high 40s with constantly lower (-8%) saturations over the right forehead. Anisocoria (right > left) was first noted after two days on ECMO. Subsequently, the right pupil did not show a positive light reflex anymore. NIRS values as well as hemodynamics were stable

throughout all these neurological changes. A CT-scan of the brain revealed a massive intracerebral bleeding within the right temporal lobe that necessitated evacuation and osteoclastic craniotomy because of accompanying brain edema after which pupils became isocoric again.

Discussion: Cerebral oximetry obviously missed detection of this live-threatening brain hemorrhage in the supply zone of the middle cerebral artery. The observed phenomenon can either be explained by the distance between the ipsilateral optode and the bleeding or by the fact that NIRS is not able to distinguish between hemoglobin-bound oxygen that is located within the vasculature and that outside of blood vessels, which in this case had accumulated in the parenchymal tissue of the temporal lobe. Furthermore, intracerebral hematomas absorb light less intensely as extra cerebral ones hampering their identification (1).

References: 1. Gopinath SP et al. *J Neurosurg* 83;438-44,1995

Learning points: Severe brain damage in the supply zone of the middle cerebral artery may not be detected by monitoring cerebral tissue oxygenation with the help of near infrared spectroscopy.

13AP08-10

Use clinical pulmonary infection tests for definition of ventilator associated pneumonia in comatose ill neurosurgical patients

Sagimbayev A., Mustafin A., Mustafin A.

Medical University Astana, Dept of Anaesthesiology & Intensive Care, Astana, Kazakhstan

Background: Ventilator associated pneumonia (VAP) remains the most common nosocomial infection in the ICU with a very high morbidity, mortality and cost of treatment. Clinical pulmonary infection tests (CPIT) can be used prospectively to diagnosis VAP, so as to initiate early treatment and prevent mortality. Most studies indicate that the CPIT has limited value to diagnose VAP. We conducted a prospective study to detect VAP using CPIT in neurosurgical patients.

Materials and Method: After approval of Ethics Committee, 76 consecutive neurosurgical patients who required ventilatory support for more than 48 hours were studied. CPIT was calculated every day and when the CPIT was ≥ 6 , mini-BAL was taken by catheter in catheter technique and was analyzed for microorganism.

Results: A total of 29 VAP episodes were identified using CPIT (≥ 6) during the study period, of which only 13 patient's tracheal aspirate were positive for microorganism. The incidence rate expressed as the total number of VAP episodes per 1000 ventilation days using CPIT and tracheal aspirate culture was 39.7(29/889) and 23.87(19/889) respectively in this cohort, but overall our ICU VAP rate in neurosurgical patients using CPIT and tracheal aspirate culture was 15.19(29/1909) and 9.42(18/1909) respectively. Four patients were found to have early VAP (≤ 5 days of MV) and rest had late VAP. The most common organism was *Acinetobacter Baumanni*, followed by *Enterobacteraceae*. Early VAP was caused by *Enterobacteraceae* and *Acinetobacter* causing late VAP.

Conclusion: CPIT can be a fairly good method to diagnose VAP in comatose ill neurosurgical patients, when used reasonably and at the same time can help to restrict unnecessary antibiotic use.

13AP08-11

Diabetes insipidus in neuro-intensive care unit: clinical, etiological and assistance aspects

Naili A., Triki H., Bouderra S.

EPH Sidi Ghiles, Dept of Anaesthesiology & Intensive Care, Cherchel, Algeria

Background and Goal of Study: Central diabetes insipidus (CDI) is defined by the inability to retain free water, it is due to an insufficient release of the anti-diuretic hormone by the hypothalamus. CDI is one of the complications to look for after neurosurgery, or cranial trauma, it can be transient in 30% of cases, and definitive in 2% -10% of cases.

Materials and Methods: It is about a retrospective study of 530 patients hospitalized in our department from June 1st, 2015 to January 31, 2016, of which 25 patients had central diabetes insipidus, which means a frequency of 5%. Clinical, para-clinical, etiological and therapeutic data were collected from the hospitalization records.

Results and Discussion: In a series of 530 patients hospitalized during the defined period, the number of patients with central diabetes insipidus was 25, which means an incidence rate of 5%, the average age was 46 years. Trans-sphenoidal pituitary surgery was the leading cause of central diabetes insipidus with a rate of 64%.

With hormone therapy and good rehydration, diabetes was transient in 24 patients, a rate of 96%, and definitive in 1 patient or a rate of 4%.

Conclusion(s): The incidence of central diabetes insipidus in neuro-intensive care unit is certainly not negligible, it is for this reason that it must be diagnosed early in order to allow a better multidisciplinary assistance.

References:

1. diabète insipide central: diagnostic et prise en charge Rev Med Suisse 2012; 8: 2158-64
2. S Dejager, L Foubert, P Presberg, S Gerber et G Turpin. Diabète insipide central. 1998, 5 pEncycl Méd Chi (Elsevier, Paris), Encyclopédie Pratique de Médecine, 3-0620.
3. Annales d'Endocrinologie 69 (2008) 231-239 Article original Diabète insipide central: difficultés diagnostique Central diabetes insipidus: hôpital d'enfants de Tunis, 1007, rue Jabbari-Bab-Saâdoun, Tunis, Tunisie 8
4. Annales Françaises d'Anesthésie et de Réanimation 25 (2006) 525-527

13AP09-1

Frailty is associated with poor critical care outcomes

McBride M.W.¹, Columb M.², Mills G.H.³

¹University of Sheffield, Medical School, Sheffield, United Kingdom, ²University Hospital of South Manchester, Acute Intensive Care Unit, Wythenshawe, United Kingdom, ³University of Sheffield, Dept of Anaesthesiology & Intensive Care, Sheffield, United Kingdom

Background and Goal of Study: Frailty has previously been associated with increased risk of mortality and morbidity. There is little research investigating whether this difference is clinically significant in critical care in the UK. If it is, it may influence clinical decisions to escalate care. We set out to discover whether pre-morbid frailty is associated with poor critical care outcomes.

Materials and Methods: We analysed routinely collected data from 7,732 patients who had attended the critical care departments in Sheffield over a three-year period for 1-year survival outcomes with Cox proportional hazards regression. Smaller samples (n = 3,469 and 2,387 respectively) were also assessed for changes to residence and differences in dependency before and after admission. Changes to residence were analysed with multivariate logistic regression. Dependency before and after admission was analysed with Wilcoxon Signed Rank tests and a Mann-Whitney U test.

Results and Discussion: We found a significant mortality difference between frail and non-frail individuals with frail patients being more likely to die in the 1-year period following admission to critical care (HR 2.15; 95% CI, 1.79-2.59). Frailty is significantly and independently associated with the risk of requiring institutional care at discharge from hospital (OR 2.41; 95% CI 1.55-3.74). Both the frail and control groups became more dependent immediately following discharge than pre-admission (p < 0.001) but the frail group was more likely to have a greater change in dependence relative to the control group (p < 0.001).

Conclusion(s): We found that frailty is associated with poorer outcomes in the critical care population.

13AP09-2

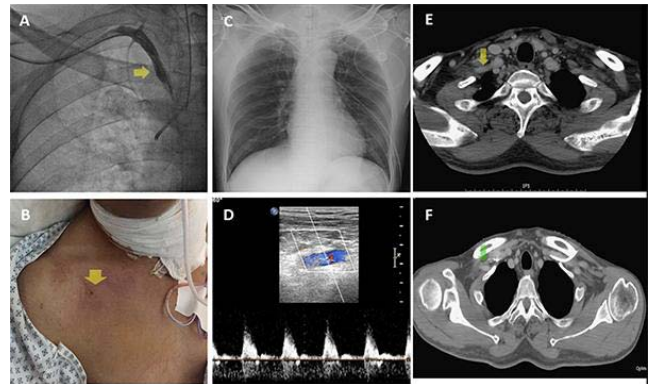
Successful treatment of inadvertent subclavian artery cannulation by arterial closure device

Chang S.L.¹, Lai C.H.², Lai H.C.¹, Hung C.J.¹, Lee W.L.²

¹Taichung Veterans General Hospital, Dept of Anaesthesiology, Taichung, Taiwan, Republic of China, ²Taichung Veterans General Hospital, Taichung, Division of Interventional Cardiology, Cardiovascular Center, Taichung, Taiwan, Republic of China

Background: Central venous catheterization (CVC) is a common procedure in clinical practice, but it is not risk free. Inadvertent cannulation to the subclavian artery (SCA) is thought to be a challenge due to difficult approach.

Case report: A 54-year-old man was admission for hypopharyngeal cancer. After general anesthesia, right subclavian vein was obtained by landmark approach. Non-pulsatile backflow appeared to be venous, then an 8Fr CVC was inserted. Inadvertent SCA cannulation was recognized immediately after pulsatile flow from the CVC, the catheter was left in place and the cardiovascular surgeon was consulted. Due to difficult approach, percutaneous treatment was suggested. The puncture site was confirmed by angiography, then endovascular repair with arterial closure device was performed. The Angio-seal was inserted via the puncture site smoothly and sealed the wound. The follow-up radiography of chest showed no hemothorax or pneumothorax. The subclavian ultrasound was also performed and revealed well patent. One month later, the computer tomography also showed good patency of right SCA with the absorption of the closure device.



[Figure 1]

Discussion: Inadvertent SCA cannulation may be dangerous if pull and compression methods were applied. Immediately image and cardiovascular surgeon consultation is mandatory. Endovascular intervention with arterial closure device is a simple and effective approach, but beware of possible complications of arterial obstruction. Ultrasound and clinical follow up are necessary to early recognize the device related complications.

References:

1. Guilbert M-C, Elkouri S, Arterial trauma during central venous catheter insertion: Case series, review and proposed algorithm. *Journal of Vascular Surgery*. 2008;48:918-925
2. Carrick MM, Morrison CA. Modern management of traumatic subclavian artery injuries: A single institution's experience in the evolution of endovascular repair. *American journal of surgery*. 2010;199:28-34

Learning points:

1. Avoid applying pull and compression while dealing with inadvertent SCA cannulation, especially in large bore catheter.
2. Percutaneous endovascular repair may be considered first to management inadvertent SCA cannulation in selected patients.

13AP09-3

Mediastinitis and necrotizing fasciitis - a challenge to an intensivist

Abdyli A.¹, Arapi B.¹, Domi R.², Huti G.¹, Miraka M.¹, Kortoci R.²

¹American Hospital Tirana, Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ²Mother Theresa University Hospital of Tirana, Dept of Anaesthesiology & Intensive Care, Tirana, Albania

Background: Necrotizing fasciitis has long been associated with a very high mortality rate even when managed in very experienced and well known centers. Mediastinitis also is a condition which has a very high mortality despite any treatment protocol.

Case report: We present a case report of a 45 years old patient who presents to our clinic with a purulent tonsillitis and difficulty breathing. After certain examinations were done we discovered a necrotizing fasciitis of the neck with a pharyngeal fistula who extended to the mediastinum causing mediastinitis and massive left pleural collection. All the blood tests showed very high levels of inflammatory mediators with a CRP of 52. The patient was immediately brought to the operating room and radical neck dissection and left thoracotomy with pleural excision was done. The fistula was surgically closed and the pleural collection emptied. Cultures were sent and a lavage was done. The

operation lasted for about 12 hours and the patient was transferred to the ICU afterwards. During the ICU period for about 12 days we saw a major improvement of the patient. He was extubated on the fifth day and then transferred to the ward on the twelfth day. He stayed in the hospital for about a month and was treated with broad spectrum antibiotics and hyperbaric oxygen therapy from the extubation and on. We saw dramatic decrease of CRP after the beginning of hyperbaric oxygen therapy.

Discussion: A multidisciplinary approach is mandatory to have success in the management of these severe conditions. Role of hyperbaric oxygen therapy should be studied more specifically.

References:

1. Acute mediastinitis Proc (Bayl Univ Med Cent). 2000 Jan; 13(1): 31-33.
2. Necrotizing Fasciitis of the lower extremity: a case report and current concept of diagnosis and management Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2009;17:28 DOI: 10.1186/1757-7241-17-28
3. Using oxygen at high pressure (in a compression chamber) for the treatment of individuals with severe soft tissue infection (necrotizing fasciitis) Levett D, Bennett MH, Millar I

Learning points:

A multidisciplinary approach is mandatory
Role of hyperbaric oxygen therapy should be studied

13AP09-4

Incidence and socioeconomic cost of care to patients candidates to withdrawing life sustaining treatments in a Tunisian intensive care unit

Nakhli M.S., Kahloul M., Chakroun A., Harrathi M.A., Chebbi N., Mhamdi S.

Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse, Tunisia

Background and Goal of Study: The absence of laws organizing the withdrawing life sustaining treatments (WLST) forces us to make unjustified therapeutic obstinacy. Our purpose is to determine the incidence of candidates to WSLT decision, their sociodemographic characteristics and the socioeconomic cost of their medical care.

Materials and Methods: This is a prospective study realized in ICU of Sahloul teaching hospital over a 3 month period and including patients who could be candidates for WLST decision. Children, pregnant women and candidates for organ donations were excluded. The collected parameters were sociodemographic data, the reason for hospitalization, prognosis scales (McCabe, Knaus, GSI and SOFA), the arguments for WLST decision, cost of the medical care and patients' evolution.

Results and Discussion: The number of patients who were candidates for WLST was eighteen and their incidence was 10.4 %. The average age was 62.16 years with the existence of comorbidity in 83.3 % of the cases. The scales of McCabe at 1 and Knaus at B were respectively noted in 55.6 % and 44.4 % of the cases. The GSI and SOFA scales at the admission were respectively 59.39 and 10.83. The proposal of WSLT decision was made essentially by the medical expertise (66.7%) with a timeframe of 5.33 days. The length of stay was 21.5 days. The average cost of hospitalization from the proposal of WLST decision was 9724.4 TD (about 4006.5 euros) with a cumulated cost of 231635 DT (95436 euros). Only one patient survived with severe sequelae.

Conclusion(s): The incidence of candidate patients to WLST is important with a considerable socioeconomic cost, justifying the necessity of a legal frame which organizes it in Tunisia.

13AP09-5

Aorto-enteric fistula and candida glabrata: an unusual association

Pérez de Lis Novo M., Vidal Seoane M., Rama Maceiras P., Pensado Castiñeiras A.

Complejo Hospitalario Universitario A Coruña, Department of Anaesthesiology and Perioperative Medicine, A Coruña, Spain

Background: Aorto-enteric fistula is a rare and potentially lethal entity. Infections are one of the major etiologic factors. It occurs in 2-6% of patients with prosthesis and Staphylococcus sp are the most common responsible pathogens.

Case report: A 67-year-old male, smoker, was admitted in our hospital because of fever, weight loss and melena. In 2007, he had undergone aortobifemoral bypass surgery for aortoiliac occlusive disease. During admittance, esophagogastroduodenoscopy (EGD) and colonoscopy were performed and the results were unremarkable. Blood tests showed elevated serum C-reactive protein level and elevated erythrocyte sedimentation rate. Serum cultures were positive for Candida glabrata. A CT scan revealed perigraft soft tissue thickening, causing a fistula between the aorta and the third part of the duodenum. The graft was removed and an extra-anatomic revascularization was performed. Microbiology specimens isolated in the graft were Candida glabrata. Caspofungin was administered for 12 weeks.

Discussion: Infection of an abdominal aortic prosthetic graft is a devastating complication, often followed by sepsis, aortoenteric fistula or haemorrhage of the suture line.

Graft infection by C. Glabrata may be anecdotal. However, its consequences can be severe. Mortality has been reported between 9% and 26% and the rate of subsequent amputation ranges from 0 to 27%. (1).

An aortoenteric fistula should always be suspected in all patients who have undergone aortic graft surgery and present with gastrointestinal haemorrhage.

A combination of endoscopy and CT or MRI may offer the best chance of detecting a fistula, but the most important tool to achieve diagnosis is clinical suspicion.

Because of high mortality and morbidity associated with secondary aortoenteric fistula, surgical treatment is always recommended. (1)

References: Kitamura T, Morota T, Motomura N, Ono M, Shibata K, Ueno K, Kotsuka Y, Takamoto S: Management of infected grafts and aneurysms of the aorta. Ann Vasc Surg. 2005, 19: 335-342.

Learning points: In dealing with an infected vascular aortic graft, the primary goal of treatment is to save life and limb.

- Explantation of the infected graft and aortic replacement by cryopreserved allograft is a valuable surgical treatment in this type of complications.
- Optimum therapy for prosthetic graft candida infection is a combination of surgery and a long course of antifungal therapy

13AP09-6

Obstetric admissions to the intensive care unit in Malta: a population-based cohort study

Abela G.P.¹, Attard Cortis P.¹, Paris T.², Borg N.¹

¹Mater Dei Hospital, Dept of Anaesthesiology & Intensive Care, Msida, Malta, ²University of Malta, Medical School, Msida, Malta

Background and Goal of Study: The aim of this study was to perform a retrospective review of obstetric admissions to Malta's only 20-bedded ICU from 2012 to 2015. Comparison to similar studies performed in other countries was done to compare with the local situation.

Materials and Methods: Patients were recruited by going through the ICU admissions database for these 4 years and listing those who were admitted for an obstetric pathology at any stage of their pregnancy and up to 30 days postpartum. Medical notes were reviewed retrospectively. The data collected included patient demographics, obstetric history, reason for admission to ICU, management, length of ICU and hospital stays and maternal and neonatal outcome. Data was inputted into a MS Excel® spreadsheet and analysed using the same programme.

Results and Discussion: 42 patients were admitted to ICU for an obstetric pathology over the 4 year period; 39 of these were included in the study. 0.25% of obstetric deliveries needed admission to ICU and obstetric admissions accounted for 0.87% of all ICU admissions. The commonest admission

diagnosis was haemorrhage (62%), followed by hypertensive diseases (26%) and sepsis (23%). Average maternal age was 28.9 years. All patients had an arterial line inserted on admission to ICU and this represented the only intensive management for most of this cohort (33%). 26 patients (67%) required surgery as part of their treatment. The commonest procedure was an emergency LSCS. There were no maternal deaths over this period. 4 patients miscarried their pregnancy and there were 3 perinatal deaths. The percentage of all deliveries requiring ICU admission in Malta is in line with rates reported in other countries. The percentage of obstetric patients as part of all intensive care unit admissions is lower than the averages quoted in the literature. The most common admission diagnosis was haemorrhage, in contrast to most other studies where admission was due to hypertensive diseases of pregnancy.

Conclusion(s): No maternal deaths is an achievement, but there is the need to improve some points of care. The setting up of a dedicated obstetric HDU can definitely help.

References:

Zeeman G et al. A blueprint for obstetric critical care. *Am J Obstet Gynecol* 2003; 188:532-6.

Zwart J et al. Obstetric ICU admission: a 2-year nationwide population-based cohort study. *Intensive Care Med* 2010; 36: 256-263.

Acknowledgements: Dr Carmel Abela, Clinical Lead in intensive care.

13AP09-7

Viability of saliva and sputum samples from acute exacerbations in COPD patients with a metabolomic signature

Asibey-Berko T.¹, Lewis K.², Mur L.³, Mironas A.³, Asandei D.³, Ghosh S.⁴

¹Hywel Dda University Health Board, Dept of Anaesthesiology, Carmarthen, United Kingdom, ²Hywel Dda University Health Board, Respiratory, Llanelli, United Kingdom, ³Aberystwyth University, IBERS, Aberystwyth, United Kingdom, ⁴Hywel Dda University Health Board, Dept of Anaesthesiology & Pain Medicine, Carmarthen, United Kingdom

Background and Goal of Study: Acute exacerbations in COPD (AECOPD) patients, remains a global health problem with a 2020 projection to rank fifth in morbidity and third in mortality (1). Our aim was to identify potential biomarkers in AECOPD with a metabolomic signature comparing microbiome changes in saliva and serum samples.

Materials and Methods: Saliva and sputum samples were collected and processed from 20 patients with AECOPD alongside 20 healthy controls.

Results and Discussion: Extracts from sputum and saliva samples were screened by Direct-Infusion Mass Spectrometry (DI-MS) to provide sensitive biochemical profiles of >2000 metabolites per sample. Multivariate and machine-learning based analyses of the profiles demonstrated that both sputum and saliva provide statistically robust discrimination between healthy controls and the GOLD, particularly the AECOPD, categories. Key discriminatory metabolites were tentatively identified. These were compared to changes in microbial load in samples and the diversity of microbial populations as determined using a next generation sequencing (NGS) based approach. This latter, "microbiomic" study, was based on identifying the microbes in each sample based on the diversity of the 16S ribosomal RNA (rRNA) sequences.

Conclusion: The results of our study reveal the importance of saliva and sputum metabolomic profiling in AECOPD with possible significant clinical implications.

References: 1. From the global strategy for the diagnosis, management and prevention of COPD. Global initiative for chronic obstructive lung disease (GOLD). 2016.

Acknowledgements: The authors would like to thank the ITU staff of Glangwili General Hospital for their immense contribution in collecting samples.

13AP09-8

Continuous glucose monitoring in critical care: state of the art and role of glucose control

Spennati V.¹, Mastrantonio F.², Lauro D.³, Valgimigli F.⁴, Borsellino B.¹, Sagarìo M.¹

¹University of Roma La Sapienza, Dept of Anaesthesiology & Intensive Care, Rome, Italy, ²Menarini Group, Marketing, Florence, Italy, ³University of Tor Vergata Rome, Dept of Anaesthesiology, Rome, Italy, ⁴Menarini Group, Scientific Affairs, Florence, Italy

Background and Goal of Study: Glucose control (GC) in critically ill patients has been the topic of an intense debate since the 2000s. GC remains an important therapeutic goal in clinically ill patients, despite an ongoing debate regarding the optimum target ranges. GC in the intensive care unit (ICU) requires frequent and correct glucose monitoring. An accurate real-time continuous glucose monitoring system (CGMS) might improve the management and treatment of hypoglycemia, hyperglycemia, and glucose variability in this group of patients. The aim of this systematic review (SR) is to report available clinical relevance of continuous glucose monitoring in adult ICU patients.

Materials and Methods: A literature search of PubMed database was carried out using 10 key words: continuous glucose monitoring & ICU patients; tight glycaemic control & ICU patients; hypoglycaemia & ICU patients; intravascular glucose monitoring & ICU patients; glucose target & ICU patients; "closed-loop" monitoring in glycaemic monitoring; diabetes in ICU patients; critically ill & blood glucose; intravascular microdialysis; glucose control metrics in ICU patients. The following filters were used: all full text clinical trials, written in English language, published between 01/01/2000 and 10/31/2016 on the human genre concerning adult patients. Prospective and Retrospective Observations were also included. Two authors (VS and FB) independently screened and assessed retrieved papers. Only clinical reports (RCTs, prospective and retrospective studies and case reports) were selected.

Results and Discussion: A total of 4548 papers were examined, 197 were filtered, of which 182 were excluded and 15 were selected as suitable for the present SR. Selected papers were categorized into 3 subchapters:

1. CGMS and glycaemic variability;
2. Closed-loop system;
3. GCMS in cardiac surgery.

These studies have shown that often an accurate GCMS allows a better management of glycaemia in ICU patients.

Conclusion: Using CGMS to improve glucose control in the ICU requires continuous glucose measurement combined with an insulin algorithm that allows glucose rescue in response to unexpected hypoglycaemia or hyperglycaemia episodes. This method might improve even glucose control with regard to glucose variability. Future versions of CGMS will need real-time data analysis, fast warm-up, and less frequent calibrations to be used in the clinical setting.

13AP09-9

Intensive care admission and hospital mortality in the elderly after non-cardiac surgery in Spain: secondary analysis of EuSOS study

de Nadal M.¹, Pérez-Hoyos S.², Montejó-González J.C.³, Pearse R.⁴, Aldecoa C.⁵, European Surgical Outcomes Study (EuSOS) Study Group

¹Hospital Universitari Vall d'Hebron, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain, ²Hospital Universitari Vall d'Hebron, Research Institute, Barcelona, Spain, ³Hospital Universitario 12 de Octubre, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ⁴Barts and The London School of Medicine and Dentistry, Queen Mary University of London, Dept of Anaesthesiology & Intensive Care, London, United Kingdom, ⁵Hospital Universitario Rio Hortega, Dept of Anaesthesiology & Intensive Care, Valladolid, Spain

Background and Goal of Study: Post-operative intensive care admission may improve outcomes, especially in high-risk patients. Very elderly patients (over 80 or 85 years) represent a high-risk population due to their frailty and associated morbidity. The findings of studies exploring the benefits of post-operative intensive care admission for elderly patients are inconsistent. The

aim of this study was to determine the impact of age as an independent factor of ICU admission after non-cardiac surgery in Spain using data from the European Surgical Outcome Study (EuSOS).

Materials and Methods: EuSOS study methodology is described in detail in the original article. A descriptive analysis of the Spanish subset of the EuSOS, including demographic and surgical characteristics, was carried out. Age differences of ICU admission and mortality, adjusted by other demographic and surgical variables, were tested by means of a chi squared and Kruskal-Wallis test. A logistic model was fitted to relate age with ICU admission, outcomes and mortality. A multivariate model was built adding the demographic and surgical variables.

Results and Discussion: A total of 677 patients (12.5%) were admitted to an intensive care unit (ICU) after surgery, 339 (50.1%) were less than 65 years, 181 (26.7%) were 65-74 years, 140 (20.7%) were 75-85 years and 17 (2.5%) were over 85 years. Adjusted odds ratio [95% confidence interval (CI)] for ICU admission was 1.1 (0.8-1.4) for patients aged 65-74 years, 0.7 (0.5-1) for patients aged 75-85 years and 0.4 (0.2-0.8) for patients over 85 years, respectively. Age was an independent factor for ICU admission. The global risk-adjusted mortality (by age, ASA, cirrhosis, metastatic disease, surgical specialty, grade and urgency of surgery) was 1.4 (CI 0.9-2.2). No association between age and hospital mortality was found. Adjusted odds ratio (CI) for hospital mortality was 1.1 (0.7-1.7) for patients aged 65-74 years, 1.3 (0.9-2.1) for patients aged 75-85 years and 1.0 (0.5-2.4) for patients over 85 years, respectively. Factors predictive of hospital mortality were ASA score, urgency of surgery, surgical specialty and diabetes.

Conclusion(s): Patients aged over 75 years appear less likely to be admitted to ICU after non-cardiac surgery in Spanish hospitals. There was no significant association between age and post-operative mortality in this cohort.

References: Pearse RM et al. Mortality after surgery in Europe: a 7 day cohort study. *Lancet* 2012

13AP09-10

Role of anesthesiologists in early recognition of traumatic injury of the thoracic duct: case report

Burmuzoska M., Jovanovski-Srceva M.

PHI University Clinic of Anesthesiology, Reanimation and Intensive Care - Skopje, Dept of Anaesthesiology & Intensive Care, Skopje, Macedonia, the Former Yugoslav Republic of

Background: Traumatic chylothorax is a rare entity, in literature is known to be 2.6%. Leak in the thoracic duct causes collection of chylous fluid in the pleural cavity, which can lead to alterations in pulmonary function and ventilation. Early recognition and good intensive care management followed by surgical treatment is crucial.

Case report: An 11 years old boy was admitted to ICU after a stab wound in the left hemithorax. On physical examination, there was entrance wound, tachypnea and respiratory sounds were becoming lighter on the same side. After the initial CT scan, pleural effusion was seen and thoracic drainage was placed. Drainage of the effusion yielded a 2000ml cloudy, off-white fluid that settled in layers in the drainage container, in the first 24 hours. The drainage remained high in the next days and further investigations were made. Pleural fluid examination revealed a lymphocyte-rich transudate with high levels of cholesterol and triglycerides. All investigations indicated that there was lesion of the thoracic duct and indication for surgery was made.

Discussion: Traumatic chylothorax diagnosis is generally made on everyday evaluation on patient's condition and drainage fluid characteristics. Large amount of cloudy, off-white fluid, which remains for several days, is a suspicion for anesthesiologist to analyze biochemically the content from thoracic drainage. Because of the large volume of lipid- and lymphocyte-rich fluid lost in a chyle leak, nutritional support of these patients is of paramount importance to prevent malnutrition, dehydration and immunosuppression. The timing for surgical treatment is controversial. Etiology and patient's overall condition are very important.

References:

- W. Sendama, M. Shipley. Traumatic chylothorax: A case report and review. *Respiratory Medicine Case Reports* 14 (2015) 47-48
- Ufuk Çobanođlu. Ductus Thoracicus Injury: A Case Report. *Erciyes Týp Dergisi (Erciyes Medical Journal)* 2008;30(3):189-193

Learning Points: The timing for surgical treatment is controversial. Etiology and patient's overall condition are very important.

13AP09-11

Assessment of nurses' compliance and understanding of the confusion assessment method for the intensive care unit as a delirium screening tool in the London teaching hospital

Krupa M.¹, Crerar-Gilbert A.²

¹*St George's University Hospitals NHS Foundation Trust, Cardiothoracic Intensive Care Unit, London, United Kingdom,*

²*St George's University Hospitals NHS Foundation Trust, Dept of Anaesthesiology & Intensive Care, London, United Kingdom*

Background and Goal of Study: The Confusion Assessment Method for the ICU (CAMICU) is a validated tool to diagnose delirium in the intensive care. It yields three ratings: positive, negative and unable to assess (UTA). The quality improvement project¹ in the cardiothoracic unit (CTICU) 2 years ago resulted in high (80%) compliance in performing CAMICU. This study was undertaken to assess if CAMICU compliance was maintained and that scoring was accurate.

Materials and Method: Retrospective data was collected from the CTICU charts for all patients during one week. The CAMICU rating and the sedation score (RASS) at the time of the test were recorded. Data was collected and analysed in a Microsoft Excel. Ethics permission was not required.

Results and Discussion: Between 31/10/16 - 06/11/16, 52 patients data was analysed from which it was calculated that 128 CAMICU tests should have been performed. 108 (84%) CAMICU tests were completed. The CAMICU was rated:

- positive in 5 tests (4.7%);
- negative in 58 (53.7%);
- 45 tests (41.6%) were rated UTA.

18/45 (40%) of CAMICU UTA assessments were considered inappropriate as they were associated with RASS scores -3 or above (CAMICU should be done in this group²). However, many of the patients who should have received CAMICU scores (but who did not) were on the lower end of the responsiveness spectrum (-2 or -3) as measured using RASS (14/18 patients). No explanation is given for failure to assess patients with RASS scores -1 or above.

Conclusion: Following the CTICU improvement project compliance with performing the CAMICU remained high. However, this study identified that quality of testing is suboptimal. Excessive use of the UTA rating shows possible lack of understanding of how to apply the CAMICU to patients with low level of consciousness. Further education and training is required.

References:

1. Sikhamoni S (2016). Inspiring colleagues to learn about delirium. *Nursing Standard*; 9:18-20
2. Swan JT (2014). Decreasing inappropriate unable-to-assess rating for the confusion assessment method for the intensive care unit. *AJCC*; 23:60-69

13AP10-1

Isoflurane and Sevoflurane consumption in an anaesthetic conserving device (AnaConDa™) versus a semi-closed circle system with automatic end tidal concentration control (Aisys Carestation™) using an artificial lung model

Georgevici L., Procopiuc L., Drees D., Vinnikov V., Weber T.P., Bellgardt M.

St Josefs Hospital - University Clinic Bochum, Dept of Anaesthesiology & Intensive Care, Bochum, Germany

Background and Goal of Study: The use of volatile anaesthetics as sedatives in the ICU is relevant for the patient's outcome (1). Compared to anaesthesia machines which minimise the consumption of anaesthetic gas by recirculating it in a semi-closed circle system, AnaConDa™ (ACD) incorporates a reflector between the breathing circuit and the patient which captures exhaled inhalative anaesthetic and resupplies it during the next inspiration. We aimed to compare the anaesthetic gas consumption of the ACD system with the minimal, low and high flow consumption of a conventional semi-closed anaesthesia machine with automatic end tidal concentration control of the volatile anaesthetic - the Aisys CS (GE Healthcare, Madison, WI, USA).

Materials and Methods: We assembled an artificial lung model of 2x2L volume with an additional reservoir of 3.9 L simulating the functional residual capacity. This was connected to the ACD system, a Puritan Bennett™ 840 (Covidien, Mansfield, MA, USA) ventilator and a Vamos monitor (Dräger,

Lübeck, Germany) to measure end tidal CO₂ and expired volatile anaesthetic concentration or to an Aisys CS anaesthesia machine.

Measurements were each made continuously for 30 min after achieving steady state at end tidal concentrations of 0.5, 1.0, 1.5, 2.0 and 2.5 Vol% for Isoflurane (ISO) and Sevoflurane (SEVO) respectively. Every measurement was repeated 3 times. The breathing parameters were held constant (MV 5L/min, RR 10/min, TV 0.5 L). For the Aisys group measurements for all end tidal concentrations were performed at 4 different fresh gas flows (FGF): 0.5, 1.0, 2.5 and 5 L/min respectively. The groups were compared using the Mann Whitney U test (SPSS® v. 24.0).

Results and Discussion: For the ACD group there was no difference in consumption when compared to the 0.5L/min fresh gas flow anaesthesia system group across the whole range of end tidal concentrations ($p > 0.05$). Specifically, ACD ISO consumption was 0.5-5.6 mL/h versus 0.9-5.0 mL/h for Aisys 0.5 L/min FGF ($p = 1$). For ACD SEVO consumption was 1.1-6.9 mL/h versus 1.0-5.3 mL/h for Aisys 0.5 L/min FGF ($p = 0.806$).

The ACD group compared to the 1, 2.5 and 5L/min groups respectively yielded a $p < 0.05$ each time.

Conclusion: We therefore conclude that for these fixed breathing parameters the ISO and SEVO consumption of the ACD system are equivalent to those of a minimal flow anaesthesia machine.

References: 1. Bellgardt M et al, 2016, Eur J Anaesthesiol 33(1):6-13

13AP10-2

Isoflurane, Sevoflurane and Desflurane consumption in an anaesthetic gas reflector system with target controlled administration (MIRUS™) versus a semi-closed circle system with automatic end tidal concentration control (Aisys Carestation™) using an artificial lung model

Georgevici I., Procopiuc L., Drees D., Vinnikov V., Weber T.P., Bellgardt M.

St Josefs Hospital - University Clinic Bochum, Dept of Anaesthesiology & Intensive Care, Bochum, Germany

Background and Goal of Study: The use of volatile anaesthetics as sedatives in the ICU is relevant for the patient's outcome (1). The MIRUS™ System (MS) (Pall Medical, Dreieich, Germany) is the first anaesthetic gas reflector system which can administer Desflurane (DES) besides Isoflurane (ISO) and Sevoflurane (SEVO). The MS is able to independently measure and control anaesthetic gas concentrations. We aimed to compare the MS anaesthetic gas consumption with the minimal, low and high flow consumption of a conventional semi-closed anaesthesia machine - the Aisys CS (GE Healthcare, Madison, WI, USA) which has a similar end tidal concentration control.

Materials and Methods: We assembled an artificial lung model of 2x2L volume with an additional reservoir of 3.9 L simulating the functional residual capacity. This was connected to an MS and a Puritan Bennett™ 840 (Covidien, Mansfield, MA, USA) ventilator or an Aisys CS anaesthesia machine.

Measurements were each made continuously for 30 minutes after achieving steady state at end tidal concentrations of 0.5, 1.0, 1.5 and 2.5 Vol % for ISO and SEVO respectively and at 1, 2, 3, 4, 5 and 6 Vol% for DES. The breathing parameters were held constant (MV 5L/min, RR 10/min, TV 0.5 L). For the Aisys group measurements for all end tidal concentrations were performed at 4 different fresh gas flows (FGF): 0.5, 1.0, 2.5 and 5 L/min respectively. The groups were compared using the Mann Whitney U test (SPSS® v. 24.0).

Results and Discussion: In the clinically relevant domains for ICU sedation (0.5 MAC) we could derive the following consumptions: MS ISO at 0.5 Vol% consumes an average of 2 mL/h which is identical to the Aisys at FGF 1 L/min; MS SEVO at 1 Vol% consumes an average of 10 mL/h which is comparable to the Aisys at FGF 2.5 L/min (8.2 mL/h); MS DES at 3 Vol% uses up an average of 12 mL/h corresponding to the Aisys at FGF 1 L/min (9.7 mL/h). The MS interpolation curve for all three gases shows a divergent tendency at 3 Vol% which most likely corresponds to the spill over effect described for Desflurane (2).

Conclusions: MS is effective in reducing overdosing with a satisfactory performance of the reflector system for the clinically interesting concentrations, where the consumption corresponds to that of a conventional anaesthesia machine at a FGF between 1 (ISO, DES) and 2.5 L/min (SEVO).

References:

- Bellgardt M et al, 2016, Eur J Anaesthesiol 33(1):6-13
- Bombert H et al, 2014, Anaesthesia 69(11):1241-50.

13AP10-3

Can Dexmedetomidine prevent delirium during the weaning process in critically ill patients?

Fotopoulou G., Poularas I., Alexopoulou A., Kalogeromitros A., Papakonstantinou K., Koukoulitsios G.

General Hospital of Athens - G. Gennimatas, Dept of Intensive Care, Athens, Greece

Background and Goal of Study: Intensive Care Unit (ICU) delirium is associated with longer length of ICU stay and higher incidence of mortality (1). Dexmedetomidine (DEX) is an alpha-2-adrenergic agonist recently introduced as a sedation adjunct. The objective of our study was to evaluate the efficacy of DEX in preventing delirium during the weaning process.

Materials and Methods: We performed a randomized controlled study in our multidisciplinary ICU. Adult patients mechanically ventilated, meeting the standard criteria for weaning were enrolled and randomized to receive either DEX (0.15-1.5 mcg/kg/h) or remifentanyl (0.5-15 mcg/kg/h) in order to achieve a Richmond Agitation-Sedation Scale of -2 to 0. Patients with a history of alcohol, opioid or benzodiazepine abuse were excluded. Illness severity scoring systems (APACHE II, SOFA) were calculated on the first ICU day. Delirium was assessed according to the Confusion Assessment Method for the ICU. Time to extubation and vital parameters were recorded. Continuous variables were compared using the Student t-test. Categorical variables were compared using the chi-square test or Fisher's exact test.

Results and Discussion: Fifty-two mechanically ventilated, critically ill patients were included in the study (median age 69 years, 55% were males). Median values for APACHE II and SOFA scores were 18 and 9, respectively. The use of DEX was associated with significantly better extubation quality compared to remifentanyl reflected in the prevalence of delirium during the weaning process [23% (6/26) vs 65% (17/26), $p < 0.01$], as well as after extubation [8% (2/26) vs 35% (9/26), $p < 0.01$]. Consequently, less additional rescue medications for agitation were applied in the DEX group [19% (5/26) vs 58% (15/26)].

Significant differences between the two groups were recorded in the median time to extubation (40.8±36 hours in the DEX group vs 60.0±28.8 hours in the remifentanyl group, $p < 0.05$) and ICU length of stay (19.9±8.45 days in the DEX group vs 15.2±11.7 days in the remifentanyl group, $p < 0.05$).

The hemodynamic adverse effects (hypotension, hypertension, bradycardia) were reported to be less common in the remifentanyl group [42% (11/26) vs 35% (9/26)], although not significantly ($p = 0.175$).

Conclusion(s): Dexmedetomidine seems to have clinical benefits in facilitating weaning process due to the lower incidence of delirium with minimal adverse events.

References: 1. Ely EW et al. JAMA 2004; 291:1753-1762.

13AP10-4

Use of Dexmedetomidine during discontinuation of ventilation in the neuro-critically ill patient

Fotopoulou G., Alexopoulou A., Poularas I., Kalogeromitros A., Papakonstantinou K., Koukoulitsios G.

General Hospital of Athens - G. Gennimatas, Dept of Intensive Care, Athens, Greece

Background and Goal of Study: Sedation for the neuro-critically ill patient presents an array of challenges. Dexmedetomidine (DEX) is a selective alpha-2-adrenergic agonist recently evidenced to have neuroprotective effects in vitro (1). The primary objective of our study was to evaluate whether DEX can prolong the ventilator-free time in stable patients with intracranial pathology.

Materials and Methods: Adult patients mechanically ventilated who admitted in our multidisciplinary ICU as a result of traumatic brain injury (TBI), subarachnoid hemorrhage (SAH) or intracerebral hemorrhage (ICH,) meeting the standard criteria for discontinuation of mechanical ventilation, were enrolled in our randomized controlled trial. The infusion rates of DEX fluctuated between 0.5 and 1.5 mcg/kg/h. The Richmond Agitation Sedation Scale (RASS) and the Glasgow Coma Scale (GCS) was daily assessed. Illness severity scoring systems (APACHE II, SOFA) were calculated on admission. Ventilator-free days and vital parameters [mean, systolic, diastolic arterial pressure (MAP, SAP, DAP), heart rate (HR)] were recorded. Categorical data were analyzed using the chi-square test or Fisher's exact test. Normal continuous variables were compared using the Student t-test.

Results and Discussion: Twenty-six critically ill patients were randomized to receive DEX or not (median age 52 years old, 58% were females, 65% SAH, 27% TBI, 8% ICH). Median values for APACHE II and SOFA were 17 and 8 respectively. Dexmedetomidine significantly increased ventilator-free hours at 7 days following randomization compared to placebo [180.0±45.6 hr vs 124.8±55.2 hr, mean difference between groups 55.0hr (95%CI, 4.08 to 106.7 hr)]. During the DEX infusion, lower incidence of agitation [23% (3/13) vs 54% (8/13), $p<0.05$], attenuation of hemodynamic stress response to weaning (mean SBP 148.2 ± 15.3mmHg, mean MAP 84.7±7.1, mean HR 73.0±16.0 bpm) and sufficient respiratory pattern (mean tidal volume 525±112 ml, mean respiratory rate 15±3 respirations/min) were recorded. The RASS score was improved whether the GCS score remained unchanged.

Conclusion(s): The findings demonstrate that dexmedetomidine may be a safe adjunct in the neurocritical practice as the sedative is effective in controlling stress response without a decline in neurological functioning. Nevertheless, the effects of the drug in cerebral hemodynamics have to be elucidated.

References: 1. Rodríguez-González R et al. *Life Sci.*2016;144:162-9

13AP10-5

Clinical uses of dexmedetomidine in a tertiary university hospital ICU

Fariña González T.F, Jiménez Martín M.J., Pardo Rey C., Del Pino A., García Alonso L., Sanchez García M.
Hospital Clinico San Carlos, Dept of Intensive Care, Madrid, Spain

Background and Goal of Study: Dexmedetomidine (DX) has three main clinical uses: prolonged sedation in hospitalized patients, procedural sedation and general anesthesia. Another important setting is to control agitation during mechanical ventilation weaning.

Materials and Methods: Retrospective audit in a 38-bed ICU about the sedation standards in our Unit. All patients admitted between May 2013 to April 2016 that received DX during their stay in the ICU were analyzed. Variables recorded: demographics, motive of ICU admission, indication for DX use, dosage and treatment duration. Use of other sedative or analgesic medication (propofol, midazolam, remifentanyl or fentanyl, haloperidol). DX effectiveness (agitation control, reduction of other drug`s dosage. etc) and interruption because of adverse effects. We also recorded ICU and hospital length of stay (LOS) and mortality.

Results and Discussion: From a total of 8057 patients admitted, 57 (0.7%) received DX. 38 were male (66.7%) and mean age was 61 (SD ±13.42). Admission was due to cardiac surgery (28.1%), cardiac arrest (15.8%), vascular surgery (10.5%), general surgery (7%), pneumonia (7%) and others (29.8%). Mortality was 24.6%. Indication for DX were agitation (75.4%), delirium (1.8%) and others such as hypertension (22.8%). We used mainly propofol as a sedative (80.7%) and remifentanyl or fentanyl (54.4%) and morphine chloride as analgesic (8.9%). Haloperidol was used in 9 patients (15.8%). Minimum dosis was 0.46 ug/kg/h (SD ±0.21) and maximum was 1.05 ug/kg/h (SD ±0.56). Mean duration of the therapy was 3.61 days (SD ±2.86). DX was effective in 75.4% of the cases and previous analgesic/sedative drugs could be reduced or suspended in the 66.7%. There was no association between effectiveness and mortality, using agitation control (OR 1.3, 95% CI 0.3-5.5, $p=0.51$) or drugs reduction (OR 2.2, 95% IC 0.5-9.3, $p=0.33$). 11 patients were treated in more than one occasion; in those patients mean duration was 6.45 days (SD ±4.108). In 4 cases (7%), DX was discontinued because of adverse events (bradycardia or atrioventricular block). 31 patients (54.4%) were tracheostomized.

Conclusion: Although underused, dexmedetomidine controlled symptoms, specially agitation and delirium, and helped to reduced others drugs with minimum side effects.

References:

Chen K et al. *Cochrane Database Syst Rev.* 2015 Jan 6;1:CD010269
Klompas M et al. *Chest.* 2016. doi:10.1378/chest.15-1389.

13AP10-6

Abbreviated Burn Severity Index in a reference burn care unit - a 3 year experience

Silva E., Lima G., Ferreira C., Rego S., Marques M., Martins M.
Coimbra Hospital and University Centre, Dept of Anaesthesiology & Intensive Care, Coimbra, Portugal

Background and Goal of Study: Since its first description in 1982, the Abbreviated Burn Severity Index (ABSI) has gained wide acceptance as an useful tool for predicting the mortality of burned patients. The main predictor variables which determine mortality (%) related to burn are: age (years), total body surface area burned (TBSA burned, %), and inhalation injury. The ABSI uses the above parameters with the additional predictor variables of full thickness burn and gender. The goal of this study is to re-evaluate these parameters as prognosis factors in burn patients.

Materials and Methods: Retrospective data analysis of all patients admitted in Coimbra University and Hospital Center Burns Critical Care Unit from January 2013 to December 2015, excluding patients with necrotising fasciitis and Steven-Johnson syndrome/ toxic epidermal necrolysis/ Lyell syndrome (22 patients). Statistical analysis was made with SPSS 22.0®.

Results: From a total of 474 patients, 22 were excluded and 31 died. The presence of inhalation injury (survivors (S)= 51 vs non-survivors (NS)=11; OR 4; $p<0.001$) and of full thickness burn (S=229 vs NS=26; OR 4,4; $p<0.001$) were both independently associated with mortality. Age ($\bar{x}(S)= 57.6$ vs $\bar{x}(NS)= 72.3$; $p<0.001$), TBSA burned ($\bar{x}(S)= 10.4$ vs $\bar{x}(NS)= 29.3$; $p<0.001$) and ABSI ($\bar{x}(S)= 6.0$ vs $\bar{x}(NS)= 9.4$; $p<0.001$) were also independently associated with mortality. In this population, gender was not independently associated with mortality ($p>0.05$).

Conclusion(s): The mortality rate was 4 times higher in patients with inhalation injury and 4.4 times higher in patients with full thickness burn. The mortality rate was also higher in older patients, in those with higher TBSA burned and in those with higher ABSI. In our population, each of the ABSI variables, beside gender, as well as ABSI itself, was found to be a predictor of mortality.

References:

Forster NA, Zingg M, Haile SR, Künzi W, Giovanoli P, Guggenheim M. 30 years later - Does the ABSI need revision? *Burns.* 2011 Sep;37(6):958-63. doi: 10.1016/j.burns.2011.03.009. Epub 2011 Apr 13

13AP10-7

Are the type of burns and of accident prognostic factors in burn patients?

Silva E., Lima G., Ferreira C., Rego S., Marques M., Tourais I.
Coimbra Hospital and University Centre, Dept of Anaesthesiology & Intensive Care, Coimbra, Portugal

Background and Goal of Study: Burn injury is a serious pathology, potentially leading to severe morbidity and significant mortality, but it also has a considerable health-economic impact. The main predictor variables which determine mortality (%) following burn are: age (years), total body surface area burned (TBSA, %) and inhalation injury. There is scarce data regarding the role of the type of burns and type of accident in prognosis. The goal of this study was to evaluate these parameters as prognostic factors in burn patients.

Materials and Methods: Retrospective study performed on all admissions at Coimbra Hospital and University Centre Burn Intensive Care Unit, from January 2013 to December 2015, excluding necrotising fasciitis and Steven-Johnson syndrome/ toxic epidermal necrolysis/ Lyell syndrome. Statistical analysis made with SPSS 22.0®.

Results: Type of burn was divided into 5 categories: caused by fire, friction, electrical and scald burns and others. Type of accident was divided into: assault, domestic, suicide, work and traffic. From a total of 474 patients, 22 were excluded and 31 died. Neither the type of burn ($p=0.125$) nor type of accident ($p=0.585$) were independently associated with mortality.

Conclusion(s): In our population, none of the parameters studied were significantly different between survivors and non-survivors.

References: Nele Brusselaers, Stan Monstrey, Dirk Vogelaers, Eric Hoste, and Stijn Blot. Severe burn injury in europe: a systematic review of the incidence, etiology, morbidity, and mortality. *Crit Care.* 2010; 14(5): R188.

13AP10-8**Burn population in a reference Burn Care Unit - a 3 year experience**

Silva E., Rego S., Ferreira C., Lima G., Martins M., Tourais I.
Coimbra Hospital and University Centre, Dept of Anaesthesiology & Intensive Care, Coimbra, Portugal

Background and Goal of Study: Burn injury has a severe morbidity and significant mortality, but it also has a considerable economic impact. The aim of this study is to describe the hospitalized population in Coimbra Hospital and University Centre - Burns Intensive Care Unit, including the incidence, etiology, risk factors and mortality.

Materials and Methods: Retrospective analysis of data of patients treated in the Burns Intensive Care Unit at Coimbra Hospital and University Centre, from January 2013 to December 2015. Statistical analysis was made with SPSS 22.0®.

Results: In total 474 patients were identified, of which 33 died. Median age was 59 years and 225 patients were women. Median total body surface area burned (TBSA) was 12.8% (69 patients with burns >20% TBSA) and 267 patients presented with a full thickness burn; 63 patients (13,3%) presented inhalation injury and 100 were submitted to mechanical ventilation. Most of burns were caused by fire, followed followed by scald and electrical burns.

Conclusion(s): The mortality rate at our centre during the studied period was 6,9%, which is lower than median mortality described in literature. The incidence of inhalation injury was 13,3% according to published data.

References: Nele Brusselaers, Stan Monstrey, Dirk Vogelaers, Eric Hoste, and Stijn Blot. Severe burn injury in europe: a systematic review of the incidence, etiology, morbidity, and mortality. *Crit Care*. 2010; 14(5): R188.

13AP10-9**The impact of mechanical ventilation in the burn patient prognosis**

Silva E., Lima G., Ferreira C., Rego S., Marques M., Tourais I.
Coimbra Hospital and University Centre, Dept of Anaesthesiology & Intensive Care, Coimbra, Portugal

Background and Goal of Study: Serious burn injuries constitute a significant cause of morbidity and mortality. The main predictors of mortality in these patients have consistently been: age, total body surface area (TBSA) burned and the presence or absence of inhalation injury. Mechanical ventilation (MV) has been considered as a risk factor for mortality in burn patients. The awareness of ventilator-associated lung injury has increased in the last years. The goal of this study is to evaluate the predictive performance of this parameter in our centre.

Materials and Methods: Retrospective study performed on all admissions at Coimbra Hospital and University Centre Burns Intensive Care Unit, from January 2013 to December 2015, excluding necrotising fasciitis and Steven-Johnson syndrome/ toxic epidermal necrolysis/ Lyell syndrome. Statistical analysis made with SPSS 22.0®.

Results: From a total of 474 patients, 22 were excluded and 31 died. MV was independently associated with mortality (survivors=71 vs non-survivors=11; OR 12; $p < 0,001$).

Conclusion(s): In our centre the mortality rate was 12 times higher in patients submitted to MV. Therefore, it was a significant predictor of mortality. According to these results unnecessary MV should be avoided.

References:

Pantet O., Faouzi M., Brussekaers N., Vernay A., Berger M.M. Comparison of mortality prediction models and validation of SAPS II in critically ill burn patients. *Annals of Burns and Fire Disasters* - vol. XXIX - n. 2 - June 2016
Heng JS, Clancy O, Atkins J, Leon-Villapalos J, Williams AJ, Keays R, Hayes M, Takata M, Jones I, Vizcaychipi MP Revised Baux score and updated Charlson comorbidity index are independently associated with mortality in burns intensive care patients. *Burns*. 2015 Nov;41(7):1420-7. doi: 10.1016/j.burns.2015.06.009. Epub 2015 Jul 14

13AP11-1**Indocyanine green elimination measurement may detect surgical complications following major liver resection. Preliminary results**

Alarcon L., Bono P, Narvaez J., Perez J.M., Olmedilla L., Duque P
Gregorio Marañon General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Indocyanine green elimination by pulse spectrophotometry is a non-invasive liver function monitoring system. The aim of this study is to assess the relationship between postoperative ICG plasma disappearance rate (ICG PDR % min) and the onset of surgical complications.

Materials and Methods: 22 patients scheduled for mayor liver resection were selected. ICG PDR was measured preoperatively and on the day 1 and 2 post-operatively. We considered liver ischemia, biliary leak and intra-abdominal fluid collections as postoperative surgical complications. This study is registered in ClinicalTrials.gov under the number NCT02813538.

Results and Discussion: 6 patients have undergone surgical complications. The median ICG PDR was 17.2 ± 7.7 preoperatively, 16.96 ± 7.75 on postoperative day 1 and 16.24 ± 7.91 on postoperative day 2. Significant association was found between lower ICG PDR measurement taken postoperative day 1 and the onset of surgical complications (11 ± 5.9 in patients with surgical complications vs 19.47 ± 7.14 in patients without surgical complications, $p=0.017$). We have also found a significant correlation between ICG PDR measurement taken on postoperative day 1 and hospital stay ($r=0.43$, $p=0.044$).

Conclusion(s): CG PDR measured by pulse spectrophotometry is a useful non-invasive liver function test in patients undergoing major liver resection. It may predict surgical complications in these patients which could improve their management and as a consequence, their outcome.

References:

- Kim HJ, Kim CY, Park EK et al. Volumetric analysis and indocyanine green retention rate at 15 min as predictors of post-hepatectomy liver failure. *HPB (Oxford)* 2015;17(2):159-67
- Derpapas MK, Contis J, Fragulidis GP et al. Correlation of the ICG test with risk factors and postoperative outcomes following hepatic resection. *J BUON* 2013;18(3):703-7
- de Liguori Carino N, O'Reilly DA, Dajani K et al. Perioperative use of the LIMON method of indocyanine green elimination measurement for the prediction and early detection of post-hepatectomy liver failure. *Eur J Surg Oncol* 2009;35(9):957-62

13AP11-2**Potential relationship between postoperative indocyanine green elimination measurement and coagulation profile in patients undergoing major liver surgery. Preliminary results**

Alarcon L., Narvaez J., Bono P, Olmedilla L., Perez J.M., Duque P
Gregorio Marañon General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Indocyanine green elimination by pulse spectrophotometry is a non-invasive liver function monitoring system. Thromboelastometry is a global coagulation test. The aim of this study is to assess the relationship between postoperative ICG plasma disappearance rate (ICG PDR % min) and thromboelastometric parameters, procoagulant and anticoagulant protein levels following major liver surgery.

Materials and Methods: 22 patients scheduled for mayor liver resection were selected. ICG PDR, thromboelastometric analysis (coagulation time (CT), maximum clot firmness (MCF) and maximum lysis (ML) in EXTEM, INTEM and FIBTEM, procoagulant (Factor II, V, VII, VIII, IX, X, XI and XII) and anti-coagulant factors (protein C, protein S and antithrombin III) were measured preoperatively and on postoperative day 1 and 2. This study is registered in ClinicalTrials.gov under the number NCT02813538.

Results and Discussion: The mean ICG PDR was 17.2 ± 7.7 preoperatively, 16.96 ± 7.75 on postoperative day 1 and 16.24 ± 7.91 on postoperative day 2. The thromboelastometric mean values remained within the normal range. Significant correlation were found between ICG PDR and CT_{EXTEM} ($r=-0.52$, $p=0.014$), MCF_{EXTEM} ($r=-0.49$, $p=0.021$) and protein C levels ($r=0.46$, $p=0.036$) measured on postoperative day 1. This significant correlation persist on postoperative day 2 only between ICG PDR and protein C levels

($r=0.72$, $p=0.001$). We have not found any significant correlation between ICG PDR and procoagulant protein levels or routine coagulation tests.

Conclusion(s): ICG PDR measured by pulse spectrophotometry is a non-invasive liver function test in patients undergoing major liver resection. Taken ICG PDR as index of severity, CT and MCF measured in EXTEM might be a suitable prognostic factor. Protein C is a pivotal anticoagulant factor synthesized in liver known to be dramatically decreased following major hepatic surgery. Our results suggest that early postoperative protein C levels may be also prognostic of liver dysfunction.

References:

1. Tripodi A, et al. The coagulopathy of cirrhosis assessed by thromboelastometry and its correlation with conventional coagulation parameters. *Thromb Res* 2009;124(1):132-6
2. Dumitrescu G, et al. The temporal pattern of postoperative coagulation status in patients undergoing major liver surgery. *Thromb Res* 2015;136(2):402-7

13AP11-3

In-hospital and one-year mortality of patients in intensive care unit with liver cirrhosis: a nationwide population-based cohort study

Lin Y.-C.¹, Chen T.-L.²

¹School of Nursing, College of Nursing, Taipei Medical University, affiliated with Taipei Medical University Hospital, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China, ²Taipei Medical University Hospital, affiliated with School of Medicine, College of Medicine, Taipei Medical University, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China

Background and Goal of Study: Adverse outcomes of patients in the intensive care unit (ICU) with liver cirrhosis are not completely understood. This study evaluated the ICU and one-year mortality in patients with cirrhosis of liver.

Materials and Methods: Using the reimbursement claims from Taiwan National Health Insurance Research Database from in 2006-2012, 37,197 ICU patients with cirrhosis of liver were identified among 23 million beneficiaries. Using the method of propensity score-matching in socioeconomic status, pre-existing medical conditions, and cirrhosis-related morbidities, another 37,197 patients in ICU without liver cirrhosis were selected for analysis. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) of cirrhosis of liver associated with ICU mortality and factors associated with post-ICU one-year mortality were evaluated under the multivariate logistic regressions model.

Results and Discussion: Compared with people without liver cirrhosis, patients with cirrhosis of liver had higher ICU mortality than those without liver cirrhosis (OR 1.57, 95% CI 1.50-1.64), particularly in those had jaundice (OR 2.19, 95% CI 1.99-2.40), ascites (OR 2.26, 95% CI 2.13-2.39), and hepatic coma (OR 2.16, 95% CI 2.03-2.31) The association between cirrhosis of liver and increased ICU in-hospital mortality was significant in both sexes and each age group. Risk factors associated with one-year mortality after ICU in patients with cirrhosis of liver were older age, male, ICU in medical center, anemia, renal dialysis, heart failure, cancer, pneumonia, septicemia, and urinary tract infection during ICU admission. The complexity of co-morbidities and the severity of cirrhosis are crucially important for the adverse outcomes of this specific population.

Conclusions: This study showed the risk factors affecting in-hospital and one-year mortalities in ICU patients with cirrhosis of liver. In order to improve the outcomes in ICU patients with liver cirrhosis, team resources management from multidisciplinary modalities is mandatory.

13AP11-4

Standardised mortality by post-operative location in the National Emergency Laparotomy Audit

Cohen M.¹, Shaw C.P.², Martins N.¹, Bentley M.R.¹, Margaron M.P.¹

¹St Richard's Hospital, Department of Anaesthesia, Chichester, United Kingdom, ²Worthing Hospital, Department of Anaesthesia, Worthing, United Kingdom

Background and Goal of Study: The UK has a long history of national audit projects. The National Emergency Laparotomy Audit (NELA) is one such audit, following patients undergoing emergency laparotomy. The NELA protocol provides a P-POSSUM score calculated intra-operatively for each patient, to determine whether ward based care or a higher level of post-operative care is indicated.

We wished to investigate whether the standardised mortality rate (SMR) differed between patients allocated the different post-operative locations of the intensive care unit (ICU), high dependency unit (HDU) and ward; and to what extent.

Materials and Methods: Site-specific data from the NELA database between November 2013 and October 2016 was cross-referenced to ICU and hospital outcome data for all patients. Distribution of predicted risk of mortality and SMR within each cohort was investigated using a 3x2 contingency table and Chi-squared test.

Results and Discussion: Over the 36-month period ending November 2016, full data was available for 273 (82%) of 334 patients. Of these, 220 were admitted to the combined ICU/HDU (27 died, 12.3%), and 53 went directly to the ward (6 died, 11%). Two of those transferred to the ward were for palliative care only.

The predicted mortality based upon P-POSSUM at end of surgery was 44 patients; the actual 30-day mortality was 33 patients - an SMR of 0.74.

	ICU (n=131)	HDU (n=89)	Ward (n=53)	P Value
Mean Predicted mortality	26.2%	11.5%	9.9%	
Median Predicted mortality (Interquartile Range)	18.9% (6-33)	5.6% (2-11)	3.6% (1.5-7.6)	
Predicted (Actual) deaths	34.3 (24)	10.2 (3)	5.3 (6)	0.278
	0.70	0.29	1.14	

[Table 1: Post-operative destination and outcomes]

Conclusion(s): Thirty-day mortality for emergency surgical patients admitted to the intensive care unit was around three-quarters of predicted. Those receiving lower levels of critical care had the lowest SMR. Of those who were transferred directly to the ward, SMR was greater than one (even when excluding the two cases for palliation the ward SMR is 1.01). This study is underpowered to show that these differences are statistically significant.

13AP11-5

Diagnostic challenges in a case of hepatic abscess with Actinomyces odontolyticus and Streptococcus intermedius

Avram O.¹, Oancea I.², Macovei R.A.¹, Coldea L.³, Ilie M.⁴

¹Clinical Emergency Bucharest Hospital, Dept of Anaesthesiology & Intensive Care, Bucharest, Romania, ²Phoenix Imagistic Clinic, Imagistic, Bucharest, Romania, ³Clinical Emergency Bucharest Hospital, Microbiology Laboratory, Bucharest, Romania, ⁴Clinical Emergency Bucharest Hospital, Gastroenterology, Bucharest, Romania

Background: Despite belonging to the oropharynx commensal flora, gastrointestinal tract and female genital tract, in rare cases Actinomyces species may cause actinomycosis, characterized by abscesses formation in the lungs or gastrointestinal tract, usually in immunocompromised patients and in association with other infectious agents. Although cervicofacial infections are the most often seen form of the disease, hepatic localization appears rarely. We describe a case of hepatic abscess in an immunocompetent female who came no others signs of liver suffering.

Case report: 73 year old female came to hospital accusing diplopia and asthenia. Clinical exam was normal, except sixth cranial nerve paresis; common laboratory investigations and a cerebral MRI were performed, showing

no relevant changes. Three days later, the patient needed urgent hospital admission for septic shock, fever, shortness of breathing and hematological disturbances. Lab investigations showed leukocytosis, thrombocytopenia, anaemia, slight elevation of hepatic enzymes and elevated levels of procalcitonin and CRP. CT examination revealed a solid mass of 7.4/4.5 cm from polycystic aspect situated in the third hepatic segment. Blood culture grew *Actinomyces odontolyticus* and *Streptococcus intermedius* and the patients received high doses of penicillin G iv (24 million units/day), followed by oral therapy with doxycycline and amoxicillin. After the attempt of abscess drainage under ultrasound guidance and lavage with saline, a subcapsular hematoma has developed on the visceral margin of the left hepatic lobe. The pus obtained from puncture confirmed the same agents found in blood cultures. After 2 months of antibiotic therapy, complete resolution of the abscess was obtained and also significant reduction in size of the subcapsular hematoma, as documented by the MRI examination.

Discussion and Learning Points: This case is particular in the peculiar onset of the disease in an immunocompetent patient with no abdominal symptoms or initial sepsis signs. Although the majority of these cases end up needing surgical drainage, in our patient, percutaneous drainage was complicated with a subcapsular hematoma. The successful conservative management of this case with prolonged antibiotherapy was due to close interdisciplinary collaboration between infectionist, microbiologist, surgeon, gastroenterologist and intensivist.

13AP11-6

Sodium nitrite attenuates hepatic ischemia reperfusion injury in rats

Choi E.K.¹, Park S.H.², Lim D.G.²

¹Yeoungnam University, College of Medicine, Dept of Anaesthesiology & Pain Medicine, Daegu, Korea, Republic of,

²Kyungpook National University, Dept of Anaesthesiology & Pain Medicine, Daegu, Korea, Republic of

Background and Goal of Study: Nitrite (NO₂) as an alternative source of NO has been proposed that mediates the protective response in presence of ischemia or hypoxic condition, and inorganic NO₂ can be reduced to NO in by xanthine oxidoreductase (XOR). In this study, we investigated whether pretreatment with sodium nitrite (NaNO₂) can attenuate liver damage in hepatic IR injury, and identified the possible mechanism of NO₂ reduction using 2-(4-carboxyphenyl)-4,5-dihydro-4,4,5,5-tetramethyl-1H-imidazolyl-1-oxo-3-oxide, C-PTIO, NO scavenger and allopurinol (ALP) XOR inhibitor.

Materials and Methods:

Experiment 1: Thirty male Sprague-Dawley rats were divided into 5 groups:

- (1) sham operated;
- (2) hepatic IR;
- (3-5) NaNO₂ was administered at 30 min before ischemia in a dosage of 2.5, 25, and 250 μmol/kg, respectively (IP)

Experiment 2: Thirty male Sprague-Dawley rats were divided into the following 5 groups:

- (1) sham operated;
- (2) hepatic IR;
- (3) NaNO₂ + hepatic IR;
- (4) C-PTIO + NaNO₂ + hepatic IR;
- (5) ALP + NaNO₂ + hepatic IR. NaNO₂ was administered at 30 min before hepatic ischemia, and C-PTIO and ALP were administered 5 min prior to administration of NaNO₂ (25 μmol/kg).

Blood aspartate aminotransferase (AST), alanine aminotransferase (ALT), hepatic tissue malondialdehyde (MDA), histological changes, apoptosis, and expression of MAPK family members (extracellular signal-regulated kinase (ERK), c-Jun N-terminal kinase (JNK), and p38 were evaluated.

Results and Discussion: NaNO₂ limited serum elevation of the liver transaminase ALT and AST induced by hepatic IR with a peak effect occurring at 25 μmol/kg NaNO₂. Pretreatment with ALP abolished the protective effect of NaNO₂, and treatment with C-PTIO attenuated the hepatoprotection of NaNO₂ in the hepatic IR injury. Liver MDA and apoptosis activities after IR decreased in rats treated with NaNO₂. Additionally, NaNO₂ also prevented hepatic IR induced MAPK phosphorylation.

Conclusion(s): Exogenous NaNO₂ protected in hepatic IR injury. Catalytic reduction to NO and attenuation of hepatic IR injury is dependent on XOR.

References:

- Björnsson B. et al. *World J Gastroenterol.* 2015;21(6):1775-83.
 Peleli M. et al. *Free Radic Biol Med.* 2016;99:472-484.

13AP11-7

Direct current potential level in prediction of intraabdominal hypertension in patients with acute colonic obstruction

Zabolotskikh I., Musaeva T., Stakanov A.

Kuban State Medical University, Dept of Anaesthesiology & Intensive Care, Krasnodar, Russian Federation

Background and Goal of Study: It was found beneficial effects of the prolonged postoperative epidural analgesia in complex of intraabdominal hypertension (IAH) correction; however, the use of epidural analgesia preoperatively in patients with IAH being questioned in connection with the risk of hemodynamic disturbances. Therefore, fluid therapy in these patients should be performed with caution, taking into account a possible ischemic bowel edema and even greater increase intraabdominal pressure. The goal of the study - to identify the prognostic value of direct current potential (DCP) level in the risk of IAH in patients with acute colonic obstruction.

Materials and Methods: A prospective analysis of the preoperative period was made for 340 patients with acute colonic obstruction due to colon cancer. The patients were admitted for preoperative preparation to intensive care.

Results and Discussion: Validity of DCP was evaluated by assessing its discrimination (area under the curve, AUROC) and calibration (Hosmer-Lemeshow [H-L] test). The DCP is an independent predictor factor of intraabdominal hypertension, with increasing of the diagnostic value from 1 to 5 hour of preoperative period according to the AUROC (0,821 and 0.905, respectively) and calibration (6.9 (p>0.37) and 4.7 (p>0.54) by Hosmer-Lemeshow [H-L] test. The increase of intra-abdominal pressure in conjunction with a decrease in urine output (<0,5 ml/kg/h) casts doubt on advisability of continuing fluid therapy after the 3rd hour of preoperative preparation in patients with the low positive and negative values of the DCP under epidural analgesia (correlation between the level of IAH and diuresis (r = -0,61; p = 0,048). Also despite of fluid therapy in patients with low values of DCP ScvO₂ remained lower than in the other patients (63,2 (61.4-67.8)%, p<0.05), and doses of norepinephrine were higher (450 mcg/kg/min; p<0.05).

Conclusion(s): The low value of direct current potential level is an independent predictor factor of prediction of intraabdominal hypertension and fluid therapy can be guide by DCP measurement.

References: Zabolotskikh I.B. et al. Individual approach to perioperative fluid therapy based on the direct current potential levels in patients after major abdominal surgery. *European Journal of Anaesthesiology.* 2015. T. 32. № 53. C. 260.

13AP11-8

A case report on a patient presenting with syncope caused by huge hiatal hernia

Kazazi E.¹, Saliu R.², Peci J.³, Dautaj B.⁴, Bulku E.⁵, Saraci B.⁶

¹Hospital of Librazhd District, Dept of Anaesthesiology & Intensive

Care, Librazhd Elbasan, Albania, ²Hospital of Librazhd District,

Pulmonology, Librazhd Elbasan, Albania, ³American Hospital of

Tirana, Dept of Anaesthesiology & Intensive Care, Tirana, Albania,

⁴National Center of Trauma, Dept of Anaesthesiology & Intensive

Care, Tirana, Albania, ⁵Mother Theresa University Hospital of Tirana,

Dept of Anaesthesiology & Intensive Care, Tirana, Albania, ⁶Mother

Theresa University Hospital of Tirana, Radiology, Tirana, Albania

Background: Syncope is a transient loss of consciousness, associated with loss of postural tone, with spontaneous return to baseline neurologic function requiring no resuscitative efforts.

Case report: A 74 year old female had sudden loss of consciousness after eating meal and after a physical effort. A careful history is taken by witness and a detailed physical examination didn't revealed any cause of syncope. No injury was founded. A chest X-Ray was performed and after this a chest Fluoroscopy in advance which was essential to make diagnosis. There was a large retrocardiac opacity with air and liquid level compatible with a giant hiatus hernia. This can cause syncope by impeding blood flow from left atrium to the left ventricle decreasing cardiac output as the sole mechanism of syncope episode. Two dimensional echocardiography demonstrated cardiac parameters within normal limits. The diagnosis confirmed with thoracic-abdominal computed tomography. There was a huge hiatal hernia with air-fluid level behind the heart in close relation to the left atrium. After recovery the patient

was treated with antibiotics for aspiration pneumonia and she was referred to Mother Theresa Universal Hospital of Tirana for surgery treatment.

Discussion: Differentiating true syncope from “non-syncope” conditions associated with real or apparent transient loss of consciousness is generally the first diagnostic challenge and influences the subsequent diagnostic strategy. The absence of signs of suspected heart disease excludes a cardiac cause of syncope. Neurologic disease may cause transient loss of consciousness (for example, certain seizures), but is almost never the cause of syncope.

References:

1. Alboni P, Brignole M, Menozzi C. *et al* The diagnostic value of history in patients with syncope with or without heart disease. *J Am Coll Cardiol* 2001;37:1921-1928.
2. Brignole M, Alboni P, Benditt D. *et al* Guidelines on management (diagnosis and treatment) of syncope—Update 2004. *Europace* 2004;6:537-537.
3. Linzer M, Yang E, Estes M. *et al* Diagnosing syncope. Part II: unexplained syncope. *Ann Intern Med* . 1997;127:76-86.

Learning points: Neurally-mediated reflex syncopes have “non-classical” presentations. These forms are diagnosed by minor clinical criteria, exclusion of other causes for syncope (absence of structural heart disease). We present a rare case of the situational syncope triggering from gastrointestinal stimulation and physical efforts caused by huge hiatal hernia.

13AP11-9

Polymyxin B hemoperfusion in patients with abdominal sepsis shock: clinical impact

Terradillos E., Duque P, Zaballós M., Fernández-Quero L., Cruz-Conde M.C., Igual A.

Gregorio Marañón University Hospital, Dept of Anaesthesiology & Pain Medicine, Madrid, Spain

Background and Goal of Study: Treatment with hemofiltration with Polymyxin B cartridges is one of the few goal-directed therapies in sepsis. We aim to study the impact of this treatment since its introduction in our unit.

Materials and Methods: Data of abdominal septic shock patients treated with hemoperfusion with Polymyxin B between 2013 and 2015 was retrospectively evaluated. The therapy consists of 2 doses of 2 hours in the first 24 hours after diagnosis. The data analyzed included demographic variables, medical history, APACHE and SOFA scores and severity variables related to abdominal septic shock.

Results and Discussion: Of the initial 33 patients, 24 of them met the requirements of the study. Global mortality was 37.5%. Older age, a high score on the APACHE scale and the need of vasopressors were associated with increased mortality.

According to SEPSIS-3 we use SOFA score, lactate levels and vasopressor requirement to diagnosed sepsis shock. In our patient initial SOFA was lower in survivors (6,47±3,4 vs. 9±2,2 p 0.08), SOFA at the moment to initiate Polymyxin B treatment was similar (10,20 ±2 vs. 10,6±0,9 p 0.37) and SOFA 48 hours after treatment was lower in survivors (6,33±2 vs. 9±3,3 p 0.09). Distribution of lactate levels is similar to SOFA (tab 2).

Maybe patients with deterioration in the first hours after admission in ICU benefit from hemoperfusion therapy with polymyxin B.

	Survivors	No survivors	
N	15	9	
Age	64±12	76±10	p=0.015*
Female/male	6/9	5/4	p=0.45
Cardiovascular disease	0/15	2/7	p=0.047*
Respiratory disease	5/10	3/6	p=0.1

[Patient characteristics]

	Survivors	No survivors	
APACHE	18,6 ±3,9	24,6±3,4	p0,004
SOFA 0H	6,47 ±3,4	9±2,2	p0,08
SOFA PRE-PMX	10,20 ±2	10,6±0,9	p0,37
SOFA 24H	7,60±1,8	9,71±4,1	p0,29
SOFA 48H	6,33±2	9±3,3	p0,09
LACTATE 0H	1,86±1,15	3±1,9	p0,06
LACTATE PRE-PMX	3,58±2	3,91±2,4	p0,9
LACTATE 48 H	1,42±0,5	2±1	p0,11

[Patient evolution. Tab 2]

Conclusion(s): Early hemoperfusion treatment with polymyxin B among patients with abdominal septic shock that do not respond to conventional treatment might be a useful therapeutic tool.

13AP11-10

Predictability of vasopressor usage after liver transplantation

Gunt C.¹, Çekmen N.²

¹Ankara Güven Hospital, Dept of Anaesthesiology & Intensive Care, Ankara, Turkey, ²Ankara Güven Hospital, Dept of Anaesthesiology & Intensive Care, ANKARA, Turkey

Background and Goal of Study: Hyperdynamic syndrome is the reason of circulatory dysfunction in cirrhosis. In this research, we the predictability of vasopressor usage after liver transplantation by examining symptoms of hyperdynamic syndrome during preoperative visit.

Materials and Methods: From March 2013 to December 2016, 72 adult who underwent liver transplantation at Ankara Güven Hospital enrolled in the retrospective study. Analysis include demographic characteristics, etiology of cirrhosis, Child-Pugh and MELD scores, taking B blocker agent, the clinical manifestations of hyperdynamic syndrome (esophageal varices, ascites, hepatorenal syndrome, hepatopulmonary syndrome, hepatic encephalopathy, hepatic hydrothorax, cirrhotic cardiomyopathy). We recorded corrected QT interval using Fridericia's Formula, the result of exercise electrocardiogram and echocardiographic findings in pretransplantation echocardiography. These variables effect on vasopressor usage after transplantation was researched. Statistical analysis were performed with Kolmogorow-Smirnov, Student-t and MannWhitney U test. Significance was assumed with p<0.05.

Results and Discussion: The sole variable which have statistical significance on vasopressor usage during the postoperative period is age. (p<0.05) There is a statistical significance between the course of vasopressors given and MELD, Child-Pugh. (p<0.05) When these scores become higher, the time of vasopressor usage become longer. Moreover, vasopressor dosage correlate strongly with MELD and Child-Pugh. (p<0.05)

In transplanted livers, decline of hepatic macrocirculation and microcirculation during catecholamine infusion and the relation between noradrenaline usage and mortality have been showed in separate studies. In this study age was the unique variable determining the vasopressor usage. It may be related with increasing vascular smooth muscle because of vascular aging. Besides, MELD and Child-Pugh are the only variables effect time of vasopressor along with its dosage. When we think that MELD and Child-Pugh predicts survey, this result is expected. Age, MELD and Child-Pugh scores are the variables we cannot change.

Conclusion(s): Diagnostic and supportive criteria for predictability regarding vasopressor usage in liver transplanted patients need to be found to hinder graft dysfunction and mortality in the early postoperative period.

References: Transplant Proc. 2005 Apr;37(3):1499-501.

13AP11-11

Postoperative respiratory failure in esophageal surgery

Prieto Sánchez A., Polo Martínez S., Marín Posada P.A., Ferrandis Comes R., Vicente Guillén R., Argente Navarro P. *La Fe University Hospital, Dept of Anaesthesiology & Intensive Care, Valencia, Spain*

Background and Goals of Study: Respiratory complications constitute the most frequent early complication in esophageal surgery (ES). We present a pilot study to analyse the incidence of respiratory failure (RF) in patients subjected to ES, both in the initial income and re-entry (MAIN GOAL). Secondary goals, in respect to RF:

- Personal and perioperative risk factors
- Involvement in critical care unit (CCU)
- Prognostic factor

Material and methods: Retrospective unicenter study on consecutive ES cases between September 1st, 2013-September 1st, 2016.

Variables:

- Preoperative: age, gender, previous pulmonary disease.
- Intraoperative: surgery type and length, extubation before CCU income, fluid/transfusion therapy.

- Postoperative: income stay length, RF development, mechanical ventilatory therapy (non-invasive-NIMV and invasive-IMV), hydric balance.
- Re-entry: re-entry reason, RF development, day of evolution, re-entry stay length in postoperative CCU, RI development, MV.
- Morbidity/Mortality: discharge/death cause, complications.

Statistic study: descriptive analysis (mean+standard deviation), comparison with no parametric test (Chi²) (SPSS Statistics© v22), regarding p value <0,05 as significative.

Results and Discussion: 65 patients have been collected with the following characteristics.

Gender	Age	Previous pulmonary disease
Male n= 56, female n=9	61 ± 10 years old	61,5%; Tobacco use 55,4% (Smoker 29,2% Ex-smoker 27,7%), TBC 4,6%, Pleural effusion 1,53%, Chronic bronchitis 1,53%

[Preoperative factors]

Type(n)	Time	Fluidtherapy	Extubation before CCU income
Iwor Lewis(59), Transhiatal esophagectomy(4), McKeown(2)	463±102min	3259±1107ml	73,85%

[Surgery data]

92,3% of patients had a negative hydric balance in the first postoperative 24-48h.

The median income stay was 3 days (5±7). 13,8% of patients developed RF with an average stay prolongation of 17,8 days, NIMV for 3±2 days and IMV for 10±9 days.

15 patients re-entered in the CCU, 73,3% cases due to RF, with a stay of 14±18 days. These patients had a first income stay of 2,7 days, being in all cases ≤5 days. They re-entered the 6^o postoperative day as median (day 3-16^o), required NIMV 4±3 days and 6 patients IMV 15±16 days. Respiratory disease is not significantly related (p=0.06). Another re-entry causes were subfrenic abscess, pulmonary tromboembolism, suture dehiscence and coloplasty necrosis.

The mortality rate was 13,8% related to septic shock and multyorgan-faliure(4), pulmonary thromboembolism(2), nosocomial pneumonia(1), acute respiratory distress syndrome(1).

Conclusion:

- RF prolongs CCU stay
- RF is the main re-entry cause
- Previous pulmonary disease is a risk factor for RF development

13AP12-2

Screening of methicillin-resistant *Staphylococcus aureus* colonization at the admission: general surgical versus gynecological intensive care unit

Reiner K., Ljiljana M., Fudurić S., Mihaljević S.

University Clinical Hospital Center Zagreb, Clinic for Obstetrics and Gynecology, Dept of Anaesthesiology & Intensive Care, Zagreb, Croatia

Background and Goal of Study: Detection of methicillin-resistant *Staphylococcus aureus* (MRSA) colonization of nasal vestibule, oropharynx and perineum by taking swabs at the admission to the intensive care unit (ICU) has a great significance in reducing morbidity and mortality, since the colonization is early detected, which allows earlier patient isolation and application of procedures for MRSA eradication. Due to our clinical observations, we decided to compare the frequency of MRSA colonization between the two ICUs in the same hospital: general surgery ICU and gynecology ICU.

Materials and Methods: Approval from the Ethical Committee of the University Clinical Hospital Center Zagreb was obtained. We included patients scheduled for major elective general surgery and gynecology procedures. Patients were divided into two groups by the type of ICU at which they were administered immediately after the procedure: general surgery ICU (group 1) and gynecology ICU (group 2). The two ICUs are located in the separate buildings of the same hospital. Operating rooms and ICU environment do not differ between the two groups, as well as the hygiene protocols among the hospital personnel. From the general surgery ICU, total of 161 patients were included in the study. From the gynecological ICU, we included total of

40 patients till present. At the admission to the ICU, we took swabs of nasal vestibule, oropharynx and perineum in each patient. Diagnosis of MRSA colonization was established by the microbiological analysis.

Results and Discussion: It is often hard to discern the difference between colonization and infection. The swabs were taken immediately upon completed surgical procedure. Accordingly, all of the positive findings were colonization cases. Results are shown in table 1.

	Group 1	Group 2	Chi-squared test	P
Nasal vestibule colonization %	4.35	0	0.741	0.389
Oropharynx colonization %	5.59	0	1.261	0.27
Perineum colonization %	2.48	0	0.139	0.709

[Results]

Conclusions: There is no statistically significant difference in colonization between two groups. However, colonization cases were found only among general surgical ICU patients till present. Since the study is ongoing, the final data analysis will show if there really is a difference in MRSA colonization between the two groups. If present, the reasons for the difference are to determine. Rates of MRSA colonization among general surgical ICU patients are satisfying when compared with other centers.

13AP12-3

Effect of synoviolin signal transduction for Sepsis-associated encephalopathy

Ishida Y.¹, Uoshima N.¹, Chijiwa M.¹, Fujita H.², Nakajima T.², Uchino H.¹

¹Tokyo Medical University, Dept of Anaesthesiology, Tokyo, Japan,

²Tokyo Medical University, Institute of Medical Science, Tokyo, Japan

Background and Goal of Study: The pathophysiology of sepsis-associated encephalopathy (SAE) is complex and related to numerous process and pathway, especially, inflammation, reactive oxygen species (ROS) production and mitochondrial dysfunction are considered to play an important role to induce SAE. However, the real mechanisms producing neurological impairment in sepsis remain incompletely elucidated. Kynurenine is increased by infection, however the relationship between SAE and kynurenine is not clear. On the other hand, Synoviolin (SYVN1) is an E3 ubiquitin ligases that was identified from the cDNA of rheumatoid synovial cells, and is involved in the persistent inflammation such as rheumatoid arthritis. However, it is unknown how much influence does the acute inflammation affect for the brain kynurenine metabolism under the SYVN1 suppression. Based on this background, the aim of this study is to investigate the important role of SYVN1 for the kynurenine metabolism in SAE with SYVN1 KO hetero mice.

Materials and Methods: All experiments are approved by the animal ethical committee of Tokyo Medical University. C57/BL6 mice at 8 weeks of age were subjected to sepsis by cecal ligation and puncture (CLP). Mice were divided into Wild type (WT) group (n = 3), SYVN1 hetero KO type (SHTK) group (n = 3), WT Sham (WTS) group (n = 3), and SHTK sham (SHTKS) group (n = 3). At 18 hours from the procedure, mice were sacrificed by cervical dislocation, and metabolome analysis was performed using the brain tissue. In addition, cerebral kynurenine aminotransferase (KAT) activity was also measured. Statistical comparison of kynurenine and KAT value between groups were examined using Welch's t-test and considered statistically significant at P < 0.05.

Results and Discussion: Cerebral kynurenine of SHTK showed significantly lower than that of WT. (p<0.05) There was no significant difference of the cerebral kynurenine between SHTK, WTS and SHTKS. Cerebral KAT activity was elevated in SHTK. Kynurenine that causes neuropathy is metabolized to kynurenic acid by KAT. From our study, it may imply that suppression of SYVN1 increased KAT activity and accelerated metabolism of kynurenine.

Conclusions: Suppression of SYVN1 and decrease of kynurenine may suppress neurological disorder and lead to improvement of SAE.

References: Hidetoshi Fujita et al. E3 ligase synoviolin and energy expenditure. *EMBO J.* 2015 Apr 15;34(8):1042-55

13AP12-4

Infections related to central venous catheters: which germs and what profile of resistance?

Ezzouine H., El Ammari I., Jerrari A., Benslama A.
University Hassan II - Faculty of Medicine and Pharmacy, Dept of Anaesthesiology & Intensive Care, Casablanca, Morocco

Background and Goal of Study: This work is a retrospective descriptive and analytical study of documented infections related to the central venous catheters, spread over a period of one year, from January 2015 to December 2015, carried out in the medical resuscitation department of the Ibn Rochd Hospital in Casablanca, Morocco.

Materials and Methods: Included were all patients with central venous catheterization, with or without bacteraemia, after hospitalization in the medical resuscitation unit of Ibn Rushd Hospital for more than 48 hours.

Results and Discussion: Gram-negative bacilli were isolated from the culture of central venous catheters in 40.5% of cases. Gram-positive cocci represented a rate of 35.1%, coagulase-negative staphylococcus is the most frequently isolated with a rate of 84.61%. Gram-positive bacilli represent a rate of 8.2%. *Acinetobacter baumannii* is found to be 26.6%, is resistant to 100% Imipenem, sensitive to Amikacin, Gentamycin, Cefepime and Netilmycin. *Klebsiella pneumoniae* is found 26.6%, it is resistant to 75% Ampicillin and Cefotaxime, and sensitive to 75% at Imipenem, Amikacin and Cefoxitin.

For *Proteus mirabilis*, 50% were resistant to ampicillin, cefalotine and imipenem.

The rate of enteric bacteria producing ESBL was 62.5%. For *Pseudomonas aeruginosa*, 100% were resistant to imipenem, ceftazidime, gentamycin and Netilmycin.

Staphylococcus coagulase negative was resistant to Penicillin G with a rate of 72.7% and 63.6% to kanamycin with a sensitivity of 100% to teicoplanin.

Conclusion(s): The main problem in intensive units are nosocomial infections. The infections related to central venous catheters are a risk and they can be due to multiresistant bacteria. In our study, *Acinetobacter baumannii* is the main germ and it is resistant to imipenem in 100%. A strategy of managing antibiotherapy is essential in intensive care so are preventive measures in nursing and catheters cares.

13AP12-5

Novel approaches to biosensor development for endotoxin detection

Huckle D.¹, Bowen J.², Allender C.², Hall J.¹

¹Cardiff University, Department of Anaesthetics, Critical Care & Pain Medicine, Cardiff, United Kingdom, ²Cardiff University, School of Pharmacy & Pharmaceutical Science, Cardiff, United Kingdom

Focus of this project is endotoxin/lipopolysaccharide (LPS), a major constituent of gram negative bacteria outer cell walls, and its use as a sepsis marker. Molecular imprinting is a novel approach to LPS detection, it describes the generation of synthetic, polymeric receptors through the polymerisation of monomers around a template molecule. The resultant polymers possess recognition properties akin to antibodies with the ability to recognise the original target molecule. LPS is not a suitable template for conventional molecular imprinting techniques; large molecules finding, and successfully leaving, binding sites due to their size dictates technique modification that circumvents problems associated with the imprinting of biological macromolecules(1).

Initial experiments include serial binding studies using Polymyxin B (PMB), a peptide antibiotic, immobilised on Merrifield resin (MR). PMB has high affinity for LPS, conferring its antimicrobial action(2). This approach requires MR surface modification to facilitate the co-immobilisation of PMB and polymer hence a series of azide functionalised resins with increasing degrees of chloromethyl (native to MR) to azidomethyl conversion were synthesised. Modification of PMB with an alkyne group allowed for the immobilisation of PMB using 'click chemistry'(3). The resulting resins were tested to ascertain LPS binding capabilities by incubation with FITC labelled LPS. Molecularly imprinted polymers (MIPs) were then synthesised and further LPS binding assays used to compare binding capability.

Major findings include the successful generation of a set of resins with differing levels of azide conversion, demonstrated by FTIR. Subsequent binding studies using these resins with PMB attached show a range of binding kinetics (Kd 0.12- 0.9 μ M). Disappointingly, better LPS binding results were found for

resin/PMB/polymer hybrid systems than for formally produced MIPs.

The observation of linear isotherms at low PMB loading demonstrate how confounding factors such as non specific binding affect binding parameters to a greater degree as the percentage of converted chloromethyl groups decreases. This, coupled with the inherent hydrophobicity of MR, resulted in a shift of focus to the development of alternative polymerisation approaches that negate the need for a solid support.

1. Turner N, et al, J. Biotechnol Prog. 2006 (6):1474

2. Bhor V, et al, Mol BioSyst. 2005 (3):213

3. Kolb H, et al, Angew Chem. 2001(11):2004

13AP12-6

The effects of bilirubin on immune-inflammatory response in septic neutrophil and mortality in septic mouse

Kwak S., Song J., Bae H., Kim J., Jang E.A., Jeong S.
Chonnam National University Medical School and Hospital, Dept of Anaesthesiology & Intensive Care, Gwangju, Korea, Republic of

Background and Goal of Study: Despite the high potency of bilirubin as an endogenous anti-inflammatory compound, its clinical translation has been hampered because of its insolubility in water. A polyethylene glycol compound (PEG) was covalently attached to bilirubin, yielding PEGylated bilirubin (PEG-BR). This study was performed to evaluate the effects of PEG-BR on immune-inflammatory response in septic neutrophil and mortality in septic mouse.

Materials and Methods: To assess possible interactions between PEG-BR and lipopolysaccharide (LPS) on neutrophil activation, neutrophils from human blood were incubated with various concentrations of PEG-BR (0, 1, 10 and 100 nM) and LPS (100 ng/ml). The protein levels for interleukin (IL)-6, 8 and tumor necrosis factor (TNF)- α were measured using ELISA after 4 hr incubation period. To elucidate the intracellular signaling pathway, We measured the levels of phosphorylation of p38 mitogen activated protein kinases (p38), extracellular signal-regulated kinase (ERK)1/2 and c-Jun amino-terminal kinases (JNK) with western blot analysis and nuclear levels of nuclear factor (NF)- κ B with electrophoretic mobility shift assays (EMSA). We also examined the effect of PEG-BR on mortality of mouse treated with cecal ligation and perforation (CLP) model to determine whether these effects of PEG-BR also have in vivo significance.

Results and Discussion: PEG-BR attenuated LPS induced neutrophils activation including expression of ERK1/2, NF- κ B, IL-6, 8 and TNF- α . PEG-BR also improved mortality of CLP induced septic mouse.

Conclusion(s): PEG-BR can improve mortality of CLP induced septic mouse via the attenuation of neutrophil activation.

13AP12-7

Sepsis and tachycardia: etiologic factors and effects on prognosis

Baygin O., Karamaz A.
Marmara University, Dept of Anaesthesiology, Istanbul, Turkey

Purpose: The present study aimed to identify etiologic factors of tachycardia in critically ill patients with sepsis. We also investigated effects of tachycardia on prognosis.

Materials and Methods: Following the approval of the Marmara University School of Medicine Ethic Committee and written informed consent of patients' relatives, a prospective observational study was conducted in adult patients who were diagnosed with sepsis (according to American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference Committee) and followed over than 48 hours in intensive care unit(1).

Exclusion criteria were pregnancy, severe valvular diseases and coronary artery disease, extracorporeal membrane oxygenation usage and patients who does not need mechanical ventilatory support. Demographic data, comorbid diseases, and clinical and laboratory data were collected prospectively. Patients were followed up until death or hospital discharge. Early goal-directed therapy used to achieve hemodynamic optimization.

Results: Thirty men and twenty women, a total of 50 patients were included to study. We observed tachycardia in all patients during follow up. The time of heart rate greater than 100 bpm was 34.6 ± 39.7 (%95 CI 23.3-45.9). There

was correlation between tachycardia and pH, mean arterial pressure (MAP), base excess, temperature, and procalcitonin level ($p < 0.05$). When these factors were analyzed with linear regression, it was found that MAP, temperature, and procalcitonin levels were associated with increased heart rate ($p < 0.05$). Eighteen patients were discharged from intensive care unit and 32 patients died. Duration of tachycardia, APACHE and SOFA scores were associated with mortality.

Conclusions: We observed that tachycardia incidence is high in patients with sepsis. We identified that MAP, body temperature and procalcitonin levels were associated with tachycardia. This finding supports, the role of inflammation in tachycardia. Additionally, our data support that duration of tachycardia might be relevant with mortality.

References: 1. Bone, R.C., et al., Definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. The ACCP/SCCM Consensus Conference Committee. American College of Chest Physicians/ Society of Critical Care Medicine. Chest Journal. 1992;101(6):1644-1655.

13AP12-8

Antimicrobial susceptibility testing of acinetobacter baumannii strains isolated in samples from patients in the ICU. Are there any changes during the last 2 years?

Margaritis A.¹, Zotos N.², Tatsina E.², Bolosi M.¹, Stratsiani A.³, Ygropoulou O.¹

¹General Hospital of Ioannina, G. Hatzikosta', Dept of Intensive Care, Ioannina, Greece, ²General Hospital of Ioannina, G. Hatzikosta', Dept of Microbiology, Ioannina, Greece, ³General Hospital of Ioannina, G. Hatzikosta', Dept of Anaesthesiology, Ioannina, Greece

Background and Goal of Study: Acinetobacter baumannii is a hospital-acquired pathogen and causes infections mainly in immunosuppressed patients. The aim of the study was to study the changes in antimicrobial resistance rates of Acinetobacter baumannii strains isolated in the I.C.U of our hospital during the last 2 years.

Materials and Methods: All the strains of A.baumannii isolated in patients in the I.C.U during 2015 and 2016 were tested. All the samples were inoculated on blood agar plates as well as McConkey, Mannitol salt and Sabouraud Dextrose agar plates and were incubated under aerobic conditions at 37°C for 48 hours. The identification of the isolated strains and the antimicrobial susceptibility testing were conducted by the Microscan WalkAway (Siemens) system.

Results: Overall, 31 strains, isolated in 13 patients in 2015, and 29 strains, isolated in 9 patients during 2016, were the material of our study. The average time of I.C.U hospitalization was 20.2 days (ranging from 2 to 35 days). Many of the most effective antibiotic drugs against A.baumannii strains isolated during 2015 and 2016 and the antimicrobial resistance rates can be seen on the following table:

Antimicrobial Drugs	Resistance Rate 2015	Resistance Rate 2016
Ampicillin/Sulbactam	39%	30%
Gentamicin	42%	47%
Amikacin	60%	58%
Tigecycline	33%	29%
mipenem	89%	83%
Meropenem	82%	74%

[results]

Moreover, it was proven that Colistin is effective in vitro against A.baumannii strains. Furthermore, there were no significant changes in the resistance rates of A.baumannii strains against Ticarcillin, Ticarcillin/Clavulanic acid, Piperacillin/Tazobactam, Ceftazidime, Cefepime and Ciprofloxacin, against which the strains were highly resistant.

Conclusion: All the A.baumannii strains isolated in patients in the I.C.U were multi-drug resistant and comprise a severe threat to hospitalized patients. Tigecycline is often an effective drug when coming across with infections caused by drug resistant pathogens. However, Colistin is the main antibiotic when treating patients with infections caused by A.baumannii strains resistant to other antibiotic drugs available

13AP12-9

Effect of delayed remote preconditioning on systemic inflammatory response in septicemia model

Park S.J., Ko E.J., Lim C.H.

Korea University Anam Hospital, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background: Remote ischemic preconditioning (RIPC) have a protective effect on ischemic-reperfusion (I/R) injury and septic inflammatory injury. Delayed RIPC induced delayed phase of protection against subsequent I/R injury, and there have been reported delayed RIPC also attenuated ischemic-reperfusion injury. Therefore, we evaluate whether delayed RIPC also have an anti-inflammatory effect on septicemia model.

Methods: The LPS induced septicemia mice are prepared by injecting Lipopolysaccharide (LPS) 20mg/kg, intraperitoneally (i.p.). Remote ischemic preconditioning was performed with three 10-min ischemia/10-min reperfusion cycles of the right hind limbs using tourniquet before LPS injection. Saline group are received normal saline injection i.p.. LPS group are received LPS injection i.p.. RIPC groups are received RIPC before LPS injection, which they have time intervals - 0, 1, 4, 12 hours between RIPC and LPS injection (RIPC 0H, RIPC 1H, RIPC 4H, RIPC 12H group, respectively). The survival rate, serum cytokine levels, and liver's neutrophil infiltration are measured in the LPS-induced septicemia mice.

Results: Survival rate significantly increased in RIPC 0H, 1H, 4H and 12H groups than LPS group (80-100% vs 30%, $P < 0.05$, respectively). Interleukin (IL) -6 and IL-12 increased in LPS group, however, IL-6 and 12 level in RIPC groups are significantly decreased compared to LPS group ($P < 0.05$, respectively), except IL-6 level in RIPC 4H group ($P > 0.05$ versus LPS group). Neutrophil infiltration was significantly attenuated only in the RIPC 12H group compared to LPS group ($p < 0.05$).

Conclusion: Delayed RIPC attenuated inflammatory response and improved survival outcomes of LPS-induced septic mice.

13AP13-1

Abnormal oropharyngeal tract flora on admittance to hospital or ICU facility, an early predictor of nosocomial pneumonia in both ward and critically ill patients. A clinical observational study

Tranberg* A., Thorarinsdottir* H., Klarin B.

Lund University, Dept of Anaesthesiology & Intensive Care, Lund, Sweden

Background and Goal of Study: The body functions in a mutualistic balance with a large range and number of microbiota. Illness and medication alters the normal bacterial balance and cause bacilli that normally only thrive in the gut to wander up the digestive tract and inhabit the oropharyngeal tract. This imbalance increases the risk of developing pneumonia. The primary goal of this study is to establish whether there is already an imbalance in oral flora when patients are admitted to hospital, and whether there is a difference in flora between ICU and ward patients. If so, this would imply that part of the pathogenesis behind nosocomial pneumonia and VAP (ventilator-associated pneumonia) is established before arriving to the hospital. The secondary goal of this study is to explore whether there are patient characteristics (i.e., BMI, smoking, medication with PPI (proton pump inhibitors)) that increase the risk for a disturbed oropharyngeal flora.

Materials and Methods: Oropharyngeal cultures were obtained from three different study groups:

- 1) controls in the community,
- 2) patients admitted to hospital wards and
- 3) patients admitted to the ICU.

Cultures were obtained within 24 hours of admission. A logistic regression model was applied to adjust for confounding variables and to determine independent risk factors for the presence of abnormal flora.

Results and Discussion: Oropharyngeal cultures were obtained from 487 individuals: 77 controls, 193 ward patients and 217 ICU patients. Abnormal pharyngeal flora was more frequent in ICU and ward patients compared with controls (62.2% vs 10.4% vs 1.3%, $p < 0.000$). Colonization of gut flora in the oropharynx was more frequent in ICU patients compared with ward patients or controls (26.3% vs 4.7% vs 1.3%, $p = 0.001$). In the multivariable logistic regression, PPI was the strongest independent risk factor associated with ab-

normal pharyngeal flora and colonization of gut flora (odds ratio (OR), 2.35; 95% CI, 1.47 to 3.75, $p < 0.000$ and OR: 2.10, 1.08 to 4.09; $p = 0.029$).

Conclusion(s): This study indicates that abnormal oropharyngeal flora is an early and frequent event in hospitalized and critically ill patients, and that PPI use is an independent risk factor for abnormal flora. It has earlier been shown that PPI is a risk factor for both VAP and nosocomial pneumonia, as well as a risk factor for abnormal flora. This study is a link in explaining pathophysiology and identifying early risk factors for nosocomial pneumonia.

13AP13-2

An increasing in vitro antimicrobial resistance of pseudomonas aeruginosa strains isolated in patients in the ICU during the past 2 years

Margaritis A.¹, Zotos N.², Bolosi M.¹, Tatsina E.², Ygropoulou O.¹, Mousafiri O.¹

¹General Hospital of Ioannina, G. Hatzikosta', Dept of Intensive Care, Ioannina, Greece, ²General Hospital of Ioannina, G. Hatzikosta', Dept of Microbiology, Ioannina, Greece

Background and Goal of Study: Pseudomonas aeruginosa is the causing agent of severe infections in patients in the I.C.U. Hospital-acquired infections caused by multi-drug resistant strains of P.aeruginosa are frequent and despite the precautionary measures taken, they lead to an increase in the time of hospitalization, morbidity rates, mortality rates and hospital expenses. During the past years, the therapeutic choices of antimicrobial drugs are few when treating many cases of infection. The objective of our study is to evaluate the antimicrobial susceptibility of P.aeruginosa strains isolated in the I.C.U of our hospital during the last 2 years.

Materials and Method: We studied all of the strains of P.aeruginosa isolated in the I.C.U of our hospital from January 2015 till November 2016. All the samples were inoculated on blood agar plates, Mc conkey agar, Mannitol salt agar and Sabouraud Dextrose agar plates and incubated at 37°C for 48 hours. The Microscan WalkAway (Siemens) system was employed for the identification and antimicrobial susceptibility testing of the isolated strains.

Results: 32 strains of P.aeruginosa, which were isolated in 14 patients and 29 strains isolated in 11 patients were the material of the study. An increasing resistance against all of the antibiotics tested can be seen (with the exception of Colistin). The most effective antibiotic drugs against P.aeruginosa strains and the antimicrobial resistance rates during 2015 and 2016 can be seen on the following table

Piperacillin	18%	30%
Piperacillin/Tazobactam	10%	20%
Gentamicin	23%	46%
Amikacin	18%	43%
Tobramycin	18%	47%
Ceftazidime	32%	48%
Ciprofloxacin	30%	51%
Imipenem	36%	37%
Meropenem	33%	38%
Colistin	6%	2%

[A antibiotic, B resistance rate 2015, C rr 2016]

Conclusion: The increasing antimicrobial resistance should be under continual surveillance. Colistin is sufficiently effective against strains of P.aeruginosa. Furthermore, it has been the main therapeutic choice when treating patients in a critical condition due to infections caused by multi-drug resistant strains.

13AP13-3

Histamine has a contributory role in promoting organ injury in sepsis: experimental studies using knockout mice of histamine-related genes

Hattori M.¹, Shinoda M.¹, Ohashi W.², Hattori Y.², Yamazaki M.¹

¹University of Toyama, Dept of Anaesthesiology, Toyama, Japan,

²University of Toyama, Dept of Mel.Med.Pharmacology, Toyama, Japan

Background and Goal of Study: Histamine assumes a critical role as a major mediator of many disorders with inflammation and immune reactions. However, direct evidence has not been provided showing the involvement of histamine in the development of multiple organ dysfunction or failure in sepsis. The goal of the present study was to assess the response to sepsis caused by cecal ligation and puncture (CLP) in histamine decarboxylase knockout (HDC^{-/-}) mice and histamine H1-/H2- receptor double knockout (H1R^{-/-}/H2R^{-/-}) mice.

Materials and Methods: H₁R⁺/H₂R⁺ mice were generated by crossbreeding H₁-receptor null mice and H₂-receptor null mice. Polymicrobial sepsis was induced by CLP in HDC^{-/-} mice, H₁R^{-/-}/H₂R^{-/-} mice, and their littermate wild type (WT) mice.

Results and Discussion: Knockout mice of histamine-related gene showed lower levels of serum aminotransferase activity, serum creatinine, and serum and tissue pro-inflammatory cytokines (IL-1 β , IL-6, TNF- α , and MCP-1) than WT mice when the animals were rendered septic by CLP. Histopathological examinations showed significantly reduced acute lung, liver, and kidney injury after CLP in HDC^{-/-} and H₁R^{-/-}/H₂R^{-/-} mice. The histamine-mediated development of major end-organ injury was associated with an increase in the nuclear factor- κ B signaling pathway.

Conclusion(s): These results establish that endogenous histamine acting on H₁- and H₂- receptors is identified as an aggravating mediator to contribute to the development of major end-organ injury in sepsis. These results also suggest that the validity and feasibility of the use of histamine receptor antagonists to septic organ injury.

13AP13-4

Bacteria with multiresistance in Peritonitis, and its relation with comorbidity and stay in our critical care unit

Varela Durán M., Díaz Parada P., González Vilar Á., Valero Gómez M., Rey Carlin R., Carro Roibal Á.

Complejo Hospitalario Universitario de Pontevedra, Dept of Anaesthesiology & Intensive Care, Pontevedra, Spain

Background and Goal of Study: Review the incidence of "multi-resistances" in Peritonitis and its relationship with comorbidity and Critical Care Unit stay. Also a comparison of the association of "multidrug resistance" with fifteen-day and six-month deaths.

Materials and Methods: A Retrospective Descriptive Observational Study was realized. We reviewed the medical histories of 84 patients from the Critical Postsurgical Unit of the Complejo Hospitalario Universitario Pontevedra (Years 2013 and 2014). Quantitative and Qualitative variables in relation to various comorbidities were included and the presence of germs and resistances were recorded. IBPMSPPS Statistics 19 program was used. The normality of variables was proved by using Kolmogorov-Smirnov test. Additionally univariate and bivariate Analysis were realized. We compared means using the T-Student and Wilcoxon tests. The Chi-Square test was also performed. For all Analyses a value of significance of 5% was set.

Results and Discussion: 35% of the patients presented two or more comorbidities. More than half of them suffered Septic shock. Image-guided intraabdominal collections drainage was needed at 12%. The average stay in the Critical Care Unit was 18 days. More than half of the patients receive double or triple antibiotic therapy. In 8% of cases was multidrug-resistance. The global exitus was 22%. The 11% were early deaths, 73% at six months and 16% over the six months. An association between the duration of the stay and the appearance of "multiresistences" was founded. The emergence of "multi-resistance" and mortality are also associated. A relationship between the drainage of abscesses and survival was founded.

Conclusions: Multidrug-resistance is associated to a longer stay and higher mortality, especially among fifteen days and six months. The patients with more comorbidities have bigger infection risk caused by resistant germs,

meanwhile they require more prolonged time in Intensive Care. Consequently, they have more risk of exitus. Finally, the drainage of intraabdominal collections is associated with lower mortality, which turns this technique into a successful procedure.

References: Solomkin JS., Mazuski JE., Bradley JS. Et al. Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America. *Clinical Infectious Diseases*. 2010. 50: p 133-164.

13AP13-5

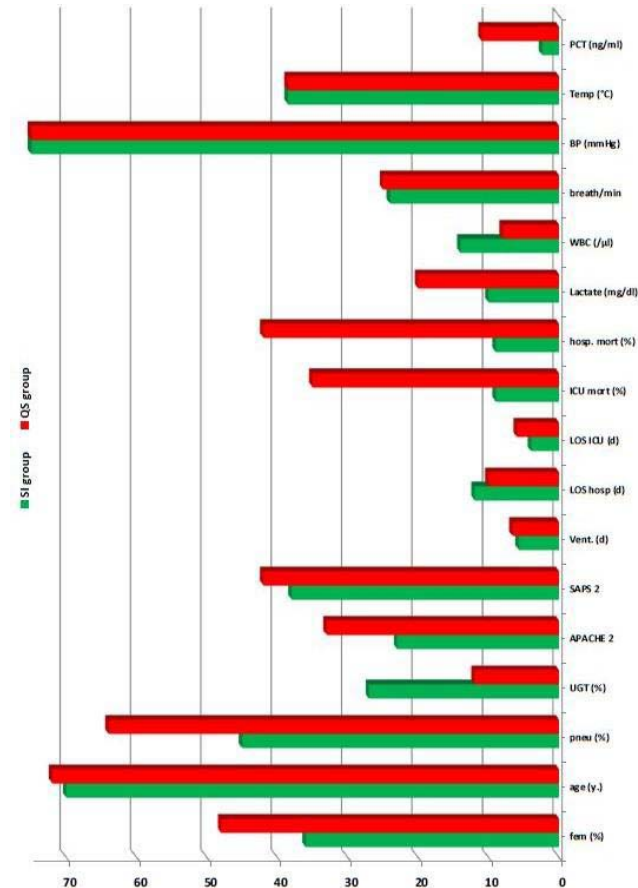
Sepsis-3: qSOFA and SIRS in clinical practice

Kogelmann K., Drüner M., Scheller M.

Klinikum Emden, Dept of Anaesthesiology & Intensive Care, Emden, Germany

Background and Goal of Study: Several studies showed strategies reducing mortality in septic patients in the last years. In spite of all strategic planning mortality is quite high, main problem consists in non identifying these patients. According to this, in 2016 definitions of sepsis/ septic shock were revised and published as Sepsis-3 definitions. Aim of our research was to detect if using qSOFA exclusively tends to result in missing ill patients at our ward.

Materials and Methods: In July 2016 we changed our screening tool for each patient admitted to our ward. Prior to this, we prompted SIRS criterias to detect these critically ill patients. Since that time, we are screening in addition for qSOFA score. We collected demographic, laboratory even as physiologic values. As data were retrospective cohort analysis, median was calculated and we compared characteristics and outcomes.



[SI vs QS data]

Results and Discussion: In time period 07-10/16 in total 53 patients had been admitted with diagnosis sepsis. Among these, 11 patients were detected without qSOFA Score ≥ 2 (SI group). 42 patients were detected using qSOFA alone (QS group). In QS vs SI group we detected pneumonia in 64.2 vs 45% and urinary tract infection 9 vs 27%. QS/SI 48%/36% female, QS/SI APACHE 2

Score 33 vs. 23. In SI group 5 patients had been admitted with severe respiratory failure needing ventilator therapy. Among the 6 others, 4 had fever more than 39°C and tachypnoe. In fact, 9 out of 11 patients would have been probably admitted without need for SIRS/qSOFA criterias at all. On the whole there had been only 2 patients in SI group in which admission would have been uncertain without using SIRS criterias. Only one patient in the SI-group died in hospital. He wasn't among the uncertain detected patients.

Conclusion(s): Using qSOFA Score exclusively to detect critically ill patients to admit to our ward would have been safe and in total only 3.7 % of our critical ill patients admitted in this period would have been probably uncertain detected. While using qSOFA Score alone, we didn't miss any deceased patient.

References:

Singer M; *JAMA* 2016; 315:80 Seymour CW; *JAMA* 2016; 315:762 Shankar-Hari M; *JAMA* 2016; 315:775

13AP13-6

Urotensin II system as a potential therapeutic target in septic shock: human and experimental studies

Clavier T.¹, Besnier E.¹, Desrues L.², Tamion F.³, Compère V.¹, Castel H.²

¹Rouen University Hospital, Dept of Anaesthesiology & Intensive Care, Rouen, France, ²Rouen University, Inserm U 982, Mont Saint Aignan, France, ³Rouen University Hospital, Dept of Intensive Care, Rouen, France

Background and Goal of Study: Urotensin II (Ull) is a vasoactive peptide activating the UT receptor, involved in cardiovascular pathologies (hypertension, preeclampsia). Ull is a pro-inflammatory peptide, we hypothesized that Ull may be involved in sepsis pathophysiology. Objectives were to investigate temporal variations of Ull plasma concentrations during septic shock in human, and to study the impact of Ull receptor antagonism on survival and cardiac function in endotoxinic mice.

Materials and Methods: Prospective, observational clinical study setting in two intensive care units. Inclusions of patients with septic shock, Ull levels were daily measured in plasma (radioimmunoassay method) during 6 days. In C57/Bl6 mice, endotoxinic shock was induced with *E. coli* lipopolysaccharide (LPS 30mg/kg). UT receptor antagonist ligand urantide injections (430 µg/kg) and cardiac echography were realized at H3, H6 and H9. Video surveillance of death occurrences was established. This work had been approved by the institutional review board (n°2010/024). Mann-Whitney test was used. Gehan-Breslow-Wilcoxon test was used for survival rate comparison in mice (α risk 5%). The main objective was to look for a correlation between plasma Ull level and sepsis severity.

Results and Discussion: In 19 patients, median Ull level on first day was 4.3 [0.6-18.6] pg/ml with no significant difference between days. Median SAPS II was 52 [40-66], survival rate was 78.9%. Daily Ull level was significantly lower when patients were receiving hydrocortisone (1 [0-4.3] pg/ml vs 3.8 [0.3-9.6] pg/ml, $p < 0.05$) and sedation (1.1 [0-3.8] pg/ml vs 5.1 [0.5-11] pg/ml, $p < 0.01$). Median daily SOFA was 7 and plasma Ull was significantly lower in patients with SOFA ≥ 7 in comparison with patients with SOFA < 7 (2.9 [0.9-6.2] pg/ml vs. 7.1 [3.3-13], $p < 0.01$).

No correlation was found with SAPS II, survival, daily dose of norepinephrine, procalcitonin, renal/hepatic functions or lactate. In mice, urantide improved survival in comparison with NaCl 0.9% (88.9% vs. 30% on day 6, $p < 0.01$) and improved cardiac function with better left ventricular fraction (31% [23-42%] vs. 56% [50-76%], $p < 0.05$) and better cardiac output (15.1 [13-16.8] ml/min vs. 30.3 [25.9-39.8] ml/min, $p < 0.01$) at H9.

Conclusion(s): Plasma Ull level is lower when septic shock appears severe with more organ failure. During mice endotoxinic shock, Ull antagonism increases survival possibly through cardiac function improvement.

13AP13-7

Hospital associated bacteremia in two Tunisian intensive care units

Nakhli M.S., Kahloul M., Chakroun A., Harrathi M.A., Mhamdi S.
Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse, Tunisia

Background and Goal of Study: Hospital associated bacteremia (HAB) represents a public health challenge because of its high morbi-mortality. It is more frequent and severe in the intensive care environment. In Tunisia, we have not a monitoring network allowing developing a control program.

The aims of our study are to determine the annual incidence of HAB in ICU environment and to study the associated risk factors.

Materials and Methods: This is a longitudinal descriptive study conducted in the surgical and medical ICU of Sahloul teaching hospital during one year and based on the French protocol REA-RAISIN 2009. All the patients hospitalized beyond 48 hours were included.

Results and Discussion: Our study included 301 patients. The average age was 45±21 years with a male domination. The average IGS II scale was 25±17. The incidence of bacteremia was estimated at 7%. The density of global and specific incidence were respectively 6,26 for 1000 days of hospitalization and 10,26 for 1000 days for central venous catheterization (CVC).

Twenty one germs were isolated. The most frequently isolated germs were *Acinetobacter baumannii* in 28,6 % (6/21 germs), *Staphylococcus aureus* and *Klebsiella pneumoniae* in 14,3 % case (3/21 germs) each.

The univariate analysis showed a statistically significant association for the age ($p = 0,039$), the IGS II scale ($p = 0,027$), the intubation ($p < 10^{-3}$), the duration of intubation > 10 days ($p = 0,001$), the tracheotomy ($p < 10^{-3}$), the urinary catheter ($p < 10^{-3}$), the duration of urinary catheter > 6 days ($p < 10^{-3}$), the central venous catheterization ($p < 10^{-3}$) and its duration ($p < 10^{-3}$).

Besides, the multivariate analysis highlighted as independent risk factor, the intubation ($p = 0,022$) and the tracheotomy ($p = 0,003$).

Conclusion(s): Our study's data confirm the major role which play the invasive devices and the duration of their implementation, inciting to revise the professional practices in intensive care units relative to the indications and the application time of these devices. From this work, an annual evaluation of the incidence and the bacteriological profile of HAB was established in our ICU.

13AP13-8

Micafungin compared to Fluconazole for prophylaxis in high risk live donor liver transplants. A randomized controlled trial

Youssef M.¹, Kamel Y.², Mohamed E.³, Abdelaziz A.³, Yassien K.²

¹National Liver Institute - Menoufia University, Research and Development Department, Shebin Elkom, Egypt, ²National Liver Institute - Menoufia University, Dept of Anaesthesiology & Intensive Care, Shebin Elkom, Egypt, ³National Liver Institute - Menoufia University, Microbiology, Shebin Elkom, Egypt

Background and Aim of Work: High risk liver transplanted recipients are prone to a higher incidence of fungal infections. Aim is to evaluate whether the prophylactic administration of Micafungin compared to standard regime of prophylactic Fluconazole would help reduce fungal infections (Site (urine, wound, throat, drains) and blood invasive), and to monitor their effect on liver graft and renal functions as well as the suggested antifungal therapy duration.

Methods: After local ethics committee approval and consent (11/2012) Recipients between 2012 and 2016 with risk factors as high MELD score, high blood products consumption and evident bile leak on day 1 were randomized for 5 postoperative days (POD) to receive either intravenous prophylactic Micafungin 50 mg or Fluconazole, 100 mg daily.

Results: 66 adult recipients were included as high risk from 103 transplanted during the study period (33 Micafungin vs 33 Fluconazole). 60 males and 6 females mainly hepatitis C. Both Micafungin and fluconazole were comparable for postoperative site fungal infections, (15/33 versus 19/33, $p = 0,325$). Total fungal isolates were 32, {*Candida Albicans*, 18(56%), while *Candida nonalbicans* 14(44%)}. 3 blood isolated invasive fungal infections (IFIs) (*Candida Albicans*) were diagnosed by POD 15, 21 and 25 after discontinuation of Micafungin. Two of the 3 IFIs did not respond to an increase of Micafungin dose from 50 mg to a therapeutic dose of 100mg and died, while one survived. No reported IFIs after fluconazole discontinuation were observed.

Postoperative urea, creatinine and liver enzymes blood levels were significantly less with micafungin when compared to fluconazole ($P < 0,05$), particularly creatinine clearance on day 5 ($P = 0,001$).

Conclusion: Micafungin has a reduced effect on renal and hepatic graft functions when compared to Fluconazole. The termination of prophylactic Micafungin therapy after discharge from Intensive care lead to the appearance of positive cases of IFIs with high mortality. Continuation of prophylactic anti-fungal therapy to beyond 5 days could be necessary to avoid hospital acquired fungal infection in this high risk recipients until final discharge, but the appropriate duration of prophylaxis and economic impact of using expensive echinocandins need to be studied further.

Perioperative Medicine

14AP01-1

Inadequate emergence after anesthesia for curative neoplastic surgery: emergence delirium and hypoactive emergence

Braga A.¹, Silva D.¹, Tavares J.², Azevedo J.¹, Santos A.¹, Abelha F.²

¹Hospital São João, Dept of Anaesthesiology, Porto, Portugal,

²Faculdade de Medicina da Universidade do Porto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Inadequate emergence after anesthesia can be characterized by the patient's activity level into two subtypes: emergence delirium and hypoactive emergence. The aim of this study was to evaluate the incidence and determinants of inadequate emergence after curative neoplastic surgery.

Materials and Methods: After approval by the ethics committee, an observational prospective study was performed in 148 patients scheduled for curative neoplastic surgery admitted to the Post Anesthetic Care Unit (PACU). Exclusion criteria: age < 18 years old and inability to give informed consent. For evaluation of inadequate emergence of anesthesia (IEA) it was applied the Richmond Agitation and Sedation Scale (RASS) 10 minutes after admission at the PACU. Emergence delirium was defined as a RASS score $> +1$ and hypoactive emergence was defined as a RASS < -2 . PQRS was applied

before (T0) and after surgery at minute 15 (T15), 40 (T40), at day 1 (D1) and 3 (D3) evaluating recovery in five domains. Recovery on PQRS was defined as return to baseline values or better for all questions within each domain. Postoperative delirium was assessed with NuDESC. Patient's demographics data and perioperative variables were recorded. The Chi-square, Fischer's exact or Mann-Whitney U tests were applied for comparisons.

Results and Discussion: Of the 148 patients, 48 (32%) had IEA: 12 patients (8%) screened positive for emergence delirium and 36 patients (24%) showed hypoactive emergence. Recovery at PQRS was less frequent in patients with IEA namely on physiological domain at T15 (4% vs 16% $p = 0,030$) and at D1 (53% vs 83% $p < 0,001$). Patients with IEA recovered more frequently in emotive domain at T15 (48% vs 27% $p < 0,001$), at T40 (55% vs 23% $p < 0,001$) and D3 (61% vs 30% $p < 0,001$).

Determinants of IEA were age (69 vs 64 years $p = 0,017$), submission to a high risk surgery (66% vs 28% $p = 0,001$), congestive heart disease (25% vs 5% $p < 0,001$), cerebrovascular disease (8% vs 0% $p = 0,010$), higher ASA score (48 vs 28 had ASA III/IV $p = 0,017$) and longer duration of anesthesia (180 vs 128 min $p < 0,001$). These patients had a higher incidence of post-operative delirium (27% vs 10% $p = 0,007$) and longer length of PACU stay (196 vs 125 min $p < 0,001$) and hospital stay (7 vs 6 days $p < 0,001$).

Conclusion: Inadequate emergence after surgery was a frequent complication and was associated with delirium. Patients with IEA were older, had more comorbidities and stayed longer at PACU and at hospital.

14AP01-2

Relationship between intraoperative continuous administration of norepinephrine during radical cystectomy and urinary diversion and cancer related outcomes and overall mortality: a retrospective analysis

Furrer M.A.¹, Fellmann A.², Löffel L.², Thalmann G.¹, Burkhard F.C.¹, Wuethrich P.²

¹University Hospital Bern, Department of Urology, Bern, Switzerland, ²University Hospital Bern, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland

Background and Goal of Study: The impact of anaesthetic techniques on disease recurrence is controversial. The intraoperative use of norepinephrine has gained increasing acceptance. It also has been suggested that norepinephrine may be implicated in angiogenesis and metastasis via oxidative stress. The objective of this study was to assess if, depending on the intraoperative administration of norepinephrine, a difference in disease progression and survival could be determined after radical cystectomy.

Materials and Methods: We conducted a retrospective analysis of a consecutive series of 1025 cancer patients undergoing for radical cystectomy and urinary diversion, between 2000 and 2015 in a single high case load centre. Mean follow-up was 58 months [95% CI 55-61]. Disease recurrence free time, cancer-specific and overall survival were estimated using the Kaplan-Meier technique. The multivariate Cox-proportional-hazards regression model included all relevant variables.

Results and Discussion: A total of 621/1025 patients (61%) received intraoperative continuous administration of norepinephrine. These patients were older (median age 69 years [range: 20-91] vs 67 [27-90]; $p=0.013$) and more comorbid (ASA 3-4: 293/621 (47%) vs 146/404 (36%); $p=0.005$). Oncological parameters (pTNM stage) and neoadjuvant chemotherapy did not differ between the groups. Blood loss (median 1000mL [range: 200-13000] vs 1200mL [200-6500]; $p<0.001$), the amount of crystalloids (2000mL [400-9000] vs 3000mL [800-7500]; $p<0.001$) and colloids (0mL [0-6200] vs 500mL [0-6400]; $p<0.001$) and the blood transfusion rate (24% vs 38%; $p<0.001$) were reduced in patients receiving norepinephrine. Estimates for cancer related and overall survivals did not differ significantly if patients received continuous administration of norepinephrine or not (mean estimated disease recurrence time 89 months [95% CI 83-96] vs 124 [115-133], HR 0.88 [95% CI 0.72-1.08], $p=0.225$; cancer specific survival 102 months [128-140] vs 137 [129-146], HR 0.89 [0.71-1.13], $p=0.348$; and overall survival (79 months [73-85] vs 104 [96-113], HR 0.91 [0.76-1.08], $p=0.270$). Administration of norepinephrine was not a predictor for cancer related outcome and overall survival in the multiple Cox regression analysis.

Conclusion: The intraoperative continuous administration of norepinephrine seems to have no significant negative impact on cancer related outcome and overall survival in this cancer patient population after radical cystectomy.

14AP01-3

Postoperative delirium after curative surgery for cancer

Sousa M., Azevedo J., Carvalho B., Marinho R., Santos A., Abelha F.
Centro Hospitalar São João, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Postoperative delirium (POD) is associated with longer hospital stay, higher medical costs and mortality. We aimed to assess the incidence, risk factors and impact of POD after curative surgery for cancer.

Materials and Methods: After approval by the institutional ethics committee, an observational, prospective study was conducted. Adult patients submitted to elective curative neoplastic surgery, and admitted to the Post Anaesthetic Care Unit (PACU) were included. EQ-5D VAS was used to measure quality of life before surgery. Revised Cardiac Risk Index (RCRI) was applied. Postoperative Quality of Recovery Scale (PQRS) was used at baseline and after surgery at minute 15 (T15), 40 (T40) and days 1 (D1) and 3 (D3) to evaluate 5 domains: physiologic (PD), nociceptive (ND), emotional (ED), functional (FD) and cognitive (CD). Quality of Recovery 15 (QoR-15) was evaluated and Poor Quality of Recovery (PQR) was considered using a calculation (mean D1 QoR-15 score minus 1 SD). The Mann-Whitney test, Chi-square or Fisher's exact test were used.

Results and Discussion: POD was found in 23 patients (16%). POD patients were older (82 vs. 73 median years, $p<0.001$) and had higher ASA status ($p=0.004$). These patients were submitted more frequently to major surgery ($p=0.007$), presented more frequently heart failure ($p<0.001$) and insulin dependent diabetes ($p=0.006$). RCRI scores were higher in POD patients ($p=0.013$) and they also had higher EQ-5D scores in usual activities ($p=0.020$) and self-care ($p=0.01$) domains. At D1, POD patients had more frequently PQR ($p=0.002$), lower median scores for total QoR-15 (80 vs. 100, $p<0.001$) and lower QOR scores in some items such as severe pain, moderate pain and feeling sad or depressed. They had more frequently incomplete recovery in PD ($p=0.007$) and in FD ($p=0.037$). Rates of recovery for ED, CD and ND were similar at all time frames. We found differences between POD patients and non-POD patients regarding duration of surgery ($p=0.002$), length of stay at PACU ($p=0.004$) and at the hospital ($p=0.010$).

Conclusion(s): Delirium was a frequent occurrence after neoplastic surgery. POD patients were older, had higher ASA physical status, higher RCRI scores and worst QOL. QoR-15 identified PQR in POD patients and PQRS revealed incomplete recovery in PD and FD at D1.

14AP01-4

Quality of life and quality of recovery in patients submitted to curative neoplastic surgery

Azevedo J., Sousa M., Silva D., Braga A., Santos A., Abelha F.
Centro Hospitalar de São João, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Quality of recovery is an important measure of the early postoperative health status. Our aim was to determine the impact of preoperative quality of life (QOL) on quality of recovery on patients submitted to curative neoplastic surgery.

Materials and Methods: After approval by the institutional ethics committee, an observational prospective study was performed in adult patients admitted for elective curative neoplastic surgery. We included patients undergoing urologic, plastic, gynaecologic and general surgery, under general or regional anaesthesia and admitted to the Post Anaesthetic Care Unit (PACU). Patients unable to give consent were excluded. Preoperatively, EQ-5D VAS was used to measure quality of life (QOL). Poor Quality of Life (PQL) was defined as having problems in any of the 5 dimensions of EQ-5D. Vulnerability was evaluated using the Clinical Frailty Scale. Frailty is defined as a score ≥ 4 . WHODAS score 2.0 was used to assess preoperative disability, which was defined as a score $\geq 25\%$. PQRS was used at baseline and after surgery at minute 15 (T15), 40 (T40) and days 1 (D1) and 3 (D3) to evaluate recovery in 5 domains: physiological (PD), nociceptive (ND), emotive (ED), functional (FD) and cognitive (CD). Recovery was defined as return to baseline values for all questions in each domain. Poor quality of recovery (PQR) was defined as absence of recovery to baseline values for at least three domains. QoR-15 was applied before (D0) and 24h after surgery (D1). The Mann-Whitney test, Chi-square or Fisher's exact test were used for comparison.

Results: Of a total of 148 patients, 130 (88%) presented problems in 1 or more of the 5 domains of EQ-5D. They also reported worst EQ-VAS median values (80vs.60, $p=0.002$). These patients presented more frequently frailty (34%vs.6%, $p=0.013$) and disability (25%vs.0%, $p=0.013$). They had lower median total QoR-15 scores at D0 (142vs.127, $p<0.001$), in items as moderate pain, feeling concerned/anxious and sad/depressed. At D1 QoR-15 scores were similar (118vs.113, $p=0.081$). PQL patients presented incomplete recovery in ED at all time frames; T15 (28%vs.72%, $p<0.001$), at T40 (27%vs.78%, $p<0.001$), D1 (33%vs.83%, $p<0.001$) and D3 (33%vs.89%, $p<0.001$). PQR was more frequent in patients with PQL (44%vs.71% $p=0.042$) at D3.

Conclusion: In our study, patients with problems in QOL presented more frailty, disability, and worst health status, before surgery. They presented PQR as evidenced by PQRS.

14AP01-5

Poor quality recovery after neoplastic surgery according to postoperative quality of recovery scale

Marinho R.¹, Carvalho B.¹, Lusquinhos J.², Azevedo J.¹, Santos A.¹, Abelha F.¹

¹Centro Hospitalar Sao Joao, Dept of Anaesthesiology, Porto, Portugal, ²Faculdade de Medicina da Universidade do Porto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: The Postoperative Quality of Recovery Scale (PQRS) objectively measures patient recovery in multiple domains. It is an increasingly important measure of postoperative health status. We aimed to assess the quality of postoperative recovery and the health status in patients scheduled for neoplastic surgery.

Materials and Methods: After approval by the institutional ethics committee, an observational prospective study was conducted in 148 patients admitted at PACU after plastic, gynecologic, urologic and general curative neoplastic surgery. Exclusion criteria: age <18 years old and inability to give informed consent. PQRS was applied before (T0) and after surgery, at minute 15 (T15) and 40 (T40), at day 1 (D1) and 3 (D3) evaluating recovery in five domains: physiological (PD), nociceptive (ND), emotive (ED), cognition (CD) and activities of daily living (AD). Patients also answered to the Quality of Recovery 15 Score (QoR-15) at T0 and at D1. Recovery on PQRS was defined as return to baseline values or better for all questions within each domain. Poor quality of recovery (PQR) was defined as recovery in less than 2 domains at D1. The Mann-Whitney test, Chi-square or Fisher's exact test were used for comparisons.

Results and Discussion: In this study, 139 patients were included and 21% were identified as having PQR. There were no differences in age, gender, BMI, ASA status and length of hospital stay. PQR patients presented lower median scores on total QoR-15 before surgery (115 vs. 132, $p<0.001$) but at D1 total QoR-15 were similar (108 vs. 115, $p=0.101$). Duration of anaesthesia was longer in patients with PQR (170 vs. 145 min, $p=0.005$). In these patients, recovery evaluated by PQRS was less frequent complete, namely on PD at T40 (11.1% vs. 32.7%, $p=0.031$) and D1 (37.9% vs. 83.6%, $p<0.001$); on ND at T15 (48.3% vs. 82.7%, $p<0.001$), at T40 (44.4% vs. 76.4%, $p=0.001$) and D1 (44.8% vs. 80%, $p<0.001$); on ED at T15 (13.8% vs. 38.2, $p=0.014$), at T40 (11.1% vs. 39.1%, $p=0.006$) and D1 (3.5% vs. 48.3%, $p<0.001$). Patients with PQR also recovered less frequently at D1 on CD (0% vs. 23.6%, $p=0.002$) and on AD (14.8% vs. 20.9%, $p=0.001$).

Conclusion(s): Neoplastic surgery were longer in patients with PQR according to PQRS and their recovery was less frequent at minute 15 and 40, at D1, but not at D3. PQR was associated with a worst health status before surgery, according to QoR-15.

14AP01-6

Perioperative hemoglobin dynamics in surgical cancer patients

Ristescu I.¹, Patrascanu E.¹, Popova O.², Faris M.², Grigoras I.¹

¹Grigore T. Popa University of Medicine and Pharmacy, Regional Institute of Oncology, Dept of Anaesthesiology & Intensive Care, Iasi, Romania, ²Grigore T. Popa University of Medicine and Pharmacy, Dept of Anaesthesiology & Intensive Care, Iasi, Romania

Background: Both perioperative anaemia and blood transfusion are currently considered independent risk factors for poor outcome in surgical patients. Patient Blood Management (PBM) strategies are recommended to minimise these risks. In oncologic patients, in addition, severe anaemia can make tumor more aggressive, may favour distal metastasis and blood transfusion seems to increase cancer recurrence. The specific PBM strategies in cancer patients are insufficiently defined.

Goal of Study: To evaluate the prevalence of anaemia and the transfusion rate at different time points during the perioperative period in oncologic patients.

Materials and Methods: We retrospectively reviewed records from all consecutive oncological patients with surgical procedures admitted in Postoperative Care Unit (POCU) between January and April 2016. The study included patients with histologically confirmed cancer, having at least 4 values of haemoglobin at different time points (at admission, preoperative, postoperative, at discharge). We compared haemoglobin values, anaemia prevalence and perioperative transfusion rate using t-student and odd ratio statistic models of SPSS 17.

Results: A total number of 552 oncological patients were included, referred to minor/intermediate/major ($n=85/344/123$) surgery, M/F=224/328, mean age=61.6±10 years, POCU LOS=1.8±1.2 days, hospital LOS=9.8±3.9 days, perioperative transfusion rate=19.7% Mean values of hemoglobin were 12.7±1.7g/dl at admission, 12.5±1.7g/dl preoperative, 11±1.5g/dl postoperative and 11±1.5g/dl at discharge. 35.5% ($n=196$) were anaemic at admission, 2.3% with severe anaemia ($n=25$). Anaemic patients had a longer POCU LOS (2.2±1.6 vs 1.6±0.9, $p=0.003$) and a higher transfusion rate (38% vs 9.8%, OR:5.6, $p<0.001$) comparing with non-anaemic patients. The prevalence of anaemia markedly increased from preoperative to postoperative period (40.4% vs 74.6%, OR:4.3, $p<0.0001$) and from admission to discharge (35.5% vs 76.3%, OR:5.8, $p<0.0001$). The transfusion rate was preoperative/intraoperative/postoperative = 0.7%/10.1%/8.9%.

Conclusion(s): Oncological patients have a high prevalence of anaemia in all phases of the perioperative period. In order to better define specific PBM strategies, there is a need for a theranostic approach of anaemia in cancer.

14AP01-7

Hypothermia and quality of recovery in surgical cancer patients

Silva D.¹, Braga A.¹, Sousa M.¹, Azevedo J.¹, Santos A.¹, Abelha F.²

¹Centro Hospitalar São João, Dept of Anaesthesiology, Porto, Portugal, ²Faculty of Medicine / University of Oporto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Postoperative hypothermia has been linked with several adverse complications that can affect patient's outcomes and may decrease quality of recovery in the postoperative period. The aim of this study was to evaluate the incidence of hypothermia and assess its impact in the recovery after curative surgery for cancer.

Materials and Methods: After study approval by ethics committee, an observational prospective study was conducted. Patients submitted to elective cancer surgery with a curative intent admitted at the post anesthesia care unit (PACU), from Jun 2016 to Oct 2016, were included. Exclusion criteria: age <18 years old and inability to give informed consent. Patients with an auricular temperature <35°C at PACU admission were classified as patients with hypothermia.

Quality of Recovery was evaluated using Post-Operative Quality of Recovery Scale (PQRS) before surgery (T0), at 15 and 40 min, 24h and 72h, and Quality of Recovery-15 (QoR-15) before (T0) and 24 hours (T24h) after surgery. Recovery on PQRS was defined as a return to baseline values or better for all questions within each domain. Patient's demographics and perioperative data were collected. The Chi-square, Fischer's exact or Mann-Whitney U tests were used for comparisons.

Results and Discussion: A total of 123 patients were included. The incidence of hypothermia was 30%. There were no differences in QoR-15 at T0, but at T24h hypothermic patients had lower median global scores (107 vs 115, $p=0.039$). PQRS showed no differences in overall rate of recovery when considering recovery in all domains, however at physiologic domain hypothermic patients had lower scores of recovery at 15 ($p=0.016$) and 40 min ($p=0.001$). Hypothermic patients presented lower scores in Richmond Agitation Sedation Scale (RASS) ($p=0.044$), and had a longer median length of stay at PACU (180 vs 124 min, $p=0.011$) and at hospital (7 vs 6 days, $p=0.001$).

Conclusion(s): In this study hypothermia was common in the postoperative period. QoR-15 revealed a poor quality of recovery in hypothermic patients. PQRS showed no differences in overall rate of recovery when considering all domains together. Hypothermia had an impact in length of PACU and hospital stay influencing postoperative recovery.

14AP01-8**Implementation strategy for a pre-warming protocol in the routine of a surgical center**

De Bern R.C.G., Paiva E.Y., Morais de Paiva T.T., Kurz A.,

Andrade da Silva L., Telles M.

Itapecerica da Serra General Hospital, Dept of Anaesthesiology, São Paulo, Brazil

Background and Goal of Study: Unintentional hypothermia is defined as a core body temperature below 36°C. The most frequent protocols in major surgeries and/or surgeries lasting more than 60 minutes are active warming methods initialized by the anesthesia team. The goal of this study was to evaluate the adherence to a protocol initiating forced-air warming by the nursing staff in the operating rooms during the immediate preoperative period. We also assessed the effects of different pre-warming times on intraoperative temperatures, specifically redistribution hypothermia due to induction of anesthesia.

Materials and Methods: The study was conducted in a surgery center and comprised the development of the pre-warming protocol, training of the nursing staff and data collection in April and May of 2015. Oral thermometers were used for up to 50 minutes during the pre-anesthesia period (depending on length of pre-warming) and esophageal temperatures were measured every 30 minutes throughout anesthesia (starting with intubation). Descriptive analyses of demographic data, core temperatures and types of forced-air warming devices were conducted. We also compared core temperatures at 60 minutes after induction. ANOVA and Tukey's Test were used to analyze the core temperatures of the groups. Significant differences were considered significant when $p < 0.05$.

Results and Discussion: We studied 146 patients. Protocol adherence was 64% in the first month and 89% in the second month of the study. We observed that 30, 40 and 50 minutes of pre-warming resulted in significant decreases in redistribution hypothermia.

Conclusion(s): There was satisfactory adherence to the forced-air warming device placement protocol performed by the nursing team prior to anesthetic induction. The effects of different pre-warming times on intraoperative temperatures showed the hypothermia occurred more times in group T10 than groups T20, T30 and T40. Pre-warming of 30 to 50 minutes significantly reduced redistribution hypothermia.

References: - Horn EP, Bein B, Bohm R, et al. Effect of short time periods of pre-operative warming in the prevention of preoperative hypothermia.

Acknowledgements: To physicians and nurses from Santa Casa Hospital.

14AP01-9**Quality of recovery in elderly cancer patients**

Sousa M., Azevedo J., Silva D., Braga A., Santos A., Abelha F

Centro Hospitalar São João, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: The elderly represent a large cohort of surgical patients. Perioperative medicine of the extreme elderly is an extensively debated issue. We aim to determine quality of recovery in this particular group of patients.

Materials and Methods: After approval by the institutional ethics committee, an observational, prospective study was conducted. Were included patients submitted to elective curative neoplastic surgery, age > 18, undergoing urologic, plastic, gynaecologic and general surgery, under general or regional anaesthesia and admitted to the Post Anaesthetic Care Unit (PACU). Patients unable to give consent were excluded. Elderly patient (EP) was defined as being over 80 years old. Vulnerability was evaluated using the Clinical Frailty Scale. Frailty is defined as a score ≥ 4 .

The Revised Cardiac Risk Index (RCRI) was applied. WHODAS score 2.0 was used to assess preoperative disability, which was defined as a score $\geq 25\%$. EQ-5D VAS was used to measure quality of life before surgery.

PQRS was used to evaluate the quality of recovery after surgery. PQRS was used at baseline (up to 14 days prior surgery) and after surgery at minute 15 (T15), 40 (T40) and days 1 (D1) and 3 (D3) to evaluate recovery in 5 domains: physiologic (PD), nociceptive (ND), emotional (ED), functional (FD) and cognitive (CD).

Recovery was defined as return to baseline values in each domain. The Mann-Whitney test, Chi-square or Fisher's exact test were used for comparison.

Results: The study enrolled 148 patients, 12% were EP (81 vs. 73 years, $p < 0.001$) and had a higher ASA physical status (71% vs. 30%, $p = 0.002$). EP presented higher RCRI scores (59% vs. 11%, $p < 0.001$), more often history of congestive heart failure (65% vs. 5%, $p < 0.001$) and chronic kidney disease (24% vs. 3%, $p = 0.006$). EP had higher EQ-5D scores at mobility (59% vs. 26%, $p = 0.005$), self-care (41% vs. 12%, $p = 0.002$) and usual activities (59% vs. 25%, $p = 0.004$). EQ-VAS was similar (60 vs. 55, $p = 0.414$). The majority of EP presented frailty (53% vs. 47%, $p = 0.032$) and disability (47% vs. 18%, $p = 0.007$). EP presented more often complete recovery in ND at D1 (94% vs. 71%, $p = 0.042$). Recovery in remaining domains was similar at all time frames.

Conclusion: EP had higher RCRI scores, were more frail, more disabled and presented limitations in mobility, self-care and usual activities. In this study, they presented complete recovery with a frequency comparable to the other patients.

14AP01-10**Neuromuscular residual blockade: incidence and implications in quality of recovery after neoplastic surgery**

Carvalho B., Marinho R., Neto I., Braga A., Santos A., Abelha F

Centro Hospitalar de São João, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Residual neuromuscular block (RNMB) is an important postoperative complication associated with the use of neuromuscular blocking drugs. The aim of this study was to assess the incidence of RNMB at Post Anaesthetic Care Unit (PACU) admission and its association with critical respiratory events (CRE) and quality of recovery.

Materials and Methods: After approval by the institutional ethics committee, an observational prospective study was conducted in adult patients undergoing curative neoplastic surgery. Exclusion criteria was inability to give informed consent. The primary outcome was RNMB at PACU admission and was defined as train-of-four (TOF) ratio < 0.9 . PQRS was used to evaluate the quality of recovery at baseline and after surgery: minute 15 (T15), 40 (T40), day 1 (D1) and 3 (D3). PQRS has 5 domains: physiological (PD), nociceptive (ND), emotive (ED), activities of daily living (AD) and cognitive (CD). Recovery was defined as the return to baseline values or better for all questions within each domain; Incomplete recovery was defined as recovery in less than 2 domains at D1. We also evaluated frequency of CRE, namely airway obstruction, mild-moderate hypoxemia, severe hypoxemia, respiratory failure, inability to breathe deeply, muscular weakness and re-intubation. Descriptive analyses of variables were used to summarize data. The Mann-Whitney U test, Chi-square or Fisher's exact test were used for comparisons.

Results and Discussion: From 148 patients observed, 116 were included in the study. RNMB incidence was 15.5%. Patients with RNMB had more CRE (61% vs. 24%; $p = 0.001$), namely mild-moderate hypoxemia (32% vs. 7%; $p < 0.001$), inability to breathe deeply (86% vs. 11%; $p < 0.001$) and muscular weakness (88% vs. 10%; $p < 0.001$). Patients with RNMB presented incomplete recovery more frequently in PD at T40 (100% vs. 71%; $p = 0.004$) and less frequently at D1 (88% vs. 64%; $p = 0.04$). These patients presented complete recovery more frequently in ED at T15 (72% vs. 29%; $p < 0.001$), T40 (83% vs. 26%; $p < 0.001$), D1 (72% vs. 33%; $p = 0.002$) and D3 (78% vs. 35%; $p = 0.001$). There were no difference regarding PACU or hospital length of stay.

Conclusion(s): RNMB occurred in 15.5% of the neoplastic patients at PACU admission and was associated with CRE. Accordingly, to PQRS, RNMB has an influence on early recovery.

14AP02-1

Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity (POSSUM) system for outcome prediction in elderly patients submitted to major vascular surgery

Teles A.R.¹, Teixeira I.², Azevedo L.³, Mourão J.⁴

¹Sao Joao Hospital, Dept of Anaesthesiology, Porto, Portugal,

²Faculty of Medicine, University of Porto, Dept of Anaesthesiology, Porto, Portugal, ³Faculty of Medicine, University of Porto, MEDCIDS - Dept of Community Medicine, Information and Health Decision Sciences & CINTESIS - Centre for Health Technology and Services Research, Porto, Portugal, ⁴Hospital São João, Dept of Anesthesia, Dept of Education and Medical Simulation, Dept of Surgery, Faculty of Medicine of University of Porto, Porto, Portugal

Background and Goal of Study: Global population is getting older. It's necessary to carefully assess the risk-benefit before surgical treatment. POSSUM system is a validated scoring system for 30-day morbidity and mortality prediction in surgical practice. The aim of this study is to evaluate the performance of POSSUM system (POSSUM, P-POSSUM, V-POSSUM, V-POSSUM physiology and V-POSSUM Cambridge scores), on predicting 30-day morbidity of elderly patients undergoing major elective vascular surgery.

Methods: A retrospective longitudinal cohort study was conducted in elderly patients (≥ 60 years) admitted at Vascular Surgery Department of a University Hospital. Between 1st January of 2014 and 31st December of 2015, we selected 202 that were submitted to major elective vascular surgery. POSSUM system's performance and calibration for predicting mortality and morbidity were assessed. Observed vs expected morbidity and mortality were compared using area under the Receiver Operating Characteristic (ROC-AUC) curves and Standardized Mortality Ratio (SMR) and the model goodness of fit was assessed using the Hosmer-Lemeshow test (H-L T).

Results and Discussion: Patients' average age was 70,75 years, (80,7% male and 19,3% female). The mean hospital stay after surgery was 18,97 days. The overall rate of 30-day-mortality was 2,97% (n=6) and 30-day-morbidity was 33,7% (n=68). POSSUM, P-POSSUM, V-POSSUM, V-POSSUM physiology and V-POSSUM Cambridge logistic regression equations yielded an overall predicted mortality of 4.0; 28.9; 15.2; 21.9 and 13.2, respectively. H-LT p-values were 0.160; 0.001; 0.210; 0.010 and 0.330, respectively. SMRs and 95% confidence interval (CI) were 1.35(0.27-2.44); 0.21(0.04-0.37); 0.39(0.08-0.71); 0.27(0.06-0.49) and 0.44(0.09-0.80), respectively. ROC curves showed AUCs and 95% CI of 0.72(0.49-0.95); 0.72(0.49-0.95); 0.73(0.51-0.94); 0.69(0.50-0.89) and 0.72(0.52-0.92), respectively. Regarding morbidity, the POSSUM system predicted a total of 103.7 events. The H-LT p-value was <0.001 and ROC-AUC showed an AUC of 0.69 (95% CI of 0.62-0.77).

Conclusions: Both P-POSSUM and V-POSSUM Physiological score models showed poor calibration and poor goodness of fit. Observed to expected (O:E) mortality ratio for POSSUM and P-POSSUM indicated significantly fewer than expected deaths. On the other hand, V-POSSUM, V-POSSUM Cambridge and POSSUM were good predictors of mortality. The POSSUM system was good predicting morbidity in our group of patients.

14AP02-3

Validation of the Surgical Outcome Risk Tool (SORT) in a high-risk Swedish cohort

Helleberg J., Bartha E., Kalman S., PROFS Study Group
Karolinska University Hospital, Dept of Anaesthesiology & Intensive Care, Huddinge, Sweden

Background and Goal of Study: There are several tools to predict post-operative outcomes but few are used in clinical practice. SORT is one such model, developed in a 2014 UK cohort¹. As the accuracy of any model may be reduced when transferred to another setting, independent external validation is warranted².

Predictors, Risk factors and Outcome Following major Surgery (PROFS³) was a prospective observational study conducted at 4 major University hospitals in Sweden (Karolinska University Hospital, Linköping University Hospital, Örebro University Hospital and Uppsala University Hospital) between November 2015 and February 2016. The aim of the study was to assess the value of a number of predictive models for short- and long term Clinical out-

comes in a high risk population undergoing major surgery. The aim of this first report from PROFS is the external validation of SORT.

Materials and Methods: Patients of ASA class 3 to 5 undergoing in-patient orthopedic, gynecologic, urologic or general surgery classified as "major" or higher according to SORT were recruited. The data needed for risk prediction was collected prospectively. Primary endpoint was 30-day mortality. Discrimination was assessed by analysis of c-statistic. Calibration was assessed with a smoothed calibration plot and the Hosmer-Lemeshow goodness-of-fit test.

Results and Discussion: Between November 2nd 2015 and February 19th 2016 a total of 25543 patients underwent surgery of any type at the centers. The 30-day mortality among all patients was 362 (1.42%). 1089 patients were included in the study, 13 were excluded due to wrongful inclusion, and 3 were lost to followup. Finally, 1073 patients remained for analysis. The predicted mortality was 4.9% and the observed was 5.6% (60 patients). The discrimination of SORT as calculated by c-statistic was 0.82 (95% CI 0.76-0.87). There was no evidence of poor fit according to the Hosmer-Lemeshow test ($p = 0.30$). SORT has good discrimination for 30-day mortality even within a selected group of high-risk patients. The lower c-statistic than in the original cohort (0.82 vs 0.91) may be due to different inclusion criteria. We could not find evidence for poor calibration.

Conclusion(s): SORT can be used to identify a high-risk surgical population in a Swedish University Hospital context.

References:

1. Br J Surg. 2014 Dec; 101(13):1337-1783
2. J Clin Epidemiol. 2008 Nov;61(11):1085-94
3. ClinicalTrials.gov identifier NCT02626546

14AP02-4

Breath-holding test in assessment of cardiorespiratory system in patients with arterial hypertension

Trembach N., Zabolotskikh I.

Kuban State Medical University, Dept of Anaesthesiology & Intensive Care, Krasnodar, Russian Federation

Background and Goal of Study: Sensitivity of peripheral chemoreceptors has been shown to be significantly enhanced in patients with arterial hypertension [1]. Enhanced chemoreception was suggested to result in alteration in the respiratory-sympathetic coupling and increased muscle vasoconstrictor activity which may contribute to the development of hypertension. These disturbances may lead to a hemodynamic instability during anesthesia [2]. Assessing the sensitivity of the peripheral chemoreflex, we can predict the likelihood of developing respiratory and cardiovascular disorders during the treatment of these patients, during surgery and general anesthesia, to predict the course of the disease and its outcome. The aim of the study was to compare the breath-holding test to single-breath carbon dioxide test in the evaluation of the sensitivity of the peripheral chemoreflex in subjects with arterial hypertension.

Materials and Methods: The study involved 13 patients with essential arterial hypertension (H group) and 16 patients with normal blood pressure (C group). In all participants, breath-holding test was performed in the morning before breakfast: voluntary breath-holding duration was assessed three times, with 10 min intervals. A mean value of the duration of the three samples was calculated. The single-breath carbon dioxide test was performed next day. The study was approved by the local ethics committee. All subjects provided signed informed consent to both tests.

Results and Discussion: The average sensitivity of peripheral chemoreflex measured with single-breath carbon dioxide test was 0.28 ± 0.1 L/min/mmHg in C group and 0.47 ± 0.15 L/min/mmHg in H group ($p < 0.05$), the average breath-holding duration was 48 ± 13 seconds and 34 ± 12 seconds, respectively ($p < 0.05$). During the correlation analysis a significant negative correlation between the results of two tests was noted in both groups (-0.79 in group C, ($p < 0.05$) and -0.81 in group H ($p < 0.05$)).

Conclusion(s): Peripheral chemoreflex sensitivity is higher in patients with arterial hypertension. A breath-holding test reflects the sensitivity of the peripheral chemoreflex to carbon dioxide in patients with essential arterial hypertension.

References:

1. Sinski M, Lewandowski J, Przybylski J, et al. Hypertens. Res. 2012; 35 (5): 487-91
2. Zabolotskikh I, Trembach N, et al., EJA 2015; 32 (suppl. 53): 62

Acknowledgements: The reported study was funded by RFBR, research project No. 16-34-60147 mol_a_dk.

14AP02-5**Influence of preoperative disability in the recovery of elective cancer surgery**Braga A.¹, Silva D.¹, Carvalho B.¹, Neto S.¹, Santos A.¹, Abelha F.²¹Hospital São João, Dept of Anaesthesiology, Porto, Portugal,²Faculdade de Medicina da Universidade do Porto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Disability is defined by the World Health Organization (WHO) as difficulties in any area of functioning as they relate to environmental and personal factors. In surgical patients, it is assessed by WHO Disability Assessment Schedule (WHODAS) 2.0. The aim of this study was to evaluate the influence of preoperative disability in the recovery after cancer surgery.

Materials and Methods: We conducted a prospective observational study, after approval by ethics committee, in patients scheduled for elective cancer surgeries with a curative intent. Exclusion criteria: age <18 years old and inability to give informed consent. Preoperative disability was defined as 25% or more on WHODAS. Quality of Recovery was evaluated with Quality of Recovery-15 (QoR-15) at baseline (T0) and 24 hours after surgery and with Post-Operative Quality of Recovery Scale (PQRS) at baseline and after surgery at minute 15 (T15), 40 (T40) and days 1 (D1) and 3 (D3), evaluating recovery in five domains. Recovery was defined as return to baseline values or better for all questions within each domain. The EQ-5D scale and Clinical Frailty scale were applied preoperatively. The Chi-square, Fischer's exact or Mann-Whitney U tests were used for comparisons.

Results and Discussion: 148 patients were included, of which 21% had Disability. Patients with disability had a lower total median QoR-15 at T0 (105 vs 134 p<0,001) with lower scores in 13 Qor-15 items, a index value for EQ-5D health status with a lower median score (50 vs 70 p<0,001) and had frailty more frequently (81% vs 16% p<0,001). They were older (74 vs. 63 p<0,001), had a higher ASA physical status (66 vs 26% for ASA III/IV, p<0,001), and more frequently had a revised cardiac risk index scoring ≥ 2 (41 vs 10%, p<0,001). These patients had more incomplete recovery in nociceptive domain at T15 (47% vs 17% p<0,001) and at D3 (52% vs 19% p<0,001) and in physiological domain at T40 (87% vs 68% p=0,030). They had less frequently full recovery at T15 in three of five domains (15% vs 45% p=0,003), at T40 when considering four domains (0% vs 15% p=0,013), at D1 and D3 when considering three domains (30% vs 52% p=0,030; 7% vs 27% p=0,024, respectively).

Conclusion(s): Patients with disability have more comorbidities and a worst health status before surgery and revealed a poor quality of recovery, suggesting an adverse impact of disability in health status and in postoperative recovery.

14AP02-6**Intraoperative hypotension is associated with acute kidney injury in non-cardiac surgery**Hallqvist L.¹, Bell M.¹, Fredrik G.²¹Karolinska University Hospital, Dept of Anaesthesiology & Intensive Care, Stockholm, Sweden, ²Karolinska Institute, Research and Development Department, Stockholm, Sweden

Background: Perioperative acute kidney injury (AKI) is common and increases risk of morbidity and mortality. The study objectives were to determine the impact of preoperative risk factors and intraoperative events, with special focus on hypotension, on the risk of perioperative AKI.

Methods: In this observational cohort study, patients undergoing major elective noncardiac surgery who were scheduled for an overnight admission to the postoperative unit at the Karolinska University Hospital, Stockholm, Sweden, Oct 2012 to June 2013 and Jan 2015 to April 2016, were included. Preoperative risk factors (comorbidities), intraoperative events (hypotension defined as a percentage decrease in systolic blood pressure relative each patient's baseline lasting >5 min) and postoperative data were collected from medical records. Plasma creatinine were measured before, on the first, second and third day after surgery; AKI was determined according to the KDIGO criteria.

Data were analysed with STATA version 14.2; the Mann-Whitney U-test or the chi-square test were used for continuous and categorical variables in the bivariate analyses, multivariable logistic regression, sensitivity analysis and tests of interaction were also performed.

Results: Of the final cohort of 470 patients, 127 (27%) developed AKI in the perioperative period. The AKI patients were more often men, had a higher ASA class, a higher frequency of treated hypertension and higher preoperative creatinine. During anaesthesia and surgery, the AKI subgroup had more hypotensive events and blood loss. In the postoperative phase positive fluid balance was more common among AKI patients, as was myocardial damage and 30-day mortality. Intraoperative hypotension was frequent; 286 patients (61%) had a 40%, and 68 patients (14%) a 50%, reduction from preoperative baseline. Multivariate analyses demonstrated that an intraoperative hypotensive event >50% was associated with a more than doubled risk of AKI (adjusted OR 2.46, CI 1.31-4.62).

Risk faktor	OR (unadjusted) (95% CI)	OR (adjusted a) (95% CI)	OR (adjusted b) (95% CI)
Hypotensive event* (>40-≤50%) vs ≤40%	1.56 (0.98-2.48)	1.64 (1.015-2.66)	1.50 (0.92-2.47)
Hypotensive event* (>50%) vs ≤40%	2.38 (1.30-4.36)	2.46 (1.31-4.62)	2.18 (1.14-4.18)

* Decrease in systolic blood pressure % relative to baseline for >5 min

a Adjusted for the covariates: male, ASA>2, treated hypertension,, pre-operative creatinine >90

b Adjusted for the covariates mentioned above and blood loss in quartiles.

[Risk of AKI, the effect of a hypotensive event.]

Conclusions: In patients undergoing noncardiac surgery there was a high incidence of perioperative AKI. Intraoperative avoidance of hypotension may decrease the risk of AKI substantially.

14AP02-7**Burnout in perioperative healthcare professionals - a cross-sectional study in one Portuguese Hospital**

Gonçalves L., Godinho P., Lavado J., Leal S., Valente E.

Centro Hospitalar de Leiria, Dept of Anaesthesiology, Leiria, Portugal

Background and Goal of Study: Burnout syndrome corresponds to a state of exhaustion due to professional reasons. Healthcare professions are particularly affected, due to their physical and psychological demands. This study assessed burnout among perioperative professionals at the Centro Hospitalar de Leiria (including medical orderlies [MO], nurses and physicians).

Materials and Methods: For two months in 2016, an online questionnaire with the Standard Portuguese version of the Maslach Burnout Inventory - Human Services Survey, along with sociodemographic and work-related variables.

Results and Discussion: Seventy-seven professionals participated in this study (15 MOs, 48 nurses and 14 physicians), with a mean age of 45.4 years and 85.7% female. Six professionals presented burnout (7.8%; all nurses). Nurses presented the highest prevalence of high emotional exhaustion (EE), compared to physicians and MOs (58.3%, 50.0% and 20.0%, respectively; p=0.035). There were no statistically significant differences between the three professions regarding depersonalization or personal accomplishment. Overall, nurses appear to be at higher risk, although larger sample sizes would be desirable to confirm these results.

Conclusions: This study provides a preliminary overview of the psychological status in perioperative healthcare professionals, suggesting some groups more susceptible to burnout and confirming the emotional and physical demands of these professions.

14AP02-8

Quality of recovery and acute postoperative pain

Pereira Alves dos Santos Neto I.M.¹, Marinho R.², Sousa M.², Silva D.², Pereira Guimaraes L.², Abelha F³

¹Centro Hospitalar Sao Joao, Dept of Anaesthesiology & Intensive Care, Porto, Portugal, ²Centro Hospitalar Sao Joao, Dept of Anaesthesiology, Porto, Portugal, ³Faculdade de Medicina da Universidade do Porto, Departamento de Cirurgia, Porto, Portugal

Background and Goal of Study: 'Quality of recovery' scores are patient-reported outcome measures evaluating recovery and anaesthesia. The Quality of Recovery-15 (QoR-15) is a recently developed, psychometrically tested, validated questionnaire and provides a valid, and efficient evaluation of post-operative Quality of Recovery. Acute post-operative (PO) pain is one of the main problems after oncologic surgery. The aim of our study was to investigate patients with the presence of Moderate or Severe Acute Postoperative Pain (MSAPP) and its impact in the PO recovery.

Materials and Methods: After approval by our institutional ethics committee, an observational prospective study was conducted in patients undergoing oncologic surgery under general anaesthesia admitted at PACU. Exclusion criteria: Age <18 years old and inability to give informed consent. The Postoperative Quality of Recovery Scale (PQRS) and the Quality of Recovery 15(QoR-15) were used to evaluate the quality of recovery. QoR-15 was applied on the day before (T0) and 24 hours after surgery (T1). PQRS was evaluated at T0 and after surgery at minute 15 (T15), 40 (T40) and days 1 (D1) and 3 (D3), to evaluate recovery in five domains: physiological, nociceptive (ND), emotive, activities of daily and cognition(CD). Recovery was defined as return to baseline values or better for all questions. Patients were considered to have MSAPP if they answered <10 in the VAS questions 11 and 12th of QoR-15. Poor Quality of Recovery(PQR) was defined as a QoR-15 and scored than the mean QoR-15 D1 after surgery - 1 standard deviation. We collected demographics and perioperative data including Revised Cardiac Risk Index(RCRI).Mann-Whitney, Chi² or Fisher's test were used.

Results and Discussion: 138 patients were enrolled. The incidence of MSAPP was 62%(n=85). We didn't detect differences in gender,BMI, education, ASA,RCRI, and duration of anaesthesia. Patients with MSAPP presented PQR more frequently (25vs 2%,p < 0.001),were younger (62 vs. 70, p=0.002). MSAPP patients had lower scores in 9items Qor-15 and scored lower for total QoR-15 median scores at T1 (103vs126, p>0.001). Patients with MSAPP had more frequently complete recovery in ND T15(87vs68%p=0,014),T40(81 vs.63% p=0.029), D1(83 vs66%,p=0.028),CD T15 (91 vs 9%, p=0.005).

Conclusions: Patients with MSAPP didn't have more co-morbidities. Qor-15 revealed a PQR suggesting an adverse impact of pain in PO recovery although these patients recover faster in some PQRS domains.

14AP02-9

Preoperative frailty and quality of recovery after curative neoplastic surgery

Azevedo J.¹, Sousa M.¹, Carvalho B.², Marinho R.¹, Santos A.¹, Abelha F¹

¹Centro Hospitalar de São João, Dept of Anaesthesiology, Porto, Portugal, ²Centro Hospitalar Sao Joao, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: The concept of frailty describes a state of increased vulnerability and is a significant predictor of adverse outcomes. We aim to evaluate the incidence of frailty in patients with neoplastic disease and the impact of this condition in postoperative recovery.

Materials and Methods: After approval by the institutional ethics committee, an observational, prospective study was conducted. Adult patients submitted to elective curative neoplastic surgery, and admitted to the Post Anaesthetic Care Unit (PACU) were included. RCRI was applied. Frailty patients (FP) were considered patients with a score ≥4 in the Clinical Frailty Scale. EQ-5D VAS was used to measure quality of life before surgery. Postoperative Quality of Recovery Scale (PQRS) was used at baseline and after surgery at minute 15 (T15), 40 (T40) and days 1(D1) and 3 (D3) to evaluate 5 domains: physiologic (PD), nociceptive (ND), emotional (ED), functional (FD) and cognitive (CD). Quality of Recovery 15 (QoR-15) was evaluated and Poor Quality of Recovery (PQR) was considered using a calculation (mean D1 QoR-15 score minus 1 SD). The Mann-Whitney test, Chi-square or Fisher's exact test were used.

Results and Discussion: Of 148 patients, 30% were frail (FP). FP were older (p<0.001), had more frequently coronary heart disease (31% vs. 6%, p<0.001), heart failure (24% vs. 6%, p=0.001), insulin dependent diabetes (13% vs 2%, p=0.010), chronic kidney disease (13% vs. 2%, p=0.01) and higher otal RCRI (33% vs. 10%, p<0.001). FP had more problems at EQ-5D dimensions: in mobility (73% vs. 11%, p<0.001), self-care (47% vs. 2%, p<0.001), usual activities (71% vs 11%, p<0.001), pain (62% vs. 24%, p<0.001) and worst median EQ-VAS (50 vs.70, p<0.001). FP presented lower global median QoR-15 scores at D0 (114 vs.134, p<0.001) but not at D1. PQR was observed more frequently in FP (50% vs. 27%, p=0.030). FP had more frequently incomplete recovery in ND, at all time frames, T15 (p=0.002), T40 (p=0.012), D1 (p=0.021) and D3 (p<0.001). At D1 FP had incomplete recovery in PD (p=0.014).

Conclusion: The incidence of frailty was 30%. FP were older, had higher RCRI and worst health status prior surgery. QoR-15 identified PQR in frail neoplastic patients and PQRS revealed incomplete recovery in FD at D1 and in ND at all time frames.

14AP02-10

Is controlled hypotension or stroke volume variation the main determinant of surgical bleeding in functional endoscopic sinus surgery (FESS)? A pilot study

Di Mauro R.¹, Dauri M.², Di Girolamo S.¹, Silvi M.B.², Boezi M.³, Lucci F²

¹University Tor Vergata, Rome, Otorhinolaryngology, Rome, Italy, ²University Tor Vergata, Rome, Dept of Anaesthesiology & Intensive Care, Rome, Italy, ³San Pietro Fatebenefratelli, Dept of Anaesthesiology & Intensive Care, Rome, Italy

Background and Goal of Study: FESS is a minimally-invasive surgical technique for patients with nasal and paranasal sinus pathology that has become popular worldwide. Surgical bleeding reduces operative field visibility, increases the incidence of serious vascular, orbital, and intracranial complications, prolongs surgical duration. Anaesthetic technique can reduce these complications. Epinephrine injection into the nasal mucosa, head elevation and controlled hypotension can be used to minimise bleeding. Hypotension carries risks and in sometimes a MAP of 60 mmHg does not reduce surgical bleeding. Study goal: to see if there is a correlation between bleeding and haemodynamic parameters using a new non-invasive monitor, the CLEARLIGHT (Edwards Lifesciences).

Materials and Methods: We enrolled 20 patients undergoing FESS into a prospective study. We had approval from the ethics committee and procedures performed were in accordance with the 1964 Helsinki declaration. Inclusion criteria: ASA 1-3, age 18-80. Exclusion criteria: Neoplastic lesions and clotting disorders. Anaesthesia induction: Propofol 2-3 mg/kg, sufentanil 0.2-0.4 mcg/kg and rocuronium 0.6 mg/kg. Maintenance: Propofol/remifentanyl TC1.

Monitoring: Standard ASA plus CLEARLIGHT to assess stroke volume index(SVI), stroke volume variation(SVV). Haemodynamic targets: MAP 60mmHg, SVV >12% and SVI 40ml/m2/min. All procedures were performed by one surgeon to ensure consistency. Intraoperative bleeding was assessed by Fromm scale (0, no bleeding to 5, worst bleeding). The surgeon was blinded to the monitor.

Results and Discussion: An adequate surgical field was achieved in 15/20 patients (p<0,01). An adequate surgical field correlated with SVV >12% (R²=0,31), better than hypotension (MAP=60 mmHg) (R²=0,027).

These haemodynamic targets were well tolerated in all cases.

Conclusion: The results showed a strong negative correlation between surgical bleeding and volaemic status as determined by a SVV >12%. Targeting higher SVV achieved shorter surgical duration and minimal risk of complications. Further studies are required.

References:

1. Stankiewicz JA, Lal D, Connor M, et al. Complications in endoscopic sinus surgery for chronic rhinosinusitis: a 25-year experience. *Laryngoscope* 2011;121: 2684-701.
2. Amorcho MC, Fat I. Anesthetic Techniques in Endoscopic Sinus and Skull Base Surgery. *Otolaryngol Clin N Am* 49 (2016) 531-547
3. Fromme GA, MacKenzie RA, Gould AB, Lund BA, Offord KP Controlled hypotension for orthognatic surgery. *Anesth Analg.* 65:683-686. 1986

14AP03-1

Implementation of a fast recovery protocol for total knee replacement (TKR) in our hospital

Lloret Villas B., Baca Pose B., Clotas Palou E., Muliterno Español E., Escobar Ayllón M., Hernández Aguado C. *Hospital Universitari Doctor Josep Trueta, Dept of Anaesthesiology, Girona, Spain*

Background and Goal of Study: Postoperative pain of TKR has direct implication for recovery of the joint, rehabilitation and hospital length of stay. We have started a new multidisciplinary fast recovery protocol (FRP) to achieve better and faster results.

Materials and Methods: Inclusion criteria are BMI <40, ASA I-II-III, has to be independent and with family support, arthrosis only in its early stages, glomerular filtration rate >29ml/min, not treated with anticoagulants and the informed consent has to be signed.

- Preoperative: Explanation of the process by specialists, no preoperative blood orders and optimization of hemoglobin levels. We also administrate gabapentin 300mg oral (po).

- Intraoperative: Spinal block using hyperbaric bupivacain 0,5% 12mg. Preemptive analgesia iv with paracetamol 1g, dexketoprofen 50mg and ketamine 0,5mg/kg with midazolam 1mg. To prevent postoperative nausea and vomiting we administrate dexamethasone 4mg, ondansetron 8mg and haloperidol 1mg iv. We do not use urinary catheters, ischemia or surgical drains. To reduce blood loss we administrate tranexamic acid 1g. iv before incision and 1g. more 3h after. The joint is infiltrated with ropivacaine 0,1-0,2%+adrenaline 100ml and 50ml without adrenaline in periarticular soft tissues.

- Postoperative: Oral intake less than 2h post surgery and rehabilitation 2h after surgery. We administrate paracetamol 1g/6h, dexketoprofen 50mg/12h, metamizole 2g/8h iv and if it is necessary morphine 5mg subcutaneous. The following day they start paracetamol and ibuprofen po. Hospital discharge should be 48h post surgery.

Data was collected between November 1 and December 15, 2016 retrospectively. We evaluated 8 FRP patients and 8 nonFRP patients with same inclusion criteria but intraoperative we used spinal block with hyperbaric bupivacain 0,5% 10-15mg+fentanyl 10mcg and femoral and sciatic nerve block using 20ml of bupivacain 0,25% for each nerve.

Results and Discussion: Only 1 out of 8 of FRP needed one dose of morphine and 4 out of 8 nonFRP needed 1 or more doses of morphine. FRP patients started walking between 3 and 10h post surgery and nonFRP between 22h and 4d after surgery. Hospital discharge was between the first 48-72h for FRP and not before 4d on the other group.

Conclusions: It looks as if in FRP patients pain control, rehabilitation and hospital discharge are faster and more effective. The results look promising and we are going to keep working with more patients.

14AP03-2

Postoperative hoarseness: does it affect quality of recovery?

Pereira Alves dos Santos Neto I.M.¹, Carvalho B.², Araujo Rebelo P.I.³, Silva M.¹, Abelha F.⁴, Mourão J.⁴, Neoplastic patients recovery
¹Centro Hospitalar Sao Joao, Dept of Anaesthesiology, Porto, Portugal, ²Centro Hospitalar São João E.P.E., Dept of Anaesthesiology, Porto, Portugal, ³Faculdade de Medicina da Universidade do Porto, Medicina, Porto, Portugal, ⁴Faculdade de Medicina da Universidade do Porto, Departamento de Cirurgia, Porto, Portugal

Background Goal of Study: Hoarseness is a common complication after surgery with tracheal intubation, is reported range from 14 to 50%. The aim of this study was to evaluate incidence of Postoperative hoarseness(POHS) and determine its implications in the quality of recovery.

Materials and Methods: After approval by the institutional ethics committee, we conducted an observational, prospective study that enrolled all the patients submitted to general anaesthesia for curative neoplastic surgery during five months. Exclusion criteria were: age <18 years old, inability to give informed consent, regional anaesthesia and ICU admission. An investigator evaluated patient-reported hoarseness 40 min (T40). The severity of POHS was grade with a scale from 0(none) to 10(completely POHS) when the patient's com-

pares the voice after surgery as it was before. Patients were evaluated by the Quality of Recovery 15(QoR-15) at 24h after surgery (D1). Postoperative Quality of Recovery Scale(PQRS) was used at baseline and after surgery at minute 15 (T15) and T40, evaluating recovery in five domains: physiological, nociceptive, emotive, cognition and activities of daily living(AD). Recovery was defined as return to baseline values or better for all questions within each domain, except three parameters; this was done for all the domains together and for each individually. Perioperative data were collected from anaesthesia chart: type and duration of anaesthesia, neuromuscular blockade, type and amount of fluidtherapy. Mann-Whitney, Chi-square or Fisher's test were used.

Results and Discussion: 131patients were enrolled for this study. The incidence of POHS was 74 (n=97). 30% have light, 41% moderate and 29% severe POHS. Patients with POHS were similar in gender, BMI, ASA, and when used BNM. POHS patients presented a longer median anaesthesia time (174 vs.126 min, P=0.001), were submitted more frequently to combined anaesthesia (94% vs. 67%, P=0.001), had a great total amount of fluids administration (14% vs 0%, p=0.011) and they had a worse recovery on AD D1(48.5vs26.9%, P=0.023). T1 median scores for total QoR-15 were similar (p=0.256) but regarding QoR-15, POHS presented with lower total median scores at T1 at 2 items: "able to return to work/ usually activities" (p=0.030) and "feeling comfortable" (p=0.037).

Conclusion: POHS was an important PO complication. POHS after surgery occurs more frequently after combined anesthesia and in patients having more fluids. Total Qor-15 did not identify POHS.

14AP03-3

Abdominal compliance optimization decreases standard pneumoperitoneum insufflation pressure in laparoscopic surgery - the 'Individualized Pneumoperitoneum Pressure in Colorectal Laparoscopic Surgery (IPPCoLapSe)' trial

Diaz-Cambronero O.¹, Robles Fernandez D.², Olmedilla Arnal L.E.³, Flor Lorente B.⁴, Matoses Jaen S.¹, Argente Navarro M.P.¹

¹Hospital Universitario y Politecnico La Fe, Dept of Anaesthesiology, Valencia, Spain, ²Hospital General Universitario de Castellon, Dept of Anaesthesiology, Castellon, Spain, ³Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology, Madrid, Spain, ⁴Hospital Universitario y Politecnico La Fe, Dept of Surgery, Valencia, Spain

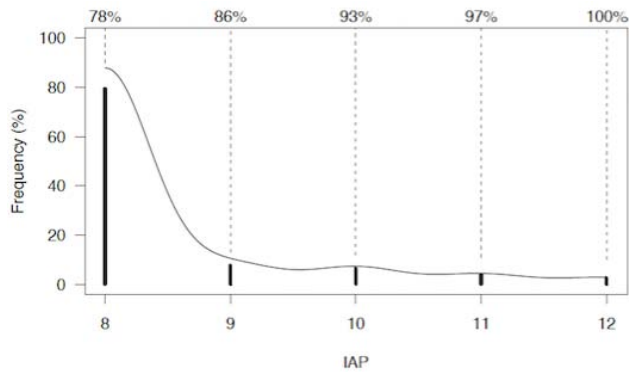
Background and Goal of Study: There is evidence that working with the lowest intraabdominal pressures (IAP) in laparoscopic surgery improves splanchnic perfusion, but the standard of care is to set the IAP insufflation at 12-15 mmHg steadily throughout the surgery.

Surgical conditions depend mainly on the intra-abdominal volume rather than IAP. The intra-abdominal volume (workspace) obtained for a given IAP depends on multiple factors, some of them being modifiable. IPPCoLapSe I trial evaluates whether it is feasible to perform colorectal surgery lowering IAP in an individualized fashion, while retaining an optimal workspace by applying optimization measures.

Materials and Methods: Multicenter observational prospective study. Institutional Ethics Committee and patient informed consent was obtained. 92 patients ASA I-III were recruited. A bundle of measures to improve abdominal compliance were performed: Deep neuromuscular blockade (TOF 0 PTC < 5), lung protective ventilation (TV 8 ml/Kg PBW, PEEP 5 cmH2O, IF O2 60-80%), optimal position (raising legs) and prestretching (insufflation to 15 mmHg for 5 minutes). Abdominal compliance was calculated during initial gas insufflation. Afterwards IAP was stepwise lowered (15, 12, 10 and 8 mmHg) and titrated to the lowest IAP level at which the surgical workspace remained acceptable (optimized IAP, surgical score). We estimated the proportion of surgical procedures finished at each IAP level and the mean intraabdominal volume along with their confidence intervals using a proportion test (Z test) and linear interpolation.

Results: 78 patients were analyzed, 14 patients were excluded. The optimized IAP was 8 mmHg in 78% of patients (CI 95%). Figure 1 suggests that with individualization was possible to decrease IAP in 97% patients versus standard of care (12-15 mmHg). Mean intraabdominal volume was 3,5 liters.

Conclusion: During colorectal laparoscopic surgery optimizing abdominal compliance allow to decrease IAP, Optimal workspace depends on volume rather than on insufflation pressure. Futures studies need to focus on the clinical impact of an individualized IAP insufflation strategy.



[Figure 1 Finished procedures and IAP Relationship]

14AP03-4

Perioperative acquired weakness (POAW)

Lachmann G., Kuenz S., Kurpanik M., Weber-Carstens S., Spies C., Wollersheim T., BioCog Study Group Charité - Universitätsmedizin Berlin, Dept of Anaesthesiology & Intensive Care, Berlin, Germany

Background and Goal of Study: ICUAW is a common complication in Intensive Care. Development occurs early during ICU stay(1). Even after 2h of mechanical ventilation, weakness and protein degradation in diaphragm could already be shown(2). Hyperglycemia is known as a risk factor for ICUAW and occurs frequently in perioperative setting. Our aim was to investigate whether clinically measurable weakness occurs during the perioperative phase, and whether glucose metabolism has an impact on it.

Materials and Methods: We analyzed 56 patients of a prospective, ethically approved (EA2/092/14), observational study undergoing elective surgery. Handgrip strength of the dominant hand, by dynamometer, was assessed preoperatively, as well as on the first postoperative day. Handgrip strength was normalized to gender and age(3). All patients had an perioperative arterial catheter, and therefore, blood glucose was measured every 20 min via arterial blood gas analyses. Maximum, mean and variability were calculated for intraoperative blood glucose. Non-parametric tests were performed.

Results and Discussion: Preoperatively, our patients showed normal handgrip strength (median: 25kg IQR (20/34), in average corresponding to 95% (83/106)), compared to age and gender normal values(3) (median: 25kg (21/36)) without significant difference. Hand grip strength on the first postoperative day decreased significantly ($p=.008$) compared to preoperative values (postoperatively measured 21kg (17/28), respectively 81% (70/96) of the expected normal value). Intraoperative glucose metabolism characterized by maximum, minimum, and mean blood glucose concentration, as well as blood glucose variability showed no impact by correlation or linear regression analyses in our data.

Conclusion: Perioperative acquired weakness (POAW) occurred. Muscle strength is reduced by about 15% at the first day after surgery, as measured per hand grip strength. We could not find an impact of intraoperative blood glucose levels on the development of weakness.

References:

1. Wollersheim et al.: ICM 2014;
2. Welvaart et al.: Ann Surg 2011;
3. Dodds et al.: PloS One 2014

Acknowledgements: The research leading to these results has received funding from the European Union Seventh Framework Program [FP7/2007-2013] under grant agreement n° 602461. TW is participant in the Clinical Scientist Program granted by the Berlin Institute of Health (BIH). SWC is supported by the Berlin Institute of Health (BIH).

14AP03-5

Preoperative levosimendan in heart failure patients undergoing hip fracture repair: a preliminary report

Martín Lorenzo M.D.C.¹, González Fariña V.¹, Montón Giménez N.¹, Brito Do Carmo M.A.², Torres Dios J.A.¹, Solera Marín J.¹

¹Hospital Universitario de Canarias - Tenerife, Dept of Anaesthesiology, S/C Tenerife, Spain, ²Hospital Universitario de Canarias - Tenerife, Dept of Anaesthesiology, La Laguna, Spain

Background: Elderly patients with heart failure (HF) undergoing noncardiac surgery suffer substantial cardiac morbidity and mortality. Levosimendan is a promising adjunct in our therapeutic repertoire for the treatment of HF It's a novel calcium sensitizer, enhances myocardial contractility while simultaneously has vasodilatory and cardioprotective properties. This could be advantageous in perioperative management of HF patients. Our objective was to evaluate the safety and efficacy of prophylactic levosimendan administration in these patients.

Materials and Methods: We studied 12 patients with HF and left ventricular ejection fraction (LVEF) <45% undergoing hip fracture repair. Levosimendan was administered with an infusion rate of 0.1 µg/kg/min in a total dose of 12.5 mg in the 24 hours (h) prior to surgery. Hemodynamic and tissue perfusion parameters were obtained at baseline, 24, 48h and 7 days(d) after initiation of levosimendan.

Results and Discussion: Twelve patients were investigated. The mean ±standard deviation age was 86±7 year, and the mean ejection LVEF was 29±5%. Patient's characteristics are given in Table 1. Characteristics...

The administration of levosimendan caused a significantly increased of the LVEF from 36±6 to 43±15% after 7d ($p 0,05$), cardiac index from 3±0.6 l/min/m² at baseline to 3.6±0.7 l/min/m² after 24h and after 48h 3,7± 0,8 by increases in stroke volume index (baseline 35±11 ml/m², after 24h 42±9 ml/m², after 48h 43±8 ml/m² ($p<0.02$)).

Mean arterial pressure decreased significantly from 86±14 to 77±13 mmHg in 48h. Administration of norepinephrine was necessary in a dose of 0.05-0.3 µg/kg/min to prevent hypotension in 4 patients. Levosimendan significantly improved SvO₂ 60±7 % at baseline 68±8 % after 48h ($p 0,01$). NT-proBNP plasma concentrations decreased from 9253±11864 pg/L to 7961±10808 pg/L after 48h ($p 0.04$). The course of patient's haemodynamics is presented in Table 2. Effects of levo...

Severe adverse effects of levosimendan were not observed during the study.

Conclusion: In patients with HF, preoperative initiation of levosimendan infusion improves perioperative haemodynamic parameters. These findings suggest that levosimendan could be an inotropic of great utility in preoperative optimization of cardiac function in high-risk patients undergoing major surgery due to its mechanism of action and its sustained hemodynamic after having finished its infusion.

14AP03-6

Polypharmacy drug errors in the elderly peri-operative population; are we providing a disservice to an at-risk group?

Isherwood J., Powell A., Mcnorton D., Gribben S., Saxena S. Scunthorpe General Hospital, Dept of Anaesthesiology, Scunthorpe, United Kingdom

Background: There are 11.6 Mil people over the age of 65 in the UK, and by 2040 it is predicted that 1 in 4 UK residents will be over 65. This age group will usually have a number of medical conditions and therefore will have been prescribed a variety of medications by their GP. These medications must be continued in secondary care and altered if necessary in the acute setting.

Materials and Methods: In this study, the admissions of 75 patients on 3 surgical wards were investigated for the maintenance of their routine medication regimes while admitted and whether its continuation was recorded on discharge. Further consideration was paid as to whether their usual dosage was moderated according to GFR. In addition, fluid maintenance for these patients was recorded and compared with the renal function to ascertain whether this was playing a role in the day to day control of fluid status.

Results and Discussion: We found that a large proportion of patients were not prescribed their regular medications in the first 48hrs of admission. Of those patients that suffered a drop in GFR during admission, the minority had their medications altered accordingly and approximately half had the fluid maintenance appropriate for their renal function.

Conclusion: The study demonstrated a clear discontinuity of care between primary and secondary care, as well as a lack of recognition of the complex interactions that are likely to be inherent in such polypharmacy.

14AP03-7

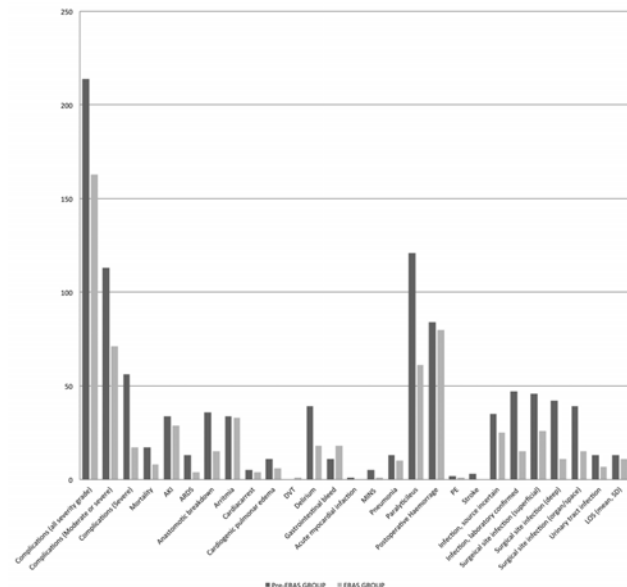
Reduced postoperative complications and length of hospital stay in colorectal surgery after implementation of an enhanced recovery protocol

Ripollés-Melchor J.¹, Casans- Francés R.², Criado-Camargo S.³, Jerez-Rodríguez P.³, Contreras del Barrio Á.³, Calvo-Vecino J.M.¹
¹Hospital Universitario Infanta Leonor, Dept of Anaesthesiology, Madrid, Spain, ²Hospital Clínico Universitario de Valencia, Dept of Anaesthesiology, Zaragoza, Spain, ³Universidad Complutense de Madrid, Surgery, Madrid, Spain

Background and Goal of Study: Enhanced recovery after surgery (ERAS) is a multimodal approach to perioperative care that combines a range of interventions to enable early mobilization and feeding after surgery. We investigated the feasibility and clinical effectiveness, of an ERAS program at a Spanish teaching hospital.

Materials and Methods: Data were collected from consecutive patients undergoing elective open or laparoscopic colorectal surgery during 2 time periods, before (November 2010-January 2013) and after implementation of a full ERAS protocol (2013-December 2015). Data collected included patient demographics, operative, and perioperative surgical and anesthesia data, 180 days-complications, length of stay and readmission rates.

Results and Discussion: There were 360 patients in the pre ERAS group, and 319 in the ERAS group. A total of 214 (59.8%) patients developed at least one complication in the pre ERAS group, versus 163 patients in the ERAS group (51.1%), moderate or severe complications (31.9 vs. 22, 26%, $p=0.009$); and severe complications (15.56 vs. 5, 33%; $p<0.0001$). There were significant fewer patients with postoperative ileus in the ERAS group (33.61 vs. 19.2%, $p<0.001$), and deep and organ-space surgical site infection in the ERAS group. More patients developed anastomotic breakdown in the Pre-ERAS group (10 vs. 4.7%; $p=0.0125$) (Figure 1).



[Figure 1]

No differences were found on mortality rates (4.73 vs. 2.51%; $p=0.154$), nor readmission (6.39 vs. 4, 39%; $p=0.31$). The median postoperative hospital stay was 13 (17) days for patients receiving conventional care and 11 (10) days for patients that had followed the ERAS protocol ($p=0.0343$).

Conclusion(s): Implementation of an enhanced recovery protocol for colorectal surgery at was associated with a significantly reduced complications and length of stay. This is consistent with that of other studies in the literature and suggests that enhanced recovery programs could be implemented successfully.

14AP03-8

Short- and long-term outcomes of patients with hypertrophic cardiomyopathy who received non-cardiac surgery

Yatabe T., Kubo T., Nagano S., Nakagoshi N., Yokoyama M.
 Kochi Medical School, Dept of Anaesthesiology & Intensive Care, Nankoku, Japan

Background and Goal of Study: Recently, the influence of non-cardiac surgery on patients with hypertrophic cardiomyopathy (HCM) has attracted attention. Although several studies have demonstrated that non-cardiac surgery in HCM patients is safe, long-term outcomes remains unclear. The study aimed to evaluate short- and long-term outcomes in patients with hypertrophic cardiomyopathy who received non-cardiac surgery.

Materials and Methods: The study participants were consecutive patients who underwent non-cardiovascular surgery for HCM from January 2007 through September 2015. Patient background and preoperative and postoperative HCM-related events were collected from medical records, and intraoperative data were collected from anesthesia records.

Primary outcome was the incidence of HCM-related events defined as sudden death, delivery of implantable cardioverter-defibrillator shock, heart failure, and thrombosis caused by arrhythmia. We divided the patients into two groups, depending on the experience of HCM-related events: patients in group E experienced intra- and postoperative these events, but those in group NE did not experience such events.

For event-free rate analysis, we divided the patients into two groups, depending on presence of left ventricular outflow obstruction, namely, group hypertrophic obstructive cardiomyopathy (HOCM) and non-HOCM.

Results and Discussion: Seventy-two patients were included in this study. Duration of the median postoperative follow-up was 1382 days. Intraoperative HCM-related events occurred in 1 patient and 1 patient died during hospital stay. Postoperative events occurred in 11 patients (15%). Thus, group E and NE comprised 12 and 60 patients, respectively. The mean patient age in group E was significantly less than that in group NE (61 ± 15 vs. 69 ± 10 years, $p=0.04$). The 2-year event-free rate in the HOCM group was significantly lower than that in the non-HOCM group (log-rank test $p=0.03$). Thus, we thought that non-cardiac surgery in HCM patients might be safe because in-hospital mortality and morbidity rate were 2.8%. However, surgical procedures might be one of the risk factors causing instability of the disease condition in HOCM patients.

Conclusion: Our retrospective study suggests that non-cardiovascular surgery in HCM patients is safe in terms of short-term outcome. However, the 2-year event-free rate in the HOCM group was significantly lower than that in the non-HOCM group.

14AP03-9

Patients' opinions on acupuncture treatment for perioperative complications: a Chinese survey

Wang F.¹, Zheng M.¹, Zhu J.¹, Ji F.B.¹, Wu W.Z.², Zheng Z.³
¹Affiliated Hospital of Nanjing University of Traditional Chinese Medicine, Dept of Anaesthesiology, Nanjing, China, ²Affiliated Hospital of Nanjing University of Traditional Chinese Medicine, Dept of Acupuncture and Rehabilitation, Nanjing, China, ³School of Health and Biomedical Sciences World Health Organization Collaborating Centre for Traditional Medicine RMIT University, Discipline of Chinese Medicine, Bundoora, Australia

Background and Goal of Study: Previous studies have shown that acupuncture has a broad range of effects on perioperative complications. This survey was aimed to assess the surgical patients' opinions on the application of acupuncture for perioperative complications and to explore the possible factors that influenced their opinions.

Methods: A 20-item questionnaire was developed and conducted among adult surgical inpatients in the Affiliated Hospital of Nanjing University of Traditional Chinese Medicine in China over a period of eight weeks. Patients who couldn't understand the questionnaire were excluded. The questionnaire included demographic characteristics (gender, age, education, and occupation), patients' knowledge about acupuncture and patients' opinions on acupuncture treatment for perioperative complications. We obtained verbal consent from patients before giving them the questionnaire to complete.

Descriptive tests were used to present data of demographics, patients' knowledge and opinions. Chi-square was used to explore the factors that might affect patients' opinions on using acupuncture for postoperative nausea and vomiting (PONV).

Results and Discussion: 176 patients completed the questionnaires with a response rate of 98.9%. Less than half of them were willing to use acupuncture for PONV (n=70, 39.8%), postoperative pain (n=79, 44.9%), preoperative anxiety and insomnia (n=65, 36.9%), postoperative gastrointestinal dysfunction (n=76, 43.2%), and postoperative urinary retention (n=81, 46.0%). Patients who were professionals or office workers (chi square=26.181, p=0.001) or with better education (chi square=14.583, p=0.024) were more willing to use acupuncture for PONV while age or gender didn't affect their opinions. However, those who had history of PONV were less willing to use acupuncture for PONV (chi square=10.664, p=0.005).

Conclusions: Overall, the willingness of the surveyed Chinese patients to use acupuncture for perioperative complications was moderate (about 40%). Having higher educational levels or a professional occupation had a positive impact on their opinions on acupuncture treatment for PONV whereas PONV history had a negative impact. This survey was only taken among surgical patients in one hospital, further multi-center studies are needed to understand the opinions of patient populations with different backgrounds and different health conditions.

14AP03-10

7 Year Study on Perioperative Glucose Targets and Post-operative Surgical Site Infection and Mortality

Ker S.¹, Ng R.², Tan T.E.³, Chew S.⁴

¹*Yong Loo Lin School of Medicine National University of Singapore, Dept of Anaesthesiology, Singapore, Singapore*, ²*Singapore General Hospital, Dept of Anaesthesiology, Singapore, Singapore*, ³*Singapore General Hospital, National Heart Centre, Singapore, Singapore*, ⁴*Duke-NUS Medical School, Cardiovascular and Metabolic Disorders Programme, Singapore, Singapore*

Background and Objectives: Hyperglycaemia is associated with adverse outcomes, including increased morbidity and mortality, in cardiac surgical patients. There is overriding evidence that glycaemic control improves morbidity and mortality in such patients. A quality improvement project was initiated to keep target glucose between 4-8mmol/l perioperatively. Thereafter, this was revised to 10mmol/l in accordance with the Society of Thoracic Surgeons guidelines. However, the association of these changing glucose targets with surgical site infection (SSI) and mortality remains to be elucidated. This retrospective study aims to determine if changing target glucose levels affects the incidence of SSI and mortality amongst Asian patients undergoing coronary artery bypass grafting (CABG).

Methods: All patients having CABG at our Centre were placed on insulin infusions titrated to achieve perioperative target glucose levels of 4-8mmol/l in 2009-2010 and 10mmol/l from 2011. The first glucose upon arrival in the cardiothoracic intensive care unit (CTSICU) was recorded. Outcomes were incidence of SSI and mortality over a 7 year period. Univariate analysis was done using Pearson chi-square test for categorical variables, and independent sample t-test for quantitative variables.

Results: 4925 patients underwent CABG over this 7-year period. The mean first glucose level upon arrival in CTSICU was within target of 4-10mmol/l with no significant variation. Patients undergoing CABG were mainly male, Chinese, hypertensive, with a Euroscore of 2.2. Prevalence of diabetic patients was approximately 50%. The average SSI rate was 3.14% in 2008 which fell to 1.65% after initiation of the project, remaining stable thereafter. There was no association between glucose control and mortality.

Conclusion: Glucose targets were maintained throughout, with the implementation of the insulin regime. There was a fall in the incidence of SSI at the beginning of the project, but no further fall thereafter. This may be partially attributed to the Hawthorne effect. The sustained control of SSI suggests that other variables are in play. We postulate preoperative glycaemic control is important as the prevalence of diabetes is significant in our population. Furthermore, the target levels may be too liberal given the high incidence of diabetes which would have to be further elucidated. Mortality remained low and was not associated with change in glucose targets.

14AP03-11

Intra-operative chloride load and peri-operative Acute Kidney Injury in high - risk surgical patients

Marouli D.¹, Chatzimichali A.², Syrogianni P.², Kolyvaki S.³, Papaioannou A.²

¹*University Hospital Heraklion, Dept of Intensive Care, Heraklion, Greece*, ²*University Hospital Heraklion, Dept of Anaesthesiology, Heraklion, Greece*, ³*University Hospital Heraklion, Department of Biochemistry, Heraklion, Greece*

Background and Goal of Study: Peri-operative Acute Kidney Injury (AKI) is a common and serious complication after major surgery. Whereas peri-operative risk factors associated with AKI after cardiac surgery have been well described [1], this is not the case for major non-cardiac surgery. Recently, the impact of a high chloride load on the pathogenesis of AKI has been suggested.

This study was performed in order to identify possible intra-operative risk factors linked to peri-operative AKI development in a group of non-cardiac surgery patients.

Materials and Methods: This single-centre, prospective observational study included adults undergoing elective major abdominal (including vascular) surgery. Patients with chronic kidney disease (CKD) stage IV or V were excluded. AKI was defined according to Acute Kidney Injury Network (AKIN) criteria within 48 hours after surgery [2]. Patients pre-operative demographics (sex, age, hypertension, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, diabetes mellitus, CKD stage) and intra-operative anaesthetic management (type of surgery, intravenous fluids, blood products, vasopressors, mean arterial blood pressure, urine output and blood loss) were evaluated as possible AKI predictors. Furthermore, chloride ion content of intra-operatively administered crystalloids and colloids was estimated.

Results and Discussion: Of 61 patients (47 males) included in the study, 10 (16.4%) developed postoperative AKI (AKI group) and 51 did not (non-AKI group). Four intra-operative variables were identified as predictors of AKI: Intra-operative blood loss (p=0.002), transfusion of fresh frozen plasma (p=0.004) and red blood cells (p=0.038), as well as high intra-operative chloride load (p=0.033, AUC=0.715±0.095, cut-off value >500mEq). The remaining pre- and intra-operative variables did not differ significantly between the two groups.

Conclusion(s): Isotonic saline administration has recently been associated with post-operative AKI, possibly as a result of the excess chloride load during cardiac surgery [3]. Our study's preliminary results indicate that a high intra-operatively administered chloride load is strongly associated with increased risk of post-operative AKI in patients undergoing elective major non-cardiac surgery.

References:

- O'Neal J et al.: Crit Care 2016; 20 (187):2-9
- Acute Kidney Injury Work Group: Kidney Intern 2012; 2:1-138
- Kim JY et al.: Crit Care 2015; 19:350

14AP04-1

Apelin: new treatment for postoperative cognitives dysfunction?

Labaste F.¹, Delort F.¹, Vinel C.², Frances B.², Dray C.², Minville V.¹

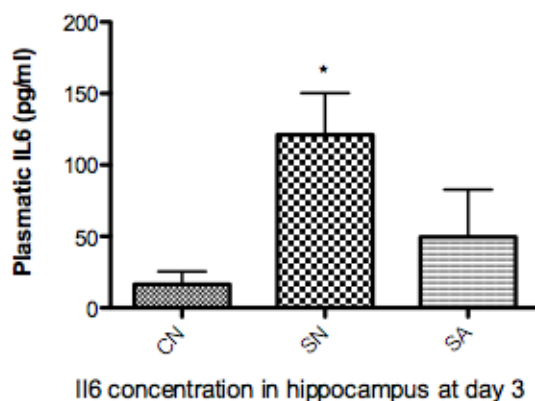
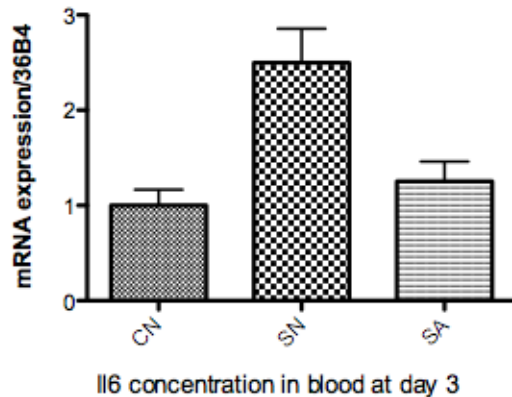
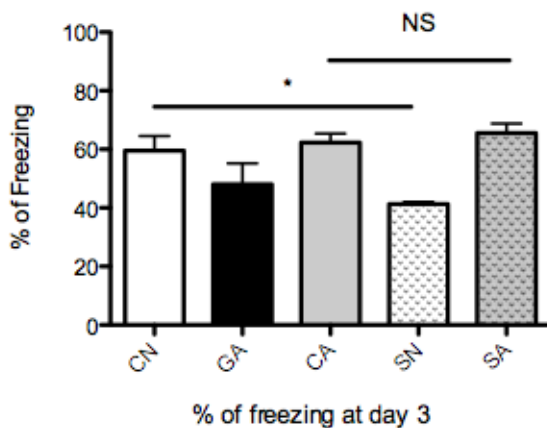
¹*Toulouse University Hospitals, Dept of Anaesthesiology & Intensive Care, Toulouse, France*, ²*INSERM I2MC Équipe 3, Research and Development Department, Toulouse, France*

Background: Postoperative cognitive dysfunction (POCD) is a common complication observed after surgery in elderly and is tightly associated with increased morbidity and mortality.¹ The main physiopathological hypothesis underlying is based on the occurrence of postoperative neuroinflammation. In this context, we identified apelin, peptide with anti-inflammatory and neuroprotective activities as a potential therapeutic strategy to counteract POCD.²

Materials and Methods: Surgery consisted of a closed tibia fracture of the right paw with intramedullary fixation under general anesthesia with sevoflurane (6%) and sufentanil (0,15ug). Experiments were conducted using 22 months C57Bl6/j male mice. Memory was assessed using a fear conditioning protocol (FC). Protocol was carried out into three steps: first a learning phase with FC, second surgery.

1 hour after, third at day 3 the postoperative memory test with mesure of freezing rate. POCD was objectified in the case of reduction in freezing rate. Treatment consisted of a daily intraperitoneal injection of 0.015 $\mu\text{mol/day}$ of apelin or same volume of 9 % NaCl. First injection occurred 1 hour before surgery. At day 3, mice were sacrificed. Inflammation was measured in blood and hippocampe using IL6 rt-PCR. Five groups of mice were performed : control with NaCl treatment (CN), control with apelin treatment (CA), surgery with NaCl treatment (SN), surgery with apelin treatment (SA), and a general anesthesia without fracture or treatment (GA). Data were subjected to an ANOVA statistical test.

Results and Discussion: Only surgery induced POCD, SN mice had a significantly reduced freezing rate compared to CN mice (35% vs 59%, $p < 0.05$). Apelin did not improved memory capacities, freezing was similar in CN and CA mice (57% vs 62%, NS). Apelin warned POCD, level of freezing was similar in CN and SA (57% vs 65%, NS) or CA and SA (62% vs 65%, NS). At day 3, apelin reduced IL6-inflammation in blood and hippocamp.



[Postoperative freezing and inflammation]

Conclusion: Perioperative treatment with apeline reduced postoperative cerebral inflammation and prevent POCD. Apeline appears to be a promising treatment of POCD.

References:

1. Deiner BJA, 103, i41
2. Cheng, Peptides 37, 171

14AP04-2

Impact of Terlipressin infusion during and after live donor liver transplantation on incidence of acute kidney injury. A randomized controlled trial

Abdel Raouf M.¹, Abou Elenain K.², Al Sebaey A.¹, Said H.¹, Afifi M.², Yassen K.¹

¹National Liver Institute, Menoufiya University, Dept of Anaesthesiology, Shebin El Kom, Egypt, ²Faculty of Medicine, Menoufiya University, Dept of Anaesthesiology, Shebin El Kom, Egypt

Background and Goal of Work: Acute kidney injury (AKI) with liver transplantation is not uncommon. Impact of Terlipressin infusion on AKI, haemodynamics (systemic and hepatic) and serum concentration of Neutrophil Gelatinase Associated Lipocalin (NGAL) was studied.

Methods: A double-blinded prospective randomized controlled trial. (NCT02059460, USA). After Local ethics committee approval and informed consent, 55 recipients were enrolled (5 excluded). Terlipressin (T), ($n = 25$) vs Controls (C), ($n = 25$). Intra and post-operative infusion of T was administrated at a rate of 1-4 $\mu\text{g/kg/h}$ for 5 days. Norepinephrine was used to maintain mean arterial pressure (MAP) > 65 mmHg. Haemodynamic management and fluids administration were guided by TED intra-operatively. Renal functions, urine output, liver enzymes, peak portal vein blood flow velocity (PPV) and hepatic artery resistive index (HARI) were recorded. Enzyme linked immunosorbent assay (ELISA Antibody shop, Denmark) was used for NGAL measurement in serum.

Results: Mainly 96% of T and 76% of C were Hepatitis C positive. Age, sex, MELD score and renal functions were comparable. Postoperative AKI incidence and NGAL concentrations were not significantly different between T and C groups (44% vs 48%, $P = 0.777$ and 112.5 ± 9 vs 93.1 ± 8 ng/ml, $P = 0.44$, respectively), but intraoperative NGAL in both groups increased significantly 2hr post reperfusion ($P < 0.05$). NGAL readings at different measuring points showed no significant difference between recipients developing AKI ($n = 23$) and others with no AKI ($n = 27$), ($p > 0.05$).

Receiver operator characteristic (ROC) analysis demonstrated that NGAL could not significantly discriminate between AKI and non-AKI ($p > 0.05$). MAP was maintained in both groups with less SVR fluctuations observed with T and hence a reduced need for norepinephrine. Median [IQR] norepinephrine consumption in T vs C (8[0-12] vs 12[8-20] mg, $P = 0.04$, respectively). Lactate, liver enzymes, PPV and HARI of the graft were not affected by T at any stage, ($P > 0.05$).

Conclusion: Terlipressin infusion did not provide renal protection for the recipients in this trial. Observed reduction in intraoperative SVR fluctuations with T helped to maintain MAP with less catecholamines, this effect need to be studied further. Intraoperative serum NGAL was unable to provide evidence for its possible role to discriminate AKI developing recipients from non-AKI. Terlipressin did not affect the graft hepatic circulation in this study.

14AP04-3

Efficacy and safety of parecoxib for the treatment of pain following total knee arthroplasty in Korean patients

Noyes Essex M.¹, Choi H.-Y.², Bhadra Brown P.³, Cheung R.⁴

¹Pfizer Inc, Global Medical Affairs, New York, United States, ²Pfizer Pharmaceutical Korea Ltd, Medical, Seoul, Korea, Republic of, ³Pfizer Inc, Statistics, New York, United States, ⁴Pfizer Inc, Medical, New York, United States

Objective: Pain is subjective, with many factors, including ethnicity, affecting patient response to therapy. Parecoxib, an injectable cyclooxygenase-2 inhibitor, has demonstrated efficacy and safety in several postoperative models

of pain. This double-blind, randomized placebo-controlled study assessed the analgesic efficacy and safety of parecoxib for pain following total knee arthroplasty in Korean patients.

Methods: Korean patients ≥ 18 years of age who experienced moderate or severe postoperative pain within 6 hours after the end of PCA were administered a single dose of 40 mg parecoxib IV or placebo the day following unilateral knee replacement surgery. Patients self-rated pain intensity (on a scale from 0 = none to 3 = severe) and pain relief (on a scale from 0 = none to 4 = complete) at time points from 15 minutes to 24 hours post-dosing.

Patient's Global Evaluation of Study Medication (on a scale from 1 = poor to 4 = excellent) was recorded upon treatment completion. Safety was assessed through the occurrence of adverse events (AEs).

Results: The patient population (placebo=58; parecoxib=58) was predominantly female ($\geq 97\%$) and had a mean age of approximately 67 years.

Mean pain intensity difference was significantly greater in the parecoxib group compared with placebo starting at 1 hour post-dose and continuing throughout the 24 hour evaluation period (all $p < 0.05$). Mean pain relief was significantly greater in the parecoxib group compared with placebo beginning at 1.5 hours post-dose and continuing until the end of the 24 hour treatment period (all $p \leq 0.001$).

Median time to rescue medication (provided at the investigator's discretion) was also significantly longer with parecoxib (21.5 hr) compared with placebo (4.1 hr; $p < 0.001$). Fifty-two percent of the parecoxib group took rescue medication compared with 89% of the placebo group ($p < 0.001$). A greater proportion of parecoxib-treated patients (70%) rated study medication as good or excellent compared with placebo-treated patients (24%). Most AEs were mild to moderate and occurred at similar rates in both treatment groups.

Conclusions: Intravenous 40 mg parecoxib provided significant analgesia and was well-tolerated in Korean patients following total knee arthroplasty. Sponsored by Pfizer Inc.

14AP04-4

Pharmacokinetics of single dose prophylactic gentamicin during cardiac surgery

Harky A.¹, Cherian B.P.², Satya D.², Smith A.³, Shipolini A.⁴, Serafino Wani R.L.²

¹St. Bartholomew's Hospital, Dept of Anaesthesiology & Intensive Care, London, United Kingdom, ²Barts Heart Centre, St.

Bartholomew's Hospital, Department of Infection, London, United Kingdom, ³Barts Heart Centre, St. Bartholomew's Hospital, Dept

of Anaesthesiology & Intensive Care, London, United Kingdom,

⁴Barts Heart Centre, St. Bartholomew's Hospital, Department of Cardiothoracic Surgery, London, United Kingdom

Background: Perioperative antibiotics prophylaxis plays an important role in reducing rate of surgical site infections (SSI). Combined use of aminoglycoside and beta-lactam antibiotics is the preferred prophylactic antibiotics combination. Maintaining safe and effective level of either antibiotics is important to achieve this.

We conducted a quality improvement project to assess whether patients undergoing cardiac surgery have adequate level of gentamicin peri-operatively and within 24 hours of surgery.

Methods: All patients evaluated in this study had an estimated glomerular filtration rate (eGFR) > 50 . All patients undergoing cardiac surgery received 1 gram of Flucloxacillin and 5mg/kg of gentamicin (maximum of 450 mg) as single dose at time of induction of anaesthesia, three further doses of flucloxacillin was given at 4 hourly intervals.

In the first phase of the study, 15 electively admitted patients for cardiac surgery were randomly selected. Serum gentamicin levels were monitored at 4 time points (30 mins, 90 mins, 240 mins and 300 mins after first dose).

The second phase of the study involved monitoring serum gentamicin levels of another 15 randomly selected elective patients at time of arrival to intensive care unit (4-6 hrs from first dose of gentamicin) and thereafter every four hours for the first twenty-four hours.

Results and Discussion: During first phase, mean pre-operative creatinine level was 83 $\mu\text{mol/L}$; all fifteen patients had gentamicin peak concentration of > 10 mg/L during surgery, and all but one patient had gentamicin level between 4-10 mg / L by the time of arrival to ICU (4-6 hours after first dose), mean eGFR was 77 mL/min and mean creatinine was 92 $\mu\text{mol/L}$ during first 24 hours in ICU. For second phase patients mean pre-operative creatinine level was 103 $\mu\text{mol/L}$. Gentamicin levels showed slow and steady clearance match-

ing Hartford nomogram for gentamicin clearance; at first 8 hours of ICU stay all but one patient had serum gentamicin level of approximately 2 mg/L; mean eGFR was 78 mL/min and mean creatinine was 84 $\mu\text{mol/L}$ postoperatively.

Conclusion(s): A single 5mg/kg dose of gentamicin used in antibiotic prophylaxis at our centre achieved adequate serum concentration to be effective for the entire duration of cardiac surgery (for up to 24 hrs) and therefore additional dose of gentamicin is not indicated for surgical prophylaxis in cardiac surgery and is more likely to cause harm (nephro and oto-toxicity) than clinical benefits.

14AP04-5

Intravenous Infusion of N-acetylcysteine in cirrhotic patients undergoing liver resection attenuates the postoperative increase in liver enzymes, C reactive protein and intercellular adhesion molecule 1. A randomized controlled trial

Yassen K.¹, Sayed E.¹, Gaballah K.², Abou Elenain K.², Said E.¹

¹Liver Institute Menoufiya University, Dept of Anaesthesiology & Intensive Care, Sheeben El Kom, Egypt, ²Faculty of Medicine, Menoufiya University, Dept of Anaesthesiology & Pain Medicine, Sheeben El Kom, Egypt

Background and Aim of the Work: Liver resection can lead to a temporary degree of hepatocellular dysfunction. Aim is to evaluate the effect of N-acetylcysteine (NAC) on Liver enzymes (Alanine aminotransferase (ALT) and aspartate aminotransferase (AST)), International normalized ratio (INR), C reactive protein (CRP) and intercellular adhesion molecule 1 (ICAM 1) in cirrhotic patients undergoing liver resection.

Methods: A prospective, randomized, double-blind trial with Ethics Committee approval, Pan African Clinical Trial Registry (PACTR201508001251260) and consent. 60 cirrhotic patients Child A undergoing liver resection. NAC group ($n = 30$) received intravenous infusion of NAC 10 g/24 h in 250 ml of 5% dextrose during parenchymal transection and for 2 days. Controls ($n = 30$) received a similar volume of 5% dextrose. Guide anaesthesia depth with Patient State Index (PSI) of SED Line (Massimo, Irvine, CA). Intraoperative Transoesophageal Doppler (TED) for fluid and haemodynamics optimization. Metabolic gas monitoring for oxygen consumption (VO_2) and oxygen delivery (DO_2). ALT, AST, INR, CRP and ICAM 1 were compared.

Results: ALT and AST increased above the baseline levels in both groups post operatively on Day 3, this increase was reduced with NAC compared to Controls (118.3 ± 18.6 vs. 145.4 ± 14.03 U/L, $P = 0.00$) and (121.5 ± 19.5 vs. 146.6 ± 15.1 U/L, $P = 0.00$) respectively, Lower serum CRP and ICAM 1 was reported in NAC vs. Controls during the same time interval (day 3) (44.2 ± 13.4 vs. 68.7 ± 48.2 mg/L, $P = 0.003$), (308.8 ± 38.2 vs. 352.8 ± 59.4 ng/ml, $P = 0.002$) respectively. Chest infection was also noted to be lower and hospital stay shorter for NAC vs Controls, (2 (6.7%) vs. 6 (20.0%)) and (6.1 ± 0.84 vs. 6.9 ± 1.18 days, $P = 0.006$) respectively. Duration of surgery, INR, haemodynamics, DO_2 and VO_2 were comparable.

Conclusion: Intravenous administration of NAC in cirrhotic patients during and after liver surgery attenuated the anticipated post-operative hepatic dysfunction as indicated from the reduced increase in transaminases, ICAM 1 and CRP blood level. A larger scale study is recommended to investigate the economic impact of NAC practice in this population in view of associated reduction in chest infection and hospital stay with enhanced recovery.

14AP04-6

The combination of Nefopam and remifentanyl is more effective to prevent the rocuronium-associated injection pain and withdrawal response compared with remifentanyl alone. A prospective, double-blinded, randomized control study

Kim D.J.¹, Kim S.H.¹, An T.H.²

¹Chosun University Medical School, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of, ²Chosun University Hospital, Dept of Anaesthesiology & Pain Medicine, Gwangju, Korea, Republic of

Background and Goal of study: Rocuronium-associated injection pain and withdrawal response (IPWR) has been effectively prevented by pretreatment of lidocaine, serotonin receptor antagonists, or opioids. Recently, nefopam has been introduced as non-narcotic, nonsteroidal, central acting analgesics, which also has a similar mechanism with serotonin, norepinephrine, and dopamine receptor antagonists. Therefore, we investigated the combination effect of nefopam and remifentanyl on the hypothesis that nefopam would provide the additional effect to prevent the rocuronium-associated IPWR.

Material and methods: After Institutional Review Board approval, patients, aged between 20 to 65 years old, ASA I or II, were enrolled. We excluded the patients with glaucoma, medication of anticonvulsants, antidepressant or opioids. Seventy six patients were randomly allocated to one of 2 groups. Normal saline 100 ml with (group N, n=37) or without (group C, n=38) nefopam (20 mg) was infused at 100 ml/h 1 hour before surgery. Anesthesia was induced with 2.0 ng/ml of remifentanyl and 3 µg/ml of propofol with a target site concentration infusion device. Intubation was performed after injection of rocuronium (0.6 mg/kg) and the grades of rocuronium-associated IPWR (0: no response, 1: wrist withdrawal, 2: arm only, 3: generalized movement) were evaluated. The grade >1 was used as cutoff value with significant rocuronium-associated IPWR. We recorded the arterial pressures, heart rate, and respiratory rate at arriving operating room, after anesthesia induction, and 1 min post-injection of rocuronium. All measured values are presented as mean (95% confidential intervals) or number of patients (%). The statistical analysis was performed by t-test, or χ^2 test. $P < 0.05$ was considered to indicate statistical significance.

Results and Discussion: One patient in group N was excluded due to nausea and vomiting during infusion of nefopam. The incidence of no response of rocuronium-associated IPWR was significantly higher in group N with 70.3% than that in group C with 39.5% ($P = 0.007$). There were no significant differences in the age, sex, height, weight, ASA physical status, arterial pressures, heart rate, and respiratory rate between group C and N.

Conclusion: The infusion of nefopam (20 mg) 1 h pre-induction provide the significant synergic positive effect to attenuate IAHCs with stable hemodynamics than remifentanyl infusion alone with 2.0 ng/ml of target site concentration.

14AP04-7

Liposome-encapsulation increases the bioavailability of midazolam on oral administration

Tanimura H.¹, Mori-Yoshioka M.², Honda-Wakasugi Y.¹, Higuchi H.², Maeda S.², Miyawaki T.¹

¹Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Dental Anesthesiology and Special Care Dentistry, Okayama-shi, Japan, ²Okayama University Hospital, Dental Anesthesiology, Okayama-shi, Japan

Background and Goal of Study: The oral administration of midazolam has often been used for sedation in pediatric patients. However, its bioavailability is low on oral administration because it is metabolized in both the intestine and liver at a high rate. Liposomes have been developed as vesicles encapsulating various kinds of drug to serve as a medical drug-delivery system. We developed liposome-encapsulated midazolam for oral administration. The purpose of the present study was to evaluate the bioavailability of liposome-encapsulated midazolam after oral administration in rabbits.

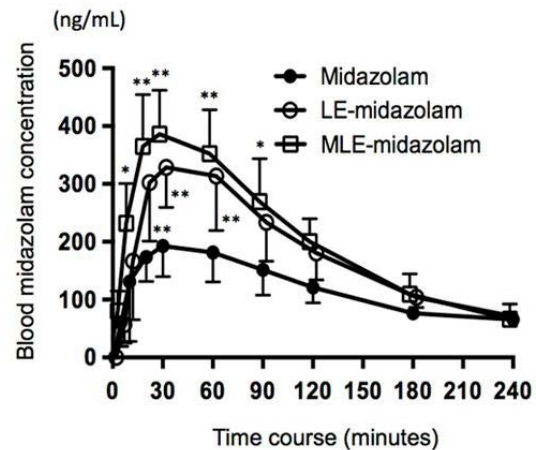
Materials and Methods: Liposome-encapsulated midazolam was produced from hydrogenated L- α -phosphatidylcholine, cholesterol, dipalmitoylphosphatidic acid, polyethylene glycol, and midazolam. A lipid film produced from the mixed materials was suspended and briefly sonicated in a water

bath, resulting in the production of liposome-encapsulated midazolam (LE-midazolam). Furthermore, because smaller liposomes are expected to be efficiently absorbed from the intestine, we also produced miniaturized liposome-encapsulated midazolam (MLE-midazolam) using a sonic vibrator with ultrasonic waves.

After being approved by the Animal Care and Use Committee, we conducted experiments using 13 male New Zealand white rabbits (10-11 weeks old). LE-midazolam, MLE-midazolam, or midazolam solution was orally administered at the same dose of 2 mg/kg, and blood samples were collected until 6 hours after the administration. Blood midazolam concentrations of the samples were measured using HPLC, and analyzed using two-way ANOVA followed by Turkey's multiple comparisons test.

Results and Discussion: Blood midazolam concentrations in rabbits administered LE-midazolam and MLE-midazolam solutions were significantly higher than that in rabbits administered midazolam solution (Fig. 1). It is possible that the encapsulating liposomes inhibited the metabolism of midazolam and/or increased its absorption in the intestine.

Conclusion: The results of the present study indicate that liposome-encapsulation increases the bioavailability of midazolam on oral administration.



[Fig. 1: Blood midazolam concentration after oral administration
LE-midazolam: liposome-encapsulated midazolam solution
MLE-midazolam: miniaturized liposome-encapsulated midazolam solution
* $p < 0.05$, ** $p < 0.01$ vs. midazolam]

14AP04-8

Assessment of the antiaggregant effect of ibuprofen in healthy subjects: IBU-Agree study

Ribera A.¹, Llau J.², Ferrandis R.³

¹University of Valencia, Human Physiology Department, Valencia, Spain, ²Hospital Clinico Universitario, Dept of Anaesthesiology & Intensive Care, Valencia, Spain, ³Hospital La Fe, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background and Goal of Study: Nonsteroidal anti-inflammatory agents (NSAIDs) have an antiaggregant effect by inhibiting steps in thromboxane A₂ (TxA₂)-mediated platelet activation (1). Until now, this effect has not been fully assessed compared with aspirin (ASA). The objective of this study is to determine if the administration of an oral standard dose of ibuprofen (600 mg) is able to produce an antiaggregant effect similar to the one produced by ASA (100-300 mg, therapeutic range).

Materials and Methods: IBU-Agree is a descriptive study, made in healthy subjects taking a 600 mg tablet of ibuprofen because of moderate headache. They had no any haemostasis complication history (Rapaport classical questions (2) were included also to support it). Subjects taking any NSAID or garlic tablets less than 3 days before were not included. A sample of 3 ml of whole blood was obtained through venous puncture before 180' after the intake (ibuprofen T_{max}: 90'-150').

To assess the antiaggregation power of ibuprofen, we used the specific ASA kit for the device VerifyNow® (Accumetrics, Inc., San Diego, CA-USA). The results are shown in ARU (Aspirin Reactive Units): >550 ARU means a normal platelet reactivity without dysfunction related with ASA or similar

drugs; <550 ARU means antiaggregation related with the mechanism of action of ASA. As it is a descriptive study, no statistics is needed.

Results and Discussion: 14 healthy subjects were included (10 M, 4 F). Age range was 22-54 y and body weight range was 43-89 kg. The samples were obtained between 100' and 165' after the intake of ibuprofen. The results showed that 13/14 subjects were antiaggregated at that time (ARU range 350-490) and 1/14 subject was no antiaggregated (ARU 591).

Conclusion(s): The results of this study show that the intake of 600 mg of ibuprofen induces an antiaggregated state similar to the one after the therapeutic administration of ASA (100-300 mg). Although more studies are needed to confirm if this antiaggregated state could be related with a haemorrhage tendency, we could anticipate that patients with haemostatic disturbances or fragile ones should avoid the intake of NSAIDs, mainly in the perioperative period.

References:

1. Armstrong AW, Golan DE. Pharmacology of hemostasis and thrombosis. LWW, 2008, Baltimore-PA.
2. Rapaport SI. Preoperative hemostatic evaluation: which test if any?. Blood 1983;61:229-31.

14AP04-9

Role of Cannabinoid 2 Receptor Activity in post CNS injury immunodeficiency

Burkovskiy I., Cerny V., Zhou J., Lehmann C.
Dalhousie University, Dept of Anaesthesiology & Pain Medicine, Halifax, Canada

Background and Goal of Study: Patients after acute CNS injury have a high risk for an infection due to post-injury disturbance of the normally well-balanced interplay between the immune system and the CNS resulting in systemic immunosuppression. The endocannabinoid system (ECS) is composed of endocannabinoids, specific receptors and metabolizing enzymes, and is involved in key homeostatic functions in the CNS and the immune system. It is suggested that local upregulation of the ECS occurs following CNS injury and represents an adaptive mechanism. Cannabinoid type 2 receptors (CB2R) are expressed in higher levels on microglia and peripheral immune cells and is shown to have an immunosuppressive role, suggesting that the activation of CB2R may be contributing to the immunosuppression seen after CNS injury. Our pharmacological approach presents experimental evidence that targeting the CB2R may have beneficial effects on the outcome after an acute CNS injury.

Materials and Methods: CNS injury was induced in C57Bl/6 mice (male, 6-8 weeks) via surgical ligation of LCCA and exposure to low oxygen atmosphere, as well as a second model of an intracerebral injection of the vasoconstrictor peptide, endothelin-1 (ET-1, 2µg/µl). Immune response to lipopolysaccharide (LPS) challenge was assessed 24 hr later using intravital microscopy within the intestinal microcirculation. The brain tissue was extracted and stained with tetrazolium chloride (TTC) to confirm CNS injury. The effect of genetic CB2R knockout on the severity of CIDS was also assessed.

Results and Discussion: Consistent with the induction of CIDS, intravital microscopy confirmed that immunochallenged animals with CNS injury have a reduced count of activated leukocytes within the intestinal microcirculation when compared to immunochallenged animals without CNS injury. AM630 (2.5 mg/kg, i.v.) administration 15 min prior to LPS challenge, reversed this measure of suppressed immune function and did not have any detrimental impact on the infarct size. Genetic knockout of CB2R revealed that the CIDS was not induced after an acute CNS injury, confirming the involvement of the ECS in CIDS. Early administration of HU308 (2.5 mg/kg, i.v.) provided neuroprotective effect by reducing the size of CNS Injury.

Conclusion: Our findings suggest that CB2R pathway may be directly involved in post CNS injury pathophysiology. Various treatment time points, as well as pharmacologic confirmation of CB2R pathway involvement is needed.

14AP05-2

6MWT and Stop Bang Index for the preoperative evaluation of obese patients

Miccichè V., Spagnuolo M., Scarpati G., Piazza O.
University of Salerno, Dept of Anaesthesiology & Intensive Care, Salerno, Italy

Background and Goal of Study: Obese patients have a higher perioperative risk than other patients because of pathophysiological changes and technical difficulties related to high weight. A prospective pilot study was conducted to assess the possibility to use a functional test, the Six Minute Walk Test (6MWT) (1) and a questionnaire, the STOP BANG (2), in the preoperative risk evaluation of obese patients scheduled for non cardiac surgery.

Materials and Methods: At the preoperative visit, 6MWT was performed and the distance travelled in meters recorded; obstructive sleep apnea was evaluated by STOP BANG questionnaire and Stop Bang Score was calculated. Postoperative cardiopulmonary complications were monitored for 48h from surgery. Statistical analysis between groups was performed with the Mann-Whitney test, by setting the level of statistical significance for p 0.05.

Results and Discussion: 45 obese patients were operated and completed the follow up (15 males and 30 females, aged 60 ± 10.7). Six obese patients developed postoperative cardiopulmonary complications: 4 hypoxic respiratory failures, 1 supraventricular arrhythmia, 1 angina at rest. The distance travelled during the 6 MWT by patients who developed any cardiopulmonary complications is significantly shorter (and always less than 400meters) than the distance travelled by patients who did not developed these complications. Moreover, the Stop Bang Score was significantly higher for obese patients who developed postoperative complications. Mean values of the score and the distance travelled of the two groups are shown in table 1.

	Cardiopulmonary complications	No cardiopulmonary complications	p value
STOP BANG score	5 ± 0.6	2.6 ± 0.8	0.0001
6MWT (meters)	315 ± 54.7	385.6 ± 68.6	0.01

[Table 1]

Conclusions: 6MWT and STOP BANG predict the risk of cardiopulmonary complications in obese surgical population. Further studies are needed to confirm these results.

References:

1. Acquistapace F et al. Monaldi Arch Chest Dis. 2009 Mar;72(1):3-9
2. Chung F et al. Anesthesiology. 2008 May; 108(5):812-21

14AP05-3

Unnecessary preoperative investigations: a quality improvement project at a district general hospital in UK

Dutta B., Somanath S.
NHS, Dept of Anaesthesiology, Newcastle upon Tyne, United Kingdom

Background and Goal of Study: Preoperative investigations are essential components of the preoperative care process to determine fitness for surgery/ anaesthesia. Although there are obvious advantages of doing preoperative investigations, there are potential disadvantages as well, which includes increased cost and false positive test results.

The goal of this project was to improve the standards of the preoperative assessment in our hospital by completing a loop of two audit cycles.

Materials and Methods: This retrospective audit was carried out in two cycles involving 50 patients in each audit cycle. Each of the audit cycles was carried out for one week. A proforma was prepared, based on the Royal College of Anaesthetists' Audit Recipe Book, which was taken as the standard and data were collected.

Following the first audit cycle, data were analyzed and then distributed across the preoperative assessment team. This was followed by circulation of the existing trust guidelines and the required changes.

The second audit cycle was carried out after a month.

Results and Discussion: There was a conscious effort from the preoperative assessment team to appropriately prescribe preoperative investigations. The total number of unnecessary investigations in the first audit was 44; which

decreased to 21 in the second. This led to substantial financial savings for the trust as well.

The reference range of a laboratory investigation is set arbitrarily based on 95% confidence interval. Therefore, up to 5% of normal individuals may have abnormal values and vice versa[1]. False-positive test results can lead to performance of further unnecessary tests in patients.

It is also a misconception that obtaining battery of routine tests provides medico-legal protection against liability[2].

Conclusion(s): Performing routine tests in all surgical patients as a screening tool is inefficient, unnecessary, and expensive.

Our audit has resulted in a substantial saving associated with preoperative testing.

References:

1. Fleisher LA. Preoperative evaluation. In: Barash PG, Cullen BF, Stoelting RK, Cohalen M, Stock MC, editors. *Clinical Anaesthesia*. 6th ed. Lippincott Williams and Wilkins; 2009. pp. 473-89.

2. Olson RP, Stone A, Lubarstry D. The prevalence and significance of low preoperative hemoglobin in ASA I or II outpatient surgery candidates. *Anesth Analg*. 2005;101:1337-40.

Acknowledgements: We sincerely thank the preoperative assessment team of the University Hospital of North Durham, UK.

14AP05-4

Early predictive markers of peri-operative Acute Kidney Injury in non-cardiac major surgery

Marouli D.¹, Chatzimichali A.², Syrogianni P.², Kolyvaki S.³, Papaioannou A.²

¹University Hospital Heraklion, Dept of Intensive Care, Heraklion, Greece, ²University Hospital Heraklion, Dept of Anaesthesiology, Heraklion, Greece, ³University Hospital Heraklion, Department of Biochemistry, Heraklion, Greece

Background and Goal of Study: Peri-operative Acute Kidney Injury (AKI) is a well defined entity associated with significant morbidity and mortality. While several serum and urine AKI biomarkers have been identified in the cardiac surgery population [1], the predictive value of those markers in non-cardiac surgical patients has not been extensively studied. The aim of this prospective observational study was the evaluation of different prognostic biomarkers in a cohort of patients undergoing elective major surgery.

Materials and Methods: 61 patients, 67.1 ± 10 years old, with no chronic kidney disease (CKD) stage IV or V undergoing elective major abdominal surgery were studied. AKI was defined according to Acute Kidney Injury Network (AKIN) criteria within 48 hours after surgery [2]. At pre-defined time points [Pre-op (pre-operatively), RR (recovery room), Post-op (24 & 48 hours post-operatively)] the following biomarkers were measured: Serum creatinine (Scr), Cystatin C (Scyst), Retinol Binding Protein (SRBP), urine α 1-microglobulin (Ua1-micr), β 2-microglobulin (U β 2-micr), Transferrin (Utransf) and Albumin (Ualb). Fractional excretion of sodium (FeNa) and urea (FeUr) were calculated as well.

Results and Discussion: 10 out of 61 patients (16.4%) developed AKI. An elevated Pre-op Ua1-micr value ($p=0.032$), as well as elevated RR levels of Scyst ($p=0.004$) were strongly associated with peri-operative AKI development. At 24hrs, post-op Scyst ($p=0.001$), SRBP ($p=0.002$), Ua1-micr ($p=0.002$), FeNa ($p=0.01$) and FeUr ($p=0.007$) were also strong markers of AKI. The remaining markers did not differ significantly between the two groups.

Conclusion(s): Urine α 1-microglobulin and serum RBP have been recognised as markers of early tubular damage in diabetic nephropathy [3]. Our preliminary results identified these two low-molecular weight proteins as possible early markers of peri-operative AKI in a well-defined cohort of non-cardiac surgical patients. With the exception of diabetic nephropathy and acute-on-chronic renal injury, this is the first study recognising the potential of these two novel biomarkers for early prediction of peri-operative AKI.

References:

- Schley G et al.: *PLoS ONE* 2015; 10(12)
- Acute Kidney Injury Work Group: *Kidney Intern*. 2012; 2:1-138
- Nikolov G et al.: *Scripta Scientifica Medica* 2013; 45(3):58-64

14AP05-5

Palonosetron versus ondansetron for prevention of nausea and vomiting after abdominal hysterectomy under spinal anesthesia: randomized, double-blinded clinical trial

Campos G.O.¹, Jesus G.N.¹, de Oliveira P.R.R.², Lessa C.N.², Alves R.L.¹, Módolo N.S.P.³

¹Hospital São Rafael, Dept of Anaesthesiology, Salvador, Brazil,

²Hospital São Rafael, Dept of Gynecology, Salvador, Brazil, ³FMB/UNESP - Universidade Estadual Paulista, Dept of Anaesthesiology, Botucatu, Brazil

Background and Goal of Study: Hysterectomy is a widely-performed surgery around the world and neuraxial anesthesia with morphine is the preferred method of anesthesia due to better postoperative pain control. Postoperative nausea and vomiting (PONV) however is a frequent problem when spinal morphine is used. Palonosetron is a potent and long lasting serotonin antagonist that is effective in preventing PONV after general anesthesia¹. Its action after neuraxial anesthesia is not well established. We aimed to compare palonosetron with ondansetron for PONV prophylaxis when spinal anesthesia with morphine as an additive is used in high risk patients for its occurrence. The hypothesis was that palonosetron provides better PONV control than ondansetron in this scenario.

Materials and Methods: After ethics committee approval, 140 healthy patients eligible for abdominal hysterectomy under spinal anesthesia were recruited. They all received spinal anesthesia with 15 mg of hyperbaric bupivacaine and 0.1 mg of morphine. Intravenous dexamethasone (8 mg) was administered in all patients as a multimodal approach for PONV prevention. Patients were randomly divided in two groups: group P received 0.075mg palonosetron intravenously and group O received 4 mg of ondansetron intravenously before beginning of surgery.

The primary outcome was PONV incidence during hospital stay. Additionally, nausea and vomiting were analyzed separately, and divided into early (≤ 6 h) or late (> 6 h) events. A validated questionnaire was used to determine clinical importance of PONV and overall satisfaction. Non-parametric statistical tests were used to compare groups.

Results and Discussion: Total PONV incidence was 42.9% on group P and 52.9% on group O ($p = 0.23$). Early nausea (21.4% vs 27.1%, $p = 0.43$), late nausea (30% vs 35.7%, $p = 0.47$) and early vomiting (14.3% vs 20%, $p = 0.37$) was not either significantly different between groups.

Late vomiting was less frequent in palonosetron group (11.4% vs 27.1%, $p = 0.018$). Clinically important PONV had a low incidence in both groups (2.8% vs 5.7%, $p > 0.05$), and there was no difference on patients satisfaction.

Conclusion: Compared to ondansetron, palonosetron reduces the incidence of late vomiting after abdominal hysterectomy under spinal anesthesia and subarachnoid morphine.

References: 1. Singh PM, Borle A, Gouda D, et al. Efficacy of palonosetron in postoperative nausea and vomiting (PONV) - A meta-analysis. *J Clin Anesth* 2016; 34: 459-82

14AP05-6

The use of computerized physician order entry with clinical decision support reduces practice variance in ordering preoperative investigations: a before-after study

Sim E.¹, Tan D.J.A.², Abdullah H.R.¹

¹Singapore General Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore, ²Duke-NUS Medical School, MD Program, Singapore, Singapore

Background and Goal of Study: Over-ordering of routine preoperative investigations is prevalent and leads to excessive healthcare expenditure. International and institutional guidelines are present to reduce variances in physician ordering practices. However, adherence to these guidelines still differ among physicians. Our institution integrated a Clinical Decision Support (CDS) model into our Computerized Physician Ordering Entry (CPOE) system to guide physician orders.

Recommendations on preoperative investigations are automatically prompted based on multiple patient and surgical factors. We aim to investigate if the inclusion of CDS into CPOE increases physician adherence to institutional guidelines.

Methods: We examined the ordering patterns of routine preoperative investigations before and after the incorporation of a CDS model into the hospital's CPOE system, over a 15-month period. The CDS model recommends the appropriate preoperative investigations based on the patient's age, gender, American Society of Anesthesiologists (ASA) score and complexity of the surgery when our physicians use the CPOE to make an electronic order for the investigations. The routine preoperative tests analyzed were: Full Blood Count (FBC), Chest Radiography (CXR), Coagulation Panel (CP), Renal Panel (RP) and Electrocardiogram (ECG). We classified orders as 'match' if they followed our institution's guidelines; 'over' if they were deemed unnecessary yet ordered, and 'under' if they were deemed necessary but not ordered.

Results and Discussion: 12,958 patients were included - 8,958 patients in the pre-intervention group, and 4,006 patients in the post-intervention group. After implementation of CDS, there was a statistically significant increase in 'matched' ordering of CP, RP, ECG and CXR based on institutional guidelines ($P < 0.001 - 0.033$). No change in ordering of FBC was found, due to the high pre-existing 'match' frequency of 96.3%. The greatest change in ordering practice was found in CP - 'matched' orders increased from 65.8%-78.1%, under-ordering decreased from 22.2% to 9.3%. The increase in 'match' orders for RP, ECG and CXR were more modest (1.2% to 3.9%). ECG and CXR have the lowest rates of 'matched' orders and highest rates of 'over' orders.

Conclusion: The implementation of Clinical Decision Support (CDS) model into a Computerized Physician Ordering Entry (CPOE) system has effectively reduced practice variance in ordering preoperative tests.

14AP05-7

Validation of a novel score for the identification of significant obstructive sleep apnoea in the obese surgical patients

Godoroja D.¹, Cioc A.D.²

¹Carol Davila University of Medicine and Pharmacy, Dept of Anaesthesiology & Intensive Care, Bucharest, Romania,

²Emergency County Hospital, Dept of Anaesthesiology & Intensive Care, Targu Mures, Romania

Background and Goal of Study: There is a high prevalence of undiagnosed obstructive sleep apnoea (OSA) in patients with obesity undergoing bariatric surgery. For the diagnosis of OSA and initiation of CPAP, the American Academy of Sleep Medicine recommend overnight polysomnography (PSG). However, relatively high cost, low availability, and poor patient compliance reduce the PSG applicability for certifying a diagnosis of OSA. We have previously shown that the novel score based on anthropometric and other objective measurements can identify the presence of moderate-severe OSA in obese surgical patients. We have now prospectively evaluated the score in a further cohort of patients to assess how well the cut-off we have chosen identifies severely obese patients that requires CPAP treatment.

Materials and Methods: The Anthropometric-OSA (A-OSA) score was derived following analysis of 1870 adult patients scheduled for elective laparoscopic bariatric surgery in Ponderas Academic Hospital Bucharest, Romania between January 2013 and June 2016. Using a cut-off equal or greater than 3 as positive for OSA, the A-OSA score increased probability for the diagnosis of moderate-severe OSA. To test the validity of the A-OSA score in a pre-operative setting we started a randomised pilot study in June 2016. The study was approved by research ethics committee and written informed consent was obtained from all patients. If the A-OSA score was positive (≥ 3), the anaesthetists who made the pre anaesthetic evaluation referred the patients to initiate the auto-titrated positive airway pressure (APAP) therapy. These anaesthetists were blinded to the results of polysomnography, that all patients subsequently underwent. After the patients received the CPAP treatment the groups were compared in terms of CPAP recommendation by A-OSA against the indication for CPAP as determined by PSG (at an AHI $\geq 15/h$).

Results and Discussion: Out of the 393 patients screened for OSA in 5 months, 91 (23%) patients scored positive for A-OSA (≥ 3). The correlation between the referral to CPAP using the score and the referral using the PSG was 0.559 ($p=0.001$) which also shows a "moderate" positive correlation. A-OSA score correctly predicted the presence of significant OSA in 87% of the patients.

Conclusion(s): The A-OSA score may provide a simple tool that identifies significant sleep apnoea that requires preoperative CPAP in bariatric patients without the need for formal PSG.

14AP05-8

Preanesthesia evaluation by using digital/telemedicine technologies in the Czech Republic - are our patients ready and willing to it?

Pařízek T.¹, Gál R.², Štourač P.³, Urbanec R.⁴, Vymazal T.⁵, Černý V.¹

¹Masaryk Hospital Ústí nad Labem, Department of Anaesthesiology, Perioperative Medicine and Intensive Care, Ústí nad Labem, Czech Republic, ²University Hospital Brno, Dept of Anaesthesiology & Intensive Care, Brno, Czech Republic, ³University Hospital Brno, Department of Pediatric Anaesthesiology and Intensive Care, Brno, Czech Republic, ⁴University Hospital in Ostrava, Dept of Anaesthesiology & Intensive Care, Ostrava, Czech Republic, ⁵University Hospital Motol, Dept of Anaesthesiology & Intensive Care, Prague, Czech Republic

Background and Goal of Study: Pre-anaesthesia assessment (PAA) represents an essential part of anaesthesia service. Only few papers report remote PAA by using digital telemedicine technologies (1). In the Czech Republic, there are no data describing patient's equipment and willingness to undergo PAA without direct contact to physician by using e.g. smartphone.

The aim of our study was to find out, whether patients scheduled for elective surgery own smartphone, have access to internet/e-mail and whether they would be willing to undergo PAA by using their devices, therefore without visiting pre-anaesthesia clinic. (PAC).

We hypothesized that 50% of adult patients visiting PAC would have smartphone and internet/e-mail access and that 50% of patients would agree to undergo their PAA at home.

Methods: Multicentre observational study based on simple questionnaire that adult patients had to answer at the end of their PAA. Recorded data - age, gender, level of education, ownership of smartphone, access to internet/e-mail and patients' willingness to undergo their PAA in a remote fashion. Sample size calculation - 1000 patients; obtained data were analyzed by using descriptive statistical methods.

Results: During 2 months period we obtained data from 1705 adult consecutive patients visiting PAC. Twenty patients were excluded from analysis due to incomplete or wrongly recorded data, finally data from 1685 patients were analysed. One thousand thirty four patients (61%) completed secondary school, 957 patients (57%) own smartphone, 1330 (79%) have access to internet, 1260 (75%) use e-mail. Five hundred and thirty-six patients (32%) expressed their willingness to undergo PAA by the use of any kind of digital connection, 1064 (64%) refused, 63 (4%) didn't know.

Conclusion: More than half of adult patients undergoing PAA own smartphone, most of them have internet connection and use e-mail. One third of patients expressed their willingness to undergo PAA by the use of any kind of digital connection. Pilot trial testing remote PAA in selected groups of patients seems to be feasible.

References: 1. Applegate RL et al. Telemedicine pre-anesthesia evaluation: a randomized pilot trial. *Telemed J E Health.* 2013 Mar;19(3):211-6.

Acknowledgements: In collaboration to the Czech Clinical Trials and Audit Network under Czech Society of Anaesthesiology and Intensive Care, No. CCTAN 01-2016.

14AP05-9**Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity (POSSUM) system for outcome prediction in elderly patients submitted to hip fracture emergency surgery**Teles A.R.¹, Marques de Castro J.², Mourão J.³, Azevedo L.⁴¹Hospital São João, Dept of Anaesthesiology, Porto, Portugal, ²Faculty of Medicine / University of Oporto, Dept of Anaesthesiology, Porto, Portugal, ³Hospital São João, Dept of Anesthesia, Dept of Education and Medical Simulation, Dept of Surgery, Faculty of Medicine of University of Porto, Porto, Portugal, ⁴Faculty of Medicine, University of Porto, MEDCIDS - Dept of Community Medicine, Information and Health Decision Sciences & CINTESIS - Centre for Health Technology and Services Research, Porto, Portugal**Background and Goal of Study:** Hip fractures caused by low-energy trauma are one of the most serious consequences of osteoporosis. Older adults have a 5 to 8-fold increased risk for all-cause mortality during the first 3 months after hip fracture. POSSUM and P-POSSUM are used in the assessment of outcomes in surgical patients. The aim of this study was to evaluate the performance POSSUM system (POSSUM, P-POSSUM and Orthopedic-POSSUM) on predicting 30-day morbimortality of elderly patients undergoing emergent hip fracture surgery.**Methods:** A retrospective cohort study was conducted in all elderly patients (65 or more years-old) admitted, at a University Hospital, with hip fracture, that underwent surgery, from 1st January 2014 to 31st December 2015. From 408 patients submitted to hip fracture surgery, 328 were excluded for not being submitted to emergency surgery. Data from the remaining 80 patients was retrospectively collected from the clinical files. The POSSUM system's performance and calibration for predicting mortality and morbidity were assessed. Observed vs expected morbidity and mortality were compared using area under the Receiver Operating Characteristic (ROC-AUC) curves and Standardized Mortality Ratio (SMR) and the model goodness of fit was assessed using the Hosmer-Lemeshow test (H-L T).**Results and Discussion:** The overall rate of 30 days mortality was 6.3%. The overall rate of 30 days morbidity was 38.8%. ROC curves of POSSUM system showed good discriminative ability for mortality (AUC=0.879; 95%CI 0.763-0.994) but poor for morbidity (AUC=0.647; 95%CI 0.524-0.771). All models showed good calibration and goodness of fit (H-L T p-values for O-POSSUM/POSSUM and P-POSSUM were respectively 0.4627 and 0.2476 for mortality and 0.0932 for O-POSSUM morbidity). SMR indicated significantly fewer than expected deaths for O-POSSUM/POSSUM (0.525; 95%CI 0.065-0.985) but not for P-POSSUM (1.321; 95%CI 0.163-2.479).**Conclusions:** POSSUM system is better for predicting mortality than morbidity. All models showed good calibration and goodness of fit. However, SMRs showed mixed results. We showed that POSSUM can be used for predicting 30-day mortality in elderly patients undergoing emergent hip fracture surgery.**14AP05-10****Are you throwing away time and money with unnecessary routine preoperative test?**

Amorim J., Caldeira A.

Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background and Goal of Study: Preanesthesia evaluation aims to assess the patient's clinical status and identify pathologies that can be optimized to reduce perioperative morbidity and mortality. This evaluation is based on clinical history, physical examination and routine testing. Preoperative tests are often ordered indiscriminately, without any clinical guidance. Several studies have demonstrated that they do not alter the outcome of asymptomatic patients undergoing elective surgery, and may even increase morbidity due to false positive results and unnecessary treatments. Furthermore, human and financial resources are also wasted.

The goal of this study is to evaluate the financial costs that could have been saved if preoperative tests were performed according to the NICE Guidelines - Routine preoperative tests for elective surgery, from April 2016.

Materials and Methods: Retrospective study that evaluate routine preoperative testing, including full blood counts, hemostasis tests (aPTT, PT), kidney function (electrolytes, creatinine, urea levels), electrocardiography (ECG) and chest X-ray, performed in patients who had anesthesiology consultation at Hospital Santa Maria - Centro Hospitalar Lisboa Norte, during November 2016. NICE Guidelines - Routine preoperative tests for elective surgery were used to determine the necessary tests and those that would be dispensable.**Results and Discussion:** The study sample included 165 patients, mean age 59,9 years, 37,6% were male and 62,4% female, 18,2% ASA I, 61,2% ASA II and 20,6% ASA III. All patients had full blood counts, hemostasis tests, kidney function, ECG and 163 performed chest X-ray. However, only 16,3% of full blood counts, 4,8% of haemostasis tests, 32,1% of kidney function and 35,2% of ECG were needed. All chest X-ray were considered irrelevant. Thus, according to all these test cost there was an excessive expenditure of 4185,40 euros, at Hospital Santa Maria.**Conclusion(s):** Unnecessary preoperative tests waste expensive staff time, as well as equipment and material. In addition, surgery may be delayed due to false positives and patients are wasting time, possibly away from work. If NICE Guidelines - Routine preoperative tests for elective surgery were applied, an excessive expenditure of 4185,40 euros could have been avoided in the preoperative evaluation.

Self-administered questionnaires and targeted preoperative examinations may be alternatives to routine preoperative tests.

14AP05-11**Feasibility and effectiveness of a personalised physical training program (prehabilitation) for the improvement of aerobic capacity in liver transplant candidates as a pre-surgical optimization maneuver: a pilot study**Risco Martínez R.¹, Ubre Lorenzo M.¹, García-Barberán A.², López Baamonde M.¹, Coca Martínez M.¹, Martínez-Pallí G.¹¹Hospital Clinic Barcelona, Dept of Anaesthesiology, Barcelona, Spain, ²Hospital Clinic Barcelona, IDIBAPS, Barcelona, Spain**Background:** Postoperative complications have a strong negative impact on clinical outcomes of the liver transplantation (LT). There is evidence indicating that aerobic capacity is associated with better postoperative prognosis. *Prehabilitation*, defined as the process of enhancing the functional capacity, appears as highly promising preventive intervention in candidates for LT who characteristically exhibit poor cardiorespiratory reserve and exercise capacity.**Goal of Study:** To evaluate the feasibility and safety of a personalized physical training program to improve aerobic capacity in LT candidates.**Materials and Methods:** Prospective pilot quasi-experimental study. Candidates for LT were invited to participate in a 6-8 week outpatient fitness program (personalized and elapsed in the community setting). Main outcome measures:

- i) training-induced enhancement of aerobic capacity (endurance time [ET]), measured with a cardiopulmonary exercise test; and,
- ii) health-related quality of life, measured with different quality of life and physical activity questionnaires (time frame: before and after the exercise training program). Data were compared to those from contemporaneous matched LT candidates that follow standard care. Comparisons were done using chi2 test for categorical variables and Student's test for numerical variables.

Results: 27 patients (58±7 yr-old, 78% male): 14 (preHAB-group) and 13 (control group) were included. The baseline demographic and clinical characteristics of the patients, including indications and degree of hepatic dysfunction (Child score) were similar in both groups, except for MELD that was superior in the preHAB-group. In preHAB-group only 6 patients completed the program. In control group 8 patients completed the initial and final evaluation. PreHAB-group showed an increase in aerobic capacity (ET from 263±51 to 816±355 sec, $p=0.016$), physical activity index (YALE from 40±10 to 75±14, $p<0.01$) and quality of life (CLDQ from 3.7±0.8 to 4.3±1.0 $p=0.025$) and a clear trend to diminish anxiety and depression symptoms (HAD from 14±11 to 12±11, $p=0.084$) after the program. Control group remained unchanged after the same period.**Conclusion(s):** A personalized physical training program is feasible, safety and may help to improve aerobic capacity, physical activity and quality of life and probably diminish anxiety and depression symptoms in LT candidates. Its impact on postoperative outcome needs to be evaluated in a randomized trial.

14AP06-1

The impact of prewarming on core temperature and cases of inadvertent perioperative hypothermia in oncogynecological surgery

Pasheev A.¹, Sayetgaraev A.¹, Muftahutdinova G.²

¹Kazan State Medical Academy, Dept of Anaesthesiology & Intensive Care, Kazan, Russian Federation, ²Kazan Oncology Clinic, Dept of Anaesthesiology & Intensive Care, Kazan, Russian Federation

Background: Inadvertent perioperative hypothermia (IPH) occurs in many patients, undergoing oncogynecological operations, due to the influence of the spinal anesthesia and sedation. The effect of warming techniques are insufficient to counteract thermal redistribution resulting from the peripheral vasodilatation, associated with spinal anesthesia. We tested the efficiency of the preoperative forced-air warming (FAW) device (Bair Paws) in combination with intravenous injection of tramadol in preventing IPH.

Methods: Eighty adult patients undergoing oncogynecological surgery under spinal anesthesia were randomized to receive either normal care or prewarming for 30 min, at 43C, using the Bair Paws, in combination with the injection of (0,5 mg/kg) tramadol preoperatively.

Results: There was smaller decrease in mean core temperature in the prewarmed group at 15, 30, 75, 90 min post-induction (P<0.05).

By the end of the operation all patients from the control group remained hypothermic, whereas only 28 patients (70%) remained hypothermic in prewarmed group (P<0.05).

26 (65%) patients from the control group and 10 (25%) patients in prewarmed group suffered from muscle shivering (P<0.05). There were no significant differences in vomiting and nausea between the groups.

Conclusions: Preoperative warming using the Bair Paws, combined with preoperative injection of tramadol results in smaller decreases in core temperature intraoperatively and less IPH in patients undergoing oncogynecological surgery under spinal anaesthesia.

References:

1. Sessler DI. Review: perioperative heat balance. *Anesthesiology* 2000; 92: 578-96
2. Camus Y, Delva E, Sessler DI, Lienhart A. Pre-induction skinsurface warming minimizes intraoperative core hypothermia. *J Clin Anesth* 1995; 7: 384-8.
3. Gamal T, Yousef, Khalid M. Elsayed Effect of forced air prewarming, tramadol or their combination on prevention of hypothermia and shivering during cesarean section under spinal anesthesia. *Z.U.M.J.Vol.19; N.2; March; 2013* 304-11.

Parameter	Prewarmed group (n 40)	Nonprewarmed group (n 40)
Active postoperative warming duration (min)	10±8,5	22±7,2*
Postoperative shivering (n (%))	10(25%)	26(65%)*
Nausea (n (%))	6(15%)	4(10%)
Vomiting (n (%))	1(2,5%)	0(0%)

[Postoperative parameters *(p<0,05).]

14AP06-2

Poor quality of recovery after neoplastic surgery according to quality of recovery 15 score

Marinho R., Carvalho B., Sousa M., Neto S., Santos A., Abelha F. Centro Hospitalar Sao Joao, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Quality of recovery after anaesthesia is an increasingly important measure of postoperative health status of patients. We aimed to assess the health status before surgery and the quality of recovery of patients scheduled for curative neoplastic surgery.

Materials and Methods: After approval by the institutional ethics committee, an observational, prospective study was performed in patients undergoing urologic, gynecologic, plastic and general curative neoplastic surgery admitted at PACU. Exclusion criteria: age <18 years old and inability to give informed consent. Patients completed the Quality of Recovery 15 Score (QoR-15) on the day before surgery (T0) and repeated it 24 hours after surgery (T1).

Poor quality of recovery (PQR) was defined as a QoR-15 score lower than the mean QoR-15 score at T1 minus 1 standard deviation. Patients were also assessed using the Post-operative Quality Recovery Scale (PQRS) before surgery, at minute 15 (T15), 40 (T40), day 1 (T1) and 3 (T3) after surgery, evaluating recovery in physiological, nociceptive, emotive, activities of daily living and cognition domains. Recovery on PQRS was defined as return to baseline values or better for all questions within each domain. Preoperative health status was assessed with the EuroQOL 5 dimensions (EQ-5D) at T0. The Mann-Whitney test, Chi-square or Fisher's exact test were used for comparisons.

Results and Discussion: In this study, 138 patients were included and 15.9% were identified as having PQR. There were no differences in age, gender, BMI, ASA status, type and duration of anaesthesia. At T0, patients with PQR presented lower median scores on total QoR-15 at T0 (130 vs. 119, p=0.03) and more problems on EQ-5D in mobility (50% vs 24.1%, p=0.014), self-care (31,8% vs. 12,9%, p=0.027) and usual activities domains (50% vs. 25,2%, p=0.019). These patients had more frequent incomplete recovery at T15 in nociceptive domain (45,5% vs. 20,7%, p=0.013), at T40 in less than 2 domains (28.6% vs 11.4% p=0,038) and at D1 in activities of daily living (90.9% vs. 62.9%, p= 0.012). At D3 there were no differences in rates of incomplete recovery. PQR patients stayed longer in the hospital (8 vs. 7 days, p=0.034).

Conclusion: Patients with PQR presented lower QoR-15 and EQ-5D scores before neoplastic surgery and had a longer hospital stay. Accordingly to PQRS, PQR patients had incomplete recovery at minute 15, 40 and at T1 but not at T3.

14AP06-3

Hepcidin in anemic patients with colorectal cancer. Blood levels pre and after iron carboximaltose

Vila Montañés M.¹, Diaz Cambronero O.¹, Garcia Gregorio N.¹, Martinez Triguero M.L.², Errando Oyonarte C.L.³, Argente Navarro M.P.¹

¹Hospital Universitario y Politecnico La Fe, Dept of Anaesthesiology, Valencia, Spain, ²Hospital Universitario y Politecnico La Fe, Hormone Laboratory, Valencia, Spain, ³Consorcio Hospital General Universitario de Valencia., Dept of Anaesthesiology, Valencia, Spain

Background and Goal of Study: Pre-operative anemia is highly prevalent in colorectal oncologic patients. Anemia is an independent risk factor for postoperative complications, length hospital stay, and blood transfusion. Preoperative management of anemia is strongly recommended by World Health Organization (WHO), to improve postoperative outcome. Anemia in colorectal cancer is multifactorial, with a mainly component of blood loss (absolute iron deficit) but could associate an inflammatory component with iron sequestration by hepcidin. Intravenous iron infusion is the standard of care, in order to improve iron stores faster and avoid the hepcidin absorption blockade. Hepcidin, a 25-peptide liver hormone, is the main regulator of iron homeostasis. Hepcidin increases in inflammatory states and in response to high circulating iron. Hepcidin blocks duodenal absorption of dietary iron and avoid the mobilization of iron stores for erythropoiesis. There no available data about hepcidin levels in anemic patients with colorectal cancer and its evolution after iron infusion.

The goal of this study is to measure plasmatic hepcidin levels previous and after iron intravenous infusion and evaluate the usefulness of hepcidin to differentiate absolute iron deficit (ID) and functional iron deficit (FID).

Materials and Methods: Observational prospective study. Institutional Ethics Committee and patient informed consent was obtained. 45 patients with colorectal cancer were recruited. All of them were anemic (Hb <12 in females and Hb <13 in males) with transferrin saturation index (ISTI) <20%.

All patients recruited receive an intravenous infusion of Carboximaltose iron 1000mg in unique dose. We obtained two blood samples. The first, before the iron infusion, and the second 96 hours after. All blood samples were obtained at the same hour (between 8-9am) and included hepcidin, iron, ferritin, IST and Hb. We obtained a third blood sample the day of surgery measuring Hb. The quantity analysis of hepcidin was performed with the DRG Hepcidin-25 ELISA Kit is a solid phase enzyme-linked immunosorbent assay, based on the principle of competitive binding.

Results and Discussion: Preliminary results show an increase in hepcidin levels after iron infusion and a positive correlation of hepcidin with ferritin levels. Definitive statistical analysis is being carried out at the moment of submission.

Conclusion(s): Iron iv increase hepcidin

14AP06-4**Patient satisfaction with anesthesia for curative neoplastic surgery: the impact of quality of recovery**

Carvalho B., Marinho R., Sousa M., Azevedo J., Santos A., Abelha F
Centro Hospitalar de São João, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Patient-reported outcomes have become one of the most important measures for assessing medical and surgical treatments. Patient satisfaction is an important tool for prompting improvements in clinical care. We aimed to evaluate if the quality of recovery has influence on patient's satisfaction after anaesthesia.

Materials and Methods: After approval by the institutional ethics committee, an observational, prospective study was performed in 133 patients scheduled for elective surgery. Patients included were older than 18 years, undergoing plastic, gynaecologic, urologic and general curative surgery, admitted to the Post Anaesthetic Care Unit (PACU). Exclusion criteria was inability to give informed consent. Patients' demographics and perioperative data were collected. Postoperative Quality of Recovery Scale (PQRS) was used to identify patients' satisfaction, 3 days after surgery. PQRS and Quality of Recovery 15 score (QoR-15) were used to evaluate the quality of recovery after surgery. PQRS was used at baseline and after surgery at minute 15 (T15), 40 (T40) and days 1 (D1) and 3 (D3) evaluating recovery in five domains: physiological (PD), nociceptive (ND), emotive (ED), activities of daily living (AD) and cognition (CD). Recovery was defined as the return to baseline values or better within each domain. Incomplete recovery was defined as recovery in less than 2 domains at D1. Satisfaction was assessed by a five-point Likert scale. The Mann-Whitney test, Chi-square or Fisher's exact test were used for comparisons.

Results and Discussion: From 148 patients, 133 completed the questionnaires. Eighty-five percent of the patients were completely satisfied with anaesthesia care. Complete satisfaction was more frequent for patients submitted to general anaesthesia (73% vs. 45%; $p=0.014$) and less frequent for patients submitted to regional anaesthesia (4% vs. 25%; $p=0.01$). At D1, patients with incomplete satisfaction had similar total QoR-15 scores ($p=0.233$) and, considering each item of QoR-15 these patients had lower median values in 2 of them: "feeling rested" ($p=0.04$) and "feeling worried or anxious" ($p=0.04$). There were no differences on rates of recovery at PQRS.

Conclusion(s): Patients with incomplete satisfaction had a poor quality of recovery in two items of the QOR-15 score at D1. Type of anaesthesia played an important role in neoplastic patient's satisfaction as well as feeling less rested and more anxious.

14AP06-5**Implementation of computer-assisted intraoperative goal-directed fluid therapy in major abdominal surgery: a before-after study**

Coeckelenbergh S.¹, Joosten A.¹, Delaporte A.², Ickx B.¹, Van Obbergh L.¹, Van der Linden P.²
¹CUB Erasmus Hospital | ULB, Dept of Anaesthesiology, Brussels, Belgium, ²Université Libre de Bruxelles - Brugmann University Hospital, Dept of Anaesthesiology, Brussels, Belgium

Background and Goal of Study: Goal-directed fluid therapy (GDFT) has been shown to decrease postoperative complications after major surgery, yet its implementation remains low. We have developed a closed-loop fluid administration system designed to help anesthesia providers to consistently apply GDFT protocols during surgery. The aim of this before and after study was to determine the impact of the implementation of this system on the amount of fluid administered and on the incidence of postoperative complications in patients undergoing major abdominal surgery.

Materials and Methods: Our closed-loop assisted GDFT system was introduced in April 2015. Patients managed with the system received a baseline crystalloid fluid therapy of 3ml/kg/h via an infusion pump and additional 100ml fluid boluses of either a balanced crystalloid or colloid. The closed-loop system delivered fluids according to a predefined GDFT strategy based on the analysis of the stroke volume and the stroke volume variation (Flo-Trac system, Edwards Lifesciences, Irvine, CA). Patients managed with the closed-loop system were then compared to those managed before its implementa-

tion. In this second group, anesthesiologists administered fluids without any predefined protocol and based their choice on static variables such as heart rate, invasive arterial pressure, central venous pressure, and diuresis. One to one matching was used to compare the groups. The primary and secondary goals were to compare the amount of fluid administered and the incidence of postoperative complications, respectively. Patients were compared using Student-t test and Chi square where appropriate. Data are presented as mean \pm SD or percentage. A $p<0.05$ was considered statistically significant.

Results and Discussion: The study included 214 patients. Baseline characteristics were not different between the 2 groups. There was a significant decrease in total volume administered and net fluid balance in the closed-loop group versus the historical group (2950 ± 1550 vs. 4350 ± 1575 , $p<0.001$, and 1450 ± 1300 vs. 2850 ± 1120 , $p<0.001$). There also was a significant decrease in the closed-loop group regarding the redo rate for complications (2.8% vs. 11.2%, $p=0.015$).

Conclusion: Our study demonstrated that implementation of a computer-assisted GDFT system reduced the amount of fluid administered intraoperatively, which possibly resulted in a lower incidence of postoperative complications.

14AP06-6**How low do you go? An investigation of treatment thresholds for intraoperative hypotension in elder patients in the UK**

Wickham A.¹, Highton D.², Clark S.³, Fallaha D.⁴, Martin D.², on behalf of The Research & Audit Federation of Trainees (RAFT)
¹Imperial College NHS Trust, Dept of Anaesthesiology, London, United Kingdom, ²University College London, Dept of Anaesthesiology & Intensive Care, London, United Kingdom, ³Oxford University Hospitals, Dept of Anaesthesiology & Intensive Care, Oxford, United Kingdom, ⁴Golden Jubilee National Hospital, Dept of Anaesthesiology, Glasgow, United Kingdom

Background and Goal of Study: Intraoperative hypotension (IOH) is common in elder patients[1] and is associated with morbidity and mortality[2, 3]. Haemodynamic manipulation has the potential to reduce this burden, but there is no consensus definition of IOH, and thus treatment thresholds. This study aims to identify the target for IOH therapy commonly applied in UK anaesthetic practice.

Materials and Methods: Ethical approval was granted. Conducted as part of a larger study on IOH by the Research and Audit Federation of Trainees (RAFT), a national trainee research group. Using paper questionnaires administered by local trainees, we surveyed all anaesthetists, who provided general or regional anaesthesia to patients' aged ≥ 65 years old over a 48 hour week-day period, about the IOH targets that would trigger intervention.

Results and Discussion: 2643 anaesthetists were surveyed from 147 centres. The majority of respondents were consultants (59.2%) or registrars (15.0%). Systolic (1863, 70.7%) and mean (2098, 79.7%) blood pressures were most frequently used to titrate vasopressor therapy. Stated blood pressure targets are summarised in table 1.

Blood Pressure Target	N (%) using target	Median value (25th - 75th quartile) triggering vasopressor use
Absolute Systolic BP value	1832 (69.3%)	90.0mmHg (80.0 - 95.0)
Relative reduction (%) in Systolic BP	1929 (73.0%)	20.0% (20.0 - 30.0)
Absolute Mean BP value	1597 (60.4%)	60.0mmHg (55.0 - 65.0)
Relative reduction (%) Mean BP	1365 (48.4%)	20.0% (20.0 - 20.0)

[Table 1: Stated Blood Pressure Targets]

Conclusion: The majority of anaesthetists use a combination of targets, both absolute and relative, to trigger IOH therapy. There appears to be an inconsistency between the favoured 20% relative drop and the median absolute targets, which approach the limits associated with increased morbidity. This suggests that although anaesthetists may recognise a need for tighter, individualised treatment of IOH in older patients (via a small relative drop of 20%), it may not always be applied. Adherence to a relative target may have future potential to avoid IOH in older patients.

References:

1. Wickham A et al. Care of elderly patients: an audit of hypotension. *Periop Med* 2016;5:12.

2. Walsh M et al. Intraoperative mean arterial pressure and outcomes. *Anesthesiology* 2013;119:507.

3. Monk T et al. Intraoperative Hypotension and Hypertension and 30-day Mortality. *Anesthesiology* 2015;123:307.

Acknowledgements: We would like to thank the AAGBI and NIHR for their support and the members of RAFT who contributed to the study.

14AP06-7

Procalcitonin and C-Reactive Protein as early markers of septic complications after laparoscopic colorectal surgery within an ERAS program: a prospective observational study

Cuquerella V, Muñoz J.L., Resalt M., Molines A., Fayos M., Pérez A. *Hospital General Universitario de Elche, Dept of Anaesthesiology & Intensive Care, Elche, Spain*

Background: The performance of most colorectal procedures within an enhanced recovery after surgery (ERAS) programs has resulted in significant advantages, including a reduction in the length of hospital stay to 4-6 days. However, some postoperative complications may appear after the patient has been discharged. The aim of this study was to investigate the efficacy of various acute phase parameters determined 24, 48 and 72 hours after laparoscopic colorectal surgery (LCS), for predicting septic complications, such as surgical site infection (SSI) and anastomotic leak (AL), in the postoperative course.

Design: A prospective study of 128 patients who underwent LCS within an ERAS program between 2014 and 2015 was performed. The clinical variables investigated were septic complications (surgical site infection (SSI) and anastomotic leak). Acute phase parameters (procalcitonin and c-reactive protein (CRP)), and white blood cell (WBC) count were determined in the blood sample extracted 24, 48 and 72 hours after surgery.

Receiver operating characteristic (ROC) curve analysis was performed, and the respective areas under the curve (AUC) were calculated to evaluate the predictive value CRP level, procalcitonin level, and WBC count for the diagnosis of septic complication. The sensitivity and specificity of these parameters were calculated.

Results: Septic complications were observed in 15 patients (11,7 %), 6 SSI (4,7 %) and 9 AL (7 %). Using ROC analysis, on 24 hours postoperatively a cutoff level of procalcitonin at 0,4 ng/ml achieved 100% sensitivity and 85% specificity for predicting septic complications. On 48 hours postoperatively a cutoff level of procalcitonin at 0,5 ng/ml achieved 90 % sensitivity and 85% specificity for predicting septic complications. On 72 hours postoperatively a cutoff level of CRP at 200 mg/l and procalcitonin at 0,5 ng/ml achieved 75 % sensitivity and 85% specificity for predicting septic complications.

Conclusions: The use of procalcitonin, in the first day and in the second day postoperative, can predict septic complications after LCS. In the third day, CRP and procalcitonin also can predict septic complications after LCS. This is mainly interesting in patients within an ERAS program that will be discharged early.

References:

1. Giaccaglia V, Salvi PF, Cunsolo GV et al. Procalcitonin, as an early biomarker of colorectal anastomotic leak, facilitates enhanced recovery after surgery. *J Crit Care.* 2014;29(4):528-32.

14AP06-8

Diabetes mellitus and perioperative glucose control: not one, but two types of diabetes

Hulst A.H.¹, Kooij FO.¹, DeVries J.H.², Lirk P.¹, Preckel B.¹, Hermanides J.³

¹AMC, Dept of Anaesthesiology, Amsterdam, Netherlands, ²AMC, Department of Internal Medicine, Amsterdam, Netherlands,

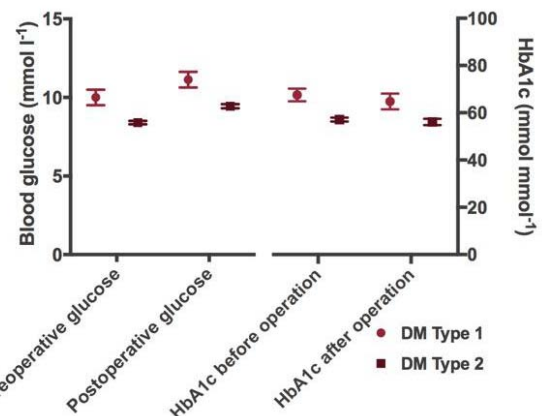
³Radboud University Medical Center, Dept of Anaesthesiology & Pain Medicine, Nijmegen, Netherlands

Background and Goal of Study: Perioperative care tends to be uniform for all people with diabetes mellitus (DM), although DM type 1 (DM1) patients could well be a distinct subpopulation with regard to perioperative management. The goal of this study was to investigate the quality of perioperative glucose control for DM1 and DM2 patients and identify risk factors for dysregulation.

Materials and Methods: We performed a retrospective database analysis of all DM patients undergoing surgery between 2012-2015 in a university hospital. All patients were treated according to the same perioperative DM protocol. We compared fasting glucose before and after surgery, and HbA1c within 90 days before and after surgery, in DM1 and DM2 patients. We defined short-term glucose dysregulation as an intra-hospital postoperative glucose value >10 mmol l⁻¹ (180 mg/dl), and long-term dysregulation as an HbA1c >53 mmol mmol⁻¹ in a 90-day period after surgery. We used logistic regression to compare characteristics of the groups with or without glucose dysregulation.

Results and Discussion: A total of 4199 DM patients were included, 463 (11%) of whom had been diagnosed with DM1. Mean glucose concentration was higher in DM1 patients compared to DM2 both preoperatively (mean ± SD: 10.0 ± 4.5 vs. 8.4 ± 3.0 mmol l⁻¹, p <0.001) and postoperatively (11.1 ± 4.5 vs. 9.4 ± 3.2 mmol l⁻¹, p <0.001). Preoperative HbA1c values were higher in DM1 patients (median(IQR): 63 (55 - 75) vs. 54 (47 - 64), p <0.001). Predictors for short-term glucose dysregulation included DM1, preoperative glucose >10 mmol l⁻¹, preoperative HbA1c >53 mmol mmol⁻¹, perioperative dexamethasone use and duration of surgery. Pre- and postoperative glucose >10 mmol l⁻¹, and preoperative HbA1c >53 mmol mmol⁻¹ were predictors for long-term glucose dysregulation.

Conclusions: Type 1 DM patients have poorer glycemic control in the whole perioperative period. Poor preoperative glycaemic control is associated with glucose dysregulation postoperatively in both types of DM. In order to prevent postoperative dysregulation, we should pay extra attention to patients with DM1 and those with a high preoperative glucose concentration.



[Perioperative glucose and HbA1c]

14AP06-9

The influence of preoperative anemia on 30-day mortality and peri-operative myocardial injury among the older patients undergoing non-cardiac surgery: a retrospective cohort study

Abdullah H.R., Sim Y.E.

Singapore General Hospital, Dept of Anaesthesiology & Intensive Care, Singapore, Singapore

Background and Goal of Study: Preoperative anemia is common among older patients undergoing major non-cardiac surgeries and is associated with increased risk of postoperative mortality and morbidity[1]. To date, studies linking preoperative anemia and perioperative myocardial injury (PMI) are lacking. This is important as even mild, asymptomatic biochemical elevation of cardiac enzymes is associated with significantly higher 30-day mortality risk[2]. We aim to investigate the relationship between preoperative anaemia with 30 day mortality rate and PMI among older patients who underwent non-cardiac surgery.

Materials and Methods: We retrieved 32910 patients above 65 years old who underwent surgery between 1 Jan 2012 to 31 Oct 2016 in a tertiary academic medical center. Patients who underwent cardiac, transplant and neurosurgery, minor procedures not requiring general or regional anaesthesia, or who had missing data were excluded. Every patient was analyzed once based on the first surgery performed. 13695 patients were analyzed. Preoperative haemoglobin classified according to WHO anaemia classification, cardiac, neurological and renal comorbidities, ASA score, surgical urgency and severity and type of anaesthesia were analyzed. Postoperative outcomes collected

include 30 day mortality and 7-day PMI, defined by an elevation of Troponin T >30ng/ml and more than 20% increase from baseline. Univariate and multivariate logistic regression were done to determine the independent effects of anaemia on outcomes.

Results and Discussion: Moderate/severe anaemia (aOR 2.45, $p < 0.001$) increased 30-day mortality. Mild anaemia (aOR 1.89, $p = 0.016$) and moderate/severe anaemia (aOR 2.27, $p = 0.001$) were associated with PMI. Other significant factors associated with both 30-day mortality and PMI include older age (> 75 years), ASA score 3 or higher, pre-existing ischemic heart disease, emergency surgeries, surgeries under GA compared to regional anaesthesia and moderate/high risk surgeries.

Conclusion: Pre-operative moderate-severe anaemia in the elderly significantly increased the odds of 30-day in-hospital mortality and perioperative myocardial injury.

References:

1. Wu, W.C et al. Preoperative Hematocrit Levels and Postoperative Outcomes in Older Patients Undergoing Noncardiac Surgery. *JAMA* 2007, 297 (22): 2481-88.
2. Devereaux, P.J. et al. Cardiac Complications in Patients Undergoing Major Noncardiac Surgery. *NEJM* 2015, 373 (23): 2258-69.

14AP06-10

Postoperative Nausea and Vomiting and Quality of Recovery in Surgical Cancer Patients

Silva D.¹, Cunha P.², Braga A.¹, Azevedo J.¹, Santos A.¹, Abelha F.²
¹Centro Hospitalar de São João, Dept of Anaesthesiology, Porto, Portugal, ²Faculty of Medicine / University of Oporto, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Postoperative nausea and vomiting (PONV) are the second most prevalent postoperative complication, with incidences ranging between 20 to 30%. Patients rated vomiting and nausea as the first and fourth most undesirable postoperative complications, respectively. The aim of this study was to evaluate the incidence of PONV and its influence in the quality of recovery after oncologic curative surgery.

Materials and Methods: After study approval by ethics committee, an observational prospective study was conducted. Patients submitted to elective cancer surgery with a curative intent admitted at the post anesthesia care unit (PACU) were included. Exclusion criteria: age <18 years old and inability to give informed consent. Quality of Recovery was evaluated using Quality of Recovery-15 (QoR-15) (D1) after surgery and Post-Operative Quality of Recovery Scale (PQRS). PQRS was used at baseline (up to 14 days before surgery) and after surgery at minute 15 (T15), 40 (T40) and days 1 (D1) and 3 (D3) evaluating recovery in five domains as follows: physiological (PD), nociceptive (ND), emotive (ED), activities of daily living (AD) and cognition (CD). Recovery was defined as return to baseline values or better for all questions within each domain. Patient's demographics and perioperative data were collected. The Chi-square, Fischer's exact or Mann-Whitney U tests were used for comparisons.

Results and Discussion: A total of 148 patients were included in the study. The incidence of PONV was 16.2%. At D1 patients with PONV had lower median global scores in QoR-15 (105 vs 116, $p = 0.027$) and scored lower in 5 items of QoR-15. PQRS found no differences in overall rate of recovery in all domains evaluated together, however patients with PONV had incomplete recovery at ND (pain and nausea) more frequently at T40 min and D3. PONV patients had incomplete recovery less frequently at ED (depression and anxiety) at T40, D1 and D3. There were no differences in gender, age, ASA, body mass index, duration of anesthesia, length of PACU and hospital stay.

Conclusion(s): In this study QoR-15 revealed a poor quality of recovery in patients with PONV, suggesting its adverse impact in postoperative recovery. PQRS showed no differences in overall rate of recovery in all domains evaluated together but showed reversed results in respect to nociceptive and emotional domains.

14AP06-11

A focused evaluation of the incidence and current management of pre-operative anaemia in a teaching hospital

Gwinnutt M., Chuni C., Stott M.
 Aintree University Hospital NHS Foundation Trust, Dept of Anaesthesiology, Liverpool, United Kingdom

Background and Goal: The aim was to quantify the number of patients presenting for surgery across all specialties in our hospital with pre-existing anaemia. This will then be used as a driver to introduce a pre-operative anaemia management service.

We defined anaemia according to the World Health Organisation (WHO) criteria of a Haemoglobin (Hb) concentration of <120d/L for females and <130g/L for males¹.

Materials and Methods: All patients seen in the pre-operative assessment clinic during a two-week period who had a full blood count performed were identified. Their demographics, date of pre-operative assessment and planned date of surgery, surgical specialty and procedure, Hb concentration, and mean corpuscular volume (mcv) was all recorded. Quantitative analysis was performed to determine the proportion of patients who were anaemic, and of these which had a microcytic anaemia ($mcv < 80 \times 10^{-15}L$).

Results and Discussion: 322 patients, of whom 164 (50.9%) were male, were identified. Overall 54 (16.8%) (18.9% of males and 14.6% of females) patients were anaemic, however of these only 7 (13.0%) had a microcytic anaemia. The median duration from pre-operative assessment to planned date of surgery was 7 days.

Conclusion: Pre-operative anaemia is a significant problem in the surgical patient population of our hospital. The cause of the anaemia may be multifactorial, but it looks as though iron deficiency certainly features amongst our patients. This highlights a need to develop a formal pre-operative anaemia management service including assessment of haematinics and a iron replenishment regime. A barrier to achieving this is the short duration from pre-operative assessment to surgery. This will need to be increased from a median of 7 days to around 28-42 days to allow adequate time for investigation and treatment.

References: 1. World Health Organization . Nutritional Anaemias: report of a WHO Scientific Group (meeting held in Geneva from 13 to 17 March 1967) Geneva: World Health Organization; 1968.

Declaration of Interests: None of the authors have any interests to declare.

14AP07-1

Randomized clinical trial comparing two patterns of intravenous iron in the postoperative period in colon cancer surgery

Laso M.¹, Caló N.², Martínez F.², Carol F.², Valle A.², Vives R.³
¹Hospital Universitari Parc Tauli, Dept of Anaesthesiology, Sabadell, Spain, ²Hospital Parc Tauli, Dept of Anaesthesiology, Sabadell, Spain, ³Hospital Parc Tauli, Pharmacology, Sabadell, Spain

Background: By an observational study we have noted that the prevalence of anaemia and/iron deficiency is >50% in patients diagnosed of colorectal cancer. After surgery, this percentage increases to more than 80% due to intra and postoperative blood loss. There are no publications that give us light about the effectiveness of intravenous iron administration, the patterns to use or the dosage in this period in colorectal cancer surgery. We have started our clinical trial with the hypothesis: treatment with 1 g of carboxymaltose iron (unique dose) is more effective than 200 g/48h to normalise haemoglobin (Hb) levels at the thirty day in the postoperative period in the patients with Hb <11g/dL.

Goal of Study: To compare the effectiveness of 1g of carboxymaltose iron against fraccionated sacarose iron 200g/48h for the postoperative anaemia, measuring the change of Hb (haemoglobin) levels between the first and thirty day after surgery.

Methods: We have designed an open randomized clinical trial of parallel groups. The main variable is the change of Hb levels between postoperative day 1 and day 30. Secondary variables are: number of transfusions, total dose given in the first thirty days, number of patients that normalise Hb levels, number of complications or adverse effects and changes in life's quality. The patient will receive a treatment regimen or another one on postoperative day 1. All patients above 18 years old with (with) Hb <11g/dL in the postoperative

period of colorectal cancer surgery will be included. It has been estimated that a sample of 48 patients per group will allow detecting a difference of 0.75 g/dL in Hb.

Results: Inclusion of patients started in september 2015. At this time we have included 48 patients and the end of recruitment is expected in september 2017.

Conclusions: A previous observational study showed us the prevalence of anaemia in our patients. This is an independent study that will allow us to determine the effectiveness of postoperative intravenous iron and the most beneficial regimen.

14AP07-2

The impact of perioperative anaemia on length of hospital stay in patients undergoing hemicolectomy surgery

Wellstead G., Chequer S.

East and North Hertfordshire NHS Trust, Dept of Surgery, Stevenage, United Kingdom

Background and Goal of Study: The aim of this study was to investigate the association between perioperative anaemia and blood transfusions with postoperative length of stay in emergency and elective hemicolectomies.

Materials and Methods: We performed a retrospective study looking at pre- and postoperative haemoglobin (Hb) levels for all patients undergoing elective or emergency hemicolectomies between 01/07/15 and 30/06/16 at The Lister Hospital, Stevenage. Our primary outcome was length of postoperative stay in hospital. We also looked at the impact of intraoperative and postoperative blood transfusions.

Results and Discussion: 59% of patients (n=85) were anaemic preoperatively and this rose to 85% postoperatively. The mean Hb change was -11.59 g/dL. 70 patients (n= 85) had a drop in Hb postoperatively (mean Hb drop = 15.2 g/dL, SD 10.33). The mean length of stay post-procedure was 13.40 days (SD 14.11). Length of stay was longest for preoperatively anaemic patients (mean 14.27 days, SD 15.08), followed by postoperatively anaemic patients (mean 13.32 days, SD 13.94). Mean length of stay was 12.1 days (SD 13.98) for elective patients and 16.91 days (SD 14.14) for emergency patients. 61% of elective patients were preoperatively anaemic vs 50% of emergency patients.

Conclusion(s): A large number of patients were preoperatively anaemic and the incidence of anaemia was higher postoperatively. Postoperative length of stay in hospital was longest for patients with preoperative anaemia. A higher length of stay was also associated with emergency surgery. A higher percentage of elective patients were preoperatively anaemic when compared with emergency patients. There is scope for further preoptimisation of anaemia in elective hemicolectomy patients. This may result in a shorter length of postoperative stay, improving patient outcomes and reducing hospital costs.

14AP07-3

Quality improvement study: implementation of perioperative goal directed therapy for major abdominal surgery in a Dutch general hospital

Godfried M.B.¹, van Rooijen T.¹, van Vliet M.¹, Karsten T.M.², Thiel B.¹, Geerts B.³

¹*Onze Lieve Vrouw Ziekenhuis, Dept of Anaesthesiology, Amsterdam, Netherlands,* ²*OLVG, Dept of Surgery, Amsterdam, Netherlands,* ³*University of Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands*

For high-risk surgical patients undergoing complex abdominal surgery, goal-directed therapy (GDT), has been associated with improvement in short- and long-term outcomes(1). GDT improves oxygen delivery to peripheral tissues with the use of a protocol for the administration of fluids and inotropes. The objective of this present quality improvement study was to evaluate the effect of perioperative oesophageal Doppler-led GDT on hospital length of stay and complications.

This is an observational study focussing on the implementation of GDT in our regular care for major abdominal surgery. The GDT protocol optimises stroke volume (SV) using fluid responsiveness evaluation with Ringers Lactate 250 ml boluses in 5 minutes using a Doppler probe (Deltex®, UK)(2). We treated

all patients for open and laparoscopic colon, pancreatic and liver surgery by means of the GDT protocol with an admission for major abdominal surgery from January up to March 2015 and compared the results with patients data of a matched pre-implementation cohort from 2013.

246 patients were included in the control group and 242 patients were treated in the GDT. A difference in patient demographics occurred due to an increase of laparoscopic procedures from 52% in the control group up to 73% in the protocol group (p<0.001). Fluid administration was lower in the protocol group with 5.75 ± 2.84 ml/kg/h compared to the pre-implementation group 8.50 ± 3.39 ml/kg/h (p<0.001). Post-operative fluid administration was also reduced in the GDT group by 36.03 ± 16.33 ml/kg in the control group versus 23.76 ± 14.21ml/kg in the protocol group (p<0.001). Per-operative vasopressor shifted from phenylephrine to noradrenaline in the treated group (p=0.001). No statistically significant differences were observed for the length of stay (LOS) and for complication incidence between both groups.

This observational quality improvement study focussed on the implementation of a GDT protocol for major abdominal surgery. We found a statistically significant reduction in fluid administration in the GDT group. However, due to the character and size of the implementation study it was not possible to assess the impact of GDT relative to the institution of laparoscopic instead of open procedures. These results prompted us to be cautious with applying the costly Doppler probes on our operation theatres.

1. Hamilton MA, . *Anesth Analg* 2011;112:1392-402.

2. Feldheiser A, *J Int Med Res* 2012;40:1227-41.

14AP07-4

Analysis of anastomosis leakage and renal failure in post-colorectal laparostomy surgery on ASA III/IV patients

Gomez Martin A.¹, García González N.², Gutiérrez González C.², Noguerol del Cid C.², Falcon Suarez O.², García Flórez L.J.³

¹*Hospital San Agustín, Dept of Anaesthesiology & Intensive Care, Aviles, Spain,* ²*Hospital Universitario Central de Asturias, Dept of Anaesthesiology, Oviedo, Spain,* ³*Hospital San Agustín, Dept of Surgery, Avilés, Spain*

Background and Goal of Study: Perioperative fluid management in colorectal surgery is controversial. Patients undergoing elective colorectal surgery are at risk for either a reduction or an increase in fluid volume. Evidence regarding best fluid management with respect to clinical outcomes is limited. The aim of our study was to establish the relationship between intraoperative fluid management and anastomotic leakage rate and secondary acute renal failure in ASA III/IV patients who underwent elective colorectal open surgery at our institution.

Materials and Methods: One hundred and sixty-three consecutive ASA III/IV patients who underwent elective colorectal open resection with anastomosis between January 2014 and September 2016 were included in the study. Patients were divided in two groups according to the intraoperative administration of crystalloids (CR) or crystalloids + colloids (CR+CO). Demographic data, clinicopathological features, operative procedures, intraoperative haemodynamic values (PiCCO) and postoperative outcomes (primary acute renal failure, pos-leakage renal failure, acute respiratory insufficiency, mortality and length of stay) were compared between the two groups. Data were analysed using statistical software SPSS v18.0, with bivariate tests (χ^2) and multivariate analysis (ANOVA).

Results and Discussion: We observed that Acute primary renal failure was observed predominantly in Crystalloid + Colloid group (15.7% vs 13.2%) with no statistical significance (p=0.12). Anastomotic leakage occurred in 18 patients (11%), mostly in males and in the CR group (10.8% in CR vs 6.2% in CR+CO, p=0.04). Analysing patients with leakage, we have found a 65% rate of secondary acute renal failure and 25% rate of acute respiratory insufficiency, which have increased in 16 +/- 3 days the length of hospital stay. We have found no other differences between both groups in clinicopathological features, operative procedures or intraoperative haemodynamic values.

Conclusions: Crystalloids only intraoperative fluid therapy is associated to a higher anastomotic leakage rate in elective open colorectal surgical ASA III/IV patients. Anastomotic leakage increased secondary acute renal failure, respiratory insufficiency and hospital stay, arising in health care costs.

Further studies with higher sample size are needed to delineate the significance of these findings.

14AP07-5**Early use of antibacterial drugs is not association with perioperative catecholamine use in intestinal perforation patient: propensity score matched analysis**Momoyo M.¹, Toshiyuki H.¹, Yukiko T.¹, Mihara T.²¹*Itabashi Chuo Medical Center, Dept of Anaesthesiology, Tokyo, Japan*, ²*Kanagawa Children's Medical Center, Dept of Anaesthesiology, Yokohama, Japan*

Background: Intestinal perforation is a life-threatening disease because the disease is often associated with the presence of severe sepsis and septic shock. Period of hypotension is risk factor of high mortality and morbidity of severe sepsis. Antibacterial drug is one of treatments of severe sepsis. However, there are no study about association between early use of antibacterial drugs and perioperative catecholamine drugs use. The aim of this study was to reveal association between early antibacterial drug use and perioperative catecholamine use in intestinal perforation patients.

Methods: Data was collected retrospectively from 621 intestinal perforation patients who had operations in our hospital between 2005 and 2016. Propensity scores (PS) for early use antibacterial drugs were calculated for each patient using multivariable logistic regression analysis. Patients and clinical factors were used for the logistic regression analysis. The predictive ability of the logistic regression model was tested with the c-index. The primary outcome was use of perioperative catecholamine drugs. Patients who received antibacterial drugs were matched with patients who did not according to the PS, using a 1:1 matching technique. The Mantel-Hanzel test was used for the matched analysis.

Results: Of the 621 patients, 180 patients received antibacterial drugs and 441 patients did not. The PS matched cohort included 240 patients; 120 patients received antibacterial drugs and the other 120 patients did not. The c-index of the model was 0.67 (95% CI; 0.61-0.73). In the univariate analysis, the use catecholamine on perioperative period was increased in the antibacterial drug group [odds ratio; 1.54, 95% CI) 1.05-2.24, P=0.02]. In the propensity score matched analysis, on the other hand, there were no significant differences between two groups (OR; 0.92, 95%CI; 0.53-1.60, P=0.89).

Conclusion: Early use of antibacterial drugs was not associated with perioperative catecholamine use in intestinal perforation patient. Prospective randomized trials are needed.

14AP07-6**Evolution of fast-track in bariatric surgery**Gomez Diago L.¹, Hernández-Cádiz M.J.¹, Bruna M.², Navarro C.², Vicente-Fernández P.¹, De Andrés J.¹¹*Consorcio Hospital General Universitario de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain*, ²*Consorcio Hospital General Universitario de Valencia, Dept of Surgery, Valencia, Spain*

Background and Goal of Study: Nowadays, vertical sleeve gastrectomy (VSG) is one of the most popular method of weight-loss surgery. Fast-track rehabilitation in the postoperative care has increased with favorable results and without raising the associated morbidity and mortality.

Our aim is to evaluate the development of the multimodal rehabilitation measures applied. Moreover, the results obtained in the different periods were evaluated comparing the postoperative morbidity and mortality among the different periods.

Materials and Methods: Retrospective and comparative analysis of patients undergoing laparoscopic VSG between January 2010 and January 2016 in our center. Anthropometric parameters and comorbidities of all patients, hospital stay, surgical time, use of drainage and nasogastric tube, postoperative oral intake tolerance and mobilization were evaluated, comparing the annual evolution of each one.

Results and Discussion: 134 patients were involved, no significant differences in the number of surgeries performed per year, neither in the BMI and associated comorbidities of the patients evaluated in each year were found. Laparoscopic surgery was performed in all patients and surgical time showed a downward and progressive trend (from 176 minutes in 2010 to 124 minutes in 2015). Postoperative stay (median 6 days in 2010 and 4 days in 2015), the use of nasogastric tube and bladder catheter after surgery (in 33.3 and 75% respectively of patients from 2010 to 17.4 and 21.7% in 2015), use of drainage

(95.8% in 2010 and 86.3% in 2015), early feeding (from 3 days in 2010 to 2 in 2015) and mobilization (from 2 days in 2010 to 1 in 2015). Associated morbidity was 20.8% in 2010 and 27.2% in 2015. There was no mortality and the percentage of reinterventions was 16.6% in 2010 and 13.6% in 2015. Results are shown in table 1.

	2010	2011	2012	2013	2014	2015
Nasogastric tube (patients)	8 (33.3%)	2 (15.4%)	2 (7.1%)	4 (16%)	4 (19%)	4 (17.4%)
Bladder catheter (patients)	18 (75%)	9 (69.2%)	11 (39.3%)	14 (56%)	11 (52.4%)	5 (21.7%)
Mobilization (median days)	2	2	2	1	2	1
Oral intake tolerance (median days)	3	3	4	4	3.5	2
Stay (median days)	8.1 (6)	12.4 (5)	6.6 (5)	5.3 (5)	7.8 (5)	4.2 (4)

[1. Results]

Conclusion(s): The progressive application of different fast-track rehabilitation measures in postoperative period of VSG is safe and reliable. Protocolization of the actions and the multidisciplinary approach in these patients must be necessary to obtain optimal results.

14AP07-7**Obstructive sleep apnea increases the odds for perioperative complications in patients undergoing hysterectomy**Mörwald E.E.¹, Zubizarreta N.², Cozowicz C.¹, Poeran J.², Mazumdar M.², Memtsoudis S.G.¹¹*Hospital for Special Surgery, Dept of Anaesthesiology, New York, United States*, ²*Icahn School of Medicine at Mount Sinai, Institute for Healthcare Delivery Science, Department of Population Health Science & Policy, New York, United States*

Background: Obstructive sleep apnea (OSA) has been identified as a risk factor for perioperative complications in various patient cohorts. However, there is a lack of data on its association with outcomes in patients undergoing hysterectomies, one of the most frequently performed surgeries among women. We hypothesized that the presence of OSA would increase perioperative complication risk.

Materials and Methods: We extracted a sample of patients who underwent a hysterectomy between 2006 and 2014 from a large nationwide administrative database (Premier Perspective Database, Premier Inc., Charlotte, NC). Among this patient sample we identified OSA-patients by using ICD-9 CM codes and compared them for perioperative outcomes with those patients who had no diagnosis of OSA. These perioperative outcomes included opioid utilization, cost of hospitalization, length of stay, need for blood transfusion, ICU admission as well as cardiac, central-nervous, gastrointestinal, genitourinary, renal, respiratory and thromboembolic complications. Multilevel multivariable models were fitted to determine associations between OSA status and outcomes. Odds ratios (OR) and 95% confidence intervals (CI) are reported. Since only de-identified data was used, this study was exempt from patient consent by the Institutional Review Boards of the Hospital for Special Surgery and Icahn School of Medicine at Mount Sinai.

Results: Of N = 459,508 patients undergoing hysterectomy, n = 11936 (2.6%) had a diagnosis code for OSA listed. On average, OSA-patients were older (52.3 ± 11.4 years vs. 48.4 ± 12.1 years; p<0.0001) and had a higher Deyo-Charlson comorbidity score (1.13 ± 1.79 vs. 0.55 ± 1.49; p<0.0001). When controlling for relevant covariates, OSA status was associated with increased cost of hospitalization (+6.24%; p<0.0001) and length of stay (+2.58%; p<0.0001). In addition, OSA-patients had higher opioid utilization than (+1.24%; p = 0.04). A similar pattern was seen for complications: OSA status was associated with substantially higher odds for ICU admission (OR 2.28; CI 1.77 - 2.94) and renal (OR 1.98; CI 1.70 - 2.31) or respiratory complications (OR 3.25; CI 2.97 - 3.56).

Conclusion(s): In this cohort of patients undergoing hysterectomies, OSA was associated with substantially increased risk of complications. Further research is needed to assess currently used perioperative care strategies for OSA patients undergoing hysterectomies, with the goal to improve outcomes.

14AP07-8**Atrial fibrillation after orthotopic liver transplantation: incidence and risk factors**

González Cibrián C.C., Fernandez Martin C., Martin Grande A., Parise Roux D., Gajate Martin L., Prada de las Heras B. *Ramón y Cajal Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*

Background: Survival in patients undergoing Orthotopic Liver Transplantation (OLT) has risen lately, but increase incidence of metabolic and cardiogenic disorders have been observed. Recent studies had demonstrated that major adverse cardiac events have a negative impact in the outcome of patients undergoing liver transplantation.

Materials and Methods: Retrospective study collecting cases of OLT performed in our hospital from January 2002 to December 2014. The incidence of AF in the early postoperative period after OLT was analyzed. Multivariate analysis could not be performed because the number of patients with atrial fibrillation is too small.

Results and Discussion: Atrial Fibrillation appeared in 21 patients (5,2%). We found statistical association between AF and some donor factors: age ($53 \pm 8,9$ years for not AF vs $59 \pm 6,0$ years for AF patients; $p < 0,001$) and renal replacement therapy needed before the transplant (2,9% not AF vs 14,3% for AF patients; $p: 0,005$). During the surgery: reperfusion syndrome (25,5% for not AF vs 47,6% for AF patients; $p: 0,025$), requirements of frozen plasma ($4,2 \pm 5,66$ units for not AF vs $8,9 \pm 8,5$ units for AF patients; $p: 0,022$) and total blood products ($12,2 \pm 14,2$ units for not AF vs $23,3 \pm 22,8$ units for AF patients; $p: 0,039$).

Complications with statistical relevance after OLT: longer time at the ICU ($7,9 \pm 9,8$ for not AF vs $17,4 \pm 15,1$ days for AF patients; $p: 0,01$), readmission to the ICU rate (13,5% for not AF vs 9,5% for AF patients; $p < 0,001$), re-intubation (18,3% for not AF vs 38,1% for AF patients; $p: 0,025$), re-intubation (14,8% for not AF vs 42,9% for AF patients; $p < 0,001$), renal replacement requirements after the LT (24,2% for not AF vs 47,6% for AF patients; $p: 0,016$), arterial thrombosis (4,2% for not AF vs 14,3% for AF patients; $p: 0,032$), and infectious complications (Pneumonia 14,3% vs 28,6%; wound infection 1,8% vs 9,5%; abdomen infection 4,2% vs 9,5%; catheter related bacteraemia 9,9% vs 0%; and others 5,7% vs 4,8%; $p: 0,031$).

Survival rates found after one year were: 82% for patients with no AF vs 47% for patients shown AF in the early postoperative period ($p < 0,001$).

Conclusion: At our centre, patients with AF in the early postoperative period after an OLT have more complications and longer ICU and hospital stays. But we cannot determine if AF is a cause or a consequence of those important differences. Further prospective studies need to be done.

14AP07-9**Participation rates and gender differences in enrolling patients for a randomized clinical trial evaluating the effect of audiovisual aids on perioperative stress response, pain and overall experience**

Mörwald E.E., Cozowicz C., Lee K.L., Memtsoudis S.G. *Hospital for Special Surgery, Dept of Anaesthesiology, New York, United States*

Background and Goal of Study: Enrolling patients in clinical trials can be challenging and reasons for non-recruitment are poorly understood. In compliance with the CONSORT statement, data about patient recruitment is tracked as per routine for each randomized controlled trial at the Hospital for Special Surgery (HSS). Information on eligibility, attempted approach for consent, consent to participate and declination to participate for each patient screened is entered to a datasheet. We analyzed this data for a clinical trial about the effects of audiovisual aids (AVA) on perioperative stress response, pain and overall experience. For the AVA trial patients undergoing arthroscopic meniscectomy under spinal anesthesia were enrolled. They were randomly assigned to either watch a movie using AVA or undergo surgery without distraction.

We hypothesized that a high percentage of patients would decline to participate and that there would be gender differences in the decision to do so.

Materials and Methods: The AVA-Pilot Study was approved by the Institutional Review Board of HSS. Patient-enrollment for this trial started November 2015 and is still ongoing. We extracted data for patients who were approached for

consent to participate in the AVA Pilot trial. This data was analyzed for rates of declination while taking gender into account. Data is presented as absolute numbers and percentages.

Results and Discussion: At the present date, N=63 patients were approached to participate in this study. Of all patients approached n=47 (74.6%) were male. Of all patients approached n=47 (74.6%) declined to participate. Of the male patients n=33 (70.2%) declined and n=14 (29.8%) agreed while of the n=16 female patients n=14 (87.5%) declined and n=2 (12.5%) agreed to participate. Similar to findings in other clinical trials the percentage of approached patients that agreed to participate was low, especially among female patients.

Conclusion(s): With the data currently available we cannot deduce if females declined because they did not want to be in a clinical trial, they disliked not knowing which treatment arm they would be in or due to the prospect of undergoing surgery without sedation in this specific trial. Collecting data about individual reasons to decline participation might help to develop methods to increase patient participation in general and female patients in particular.

14AP07-10**Hypoalbuminemia as an independent predictor of acute renal injury after liver transplantation**

Ramirez Gonzalez M., Gomez Rojo M., Gajate Martin L., Villahoz Martinez J., Cerro Zaballos C. *Hospital Universitario Ramón y Cajal, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*

Background: Liver transplantation remains the only effective treatment for end-stage liver disease and fulminant liver failure. Throughout recent years, due to improved surgical techniques and advances in the field of perioperative management, survival rates have risen. Nevertheless, there are still serious complications which can arise specially in the postoperative period. Albumin has been found to suffer important modifications in critical patients. Previous studies are highly controversial regarding the impact of serum albumin during the immediate postoperative period in patients undergoing liver transplantation.

Goal of Study: To assess hypoalbuminemia as an independent predictor for the development of acute renal injury after liver transplantation.

Materials and Methods: We analyzed liver transplantation procedures carried out between January 2011 and December 2015 in our center. All of them received the same immunosuppression therapy for protection of kidney function and underwent the same surgical technique. We analyzed the incidence of acute kidney injury (AKI) in two separate cohorts, one with plasma albumin of 3 g/dl or more (group A), and the other with plasma albumin under 3 g/dl (group B). We defined AKI according to KDIGO criteria. First, we carried out a raw analysis of the differences between both groups regarding all registered variables. Next the sample underwent univariate analysis to identify potentially unbalanced variables, potential confounding factors. Finally, binary logistic regression was used with the previously established significant variables.

Results and Discussion: A total of 166 patients were considered. Raw analysis showed a significant difference regarding the incidence of AKI between group A (32%) and group B (63.6%). Logistic regression including significant results (surgery time, intraoperative transfusion of red blood cells (RBCs), diuretic treatment prior to transplantation and intraoperative reperfusion syndrome) showed that patients with serum albumin levels $< 3\text{g/dl}$ were at an increased risk (2.4 higher) of developing AKI in the postoperative period of liver transplantation (OR 2.4; CI 1.1-4.9; $p=0,023$).

Conclusion(s): In our sample, patients with hypoalbuminemia have an increased risk of developing AKI during the postoperative period following liver transplantation. Thus, the optimization of serum albumin levels could reduce the incidence of AKI.

14AP08-1**Preparing for a difficult airway in burning victim - a shocking case report**

Perry da Câmara L., Spencer L., Pissarra F, Fragata I.
 Centro Hospitalar de Lisboa Central, Dept of Anaesthesiology,
 Lisbon, Portugal

Background: Burning victims in countries with less access to specialized medical care are often exposed to avoidable sequelae. These sequelae include post-burn scar and scar contractures, with a huge impact on the patient daily life. When these patients are proposed for any anaesthesia procedure, pre-anaesthetic assessment is essential.

Case report: 38 year old woman evacuated from São Tomé e Príncipe 15 months after a severe burning accident with gasoline, was proposed for a cervical scar contraction repair. The procedure was to be done under general anaesthesia. The patient was evaluated at the pre-anaesthetic assessment one month prior to the surgery. The main problem encountered was a difficult airway. Her cervical contracture scarring impaired neck mobility, extension and obliged her to a hyperflexion position, as seen in the pictures¹. Intubation using a laryngoscope was impossible, and glidescope was also not helpful. Tracheotomy was also impractical, not only because of impossible access to the trachea. What to do?



[Airway]



[Airway side view]

Discussion: Difficult airway is always an anaesthesiologist challenge. In this case, the patient had not only a previsible difficult intubation but also external distortion of the airway impeding ventilation. Furthermore there was no possibility of a surgical airway: an awake nasotracheal fibroscopic intubation was the only option. had to be performed. Fibroscopic intubation was planned in advance and successful.

References: ¹Jasper AO. Anaesthetic management of post-burn contractures, a recurrent challenge from oil pipeline vandalization in Nigeria: a case report. *Cases Journal*. 2009;2:9141. doi:10.1186/1757-1626-2-9141.

Learning points: Preparing for anaesthesia is an essential step on our daily activity. Prevention is the keyword to avoid intraoperative complications, mortality and morbidity.

14AP08-2**Is pulmonary hypertension still a perfect stranger?**

Spiritoso R.¹, Bianchi C.¹, Shaw E.², Madden P.B.³

¹St George's University Hospital, Dept of Anaesthesiology & Intensive Care, London, United Kingdom, ²St George's University Hospital, Pulmonary Hypertension, London, United Kingdom, ³St George's University Hospital, Dept of Intensive Care, London, United Kingdom

Background and Goal of Study: Pulmonary Hypertension (PHT) is considered a rare disease⁽¹⁾. In the perioperative period careful management of PHT is essential to avoid life-threatening complications such as right heart failure and cardiogenic shock. The purpose of our study was to test if the low prevalence of patients suffering PHT on our unit could be due to poor identification i.e. inadequate knowledge of disease process and diagnostic criteria.

Materials and Methods: Data were generated using a simple questionnaire administered to members of staff working within the anaesthetic and critical care department. They were asked to describe their roles, define PHT in terms of diagnostic numerical values, and name essential diagnostic tools. Answers were anonymous. Data were tabulated in excel and analyzed as a percentage.

Results and Discussion: 55 members of staff participated in the study; of those, 10 were consultants, 22 junior doctors and 23 senior nurses. Only 27% (n=15) of all members of staff identified PHT as a mean pulmonary arterial pressure (mPAP) ≥ 25 mmHg⁽¹⁾; 42% (n= 23) identified right heart catheterization as a gold standard for diagnosis⁽¹⁾.

Whilst PHT is not so uncommon, often, it is misdiagnosed or not considered⁽²⁾. A significant delay from symptoms onset to diagnosis has been reported⁽²⁾. Management of PHT is often seen as a niche sub-specialty interest and this could explain the difficulties in diagnosing it early.

Conclusion(s): PHT might be more prevalent than we realize. There could be an underestimation of patients suffering PHT related to under diagnosis due to limited knowledge of the disease.

Further education and an increased index of suspicion might facilitate identification of patients with PHT. The introduction of appropriate diagnostic pathways may improve management of this challenging group of patients especially in the critical care setting.

References:

1. The Joint Task Force for the Diagnosis and Treatment of Pulmonary Hypertension of the European Society of Cardiology (ESC) and the European Respiratory Society (ERS). 2015 ESC/ERS Guidelines for the Diagnosis and treatment of pulmonary hypertension. *European Heart Journal* doi:10.1093/eurheart/ehv317.
2. Brendan P Madden. A Practical Clinical Approach To The Diagnosis And Treatment Of Patients With Pulmonary Hypertension. *ECR - Volume 10 Issue 2 Winter 2015*

14AP08-3

Sepsis-related takotsubo cardiomyopathy

Monteserín Matesanz C.¹, Piñeiro Otero P¹, González Benito E.¹, López Martínez M.¹, Gonzalez-Cantero J.L.²

¹Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Hospital General Universitario Gregorio Marañón, Radiology, Madrid, Spain

Background: Takotsubo cardiomyopathy (TTC), also known as stress-induced cardiomyopathy, is a transient left ventricular (LV) systolic dysfunction that most frequently affects women aged 60-75 years. Hormonal changes associated with menopause influence its development. It usually occurs after a triggering factor although it may be absent in up to one third of patients¹. Its pathophysiology relies on suddenly increased plasma levels of catecholamines². Clinical presentation usually resembles an acute coronary syndrome (ACS)¹.

Case report: A 61-year-old woman with ACS treated with a drug-eluting stent developed rectal cancer. Surgery took place 7 months after coronary event. On late postoperative period, she suffered from acute respiratory insufficiency with intense tachypnea, resting dyspnea and tachycardia. ECG showed ST-segment elevation in leads II, III, aVF and V3-V6. Troponin T level was 378 ng/L (normal <14) and BNP level was 101 ng/L (normal <300). Transthoracic echocardiography showed LV dilatation with apical akinesia and basal hyperkinesia, with ejection fraction (EF) of 30%. Coronary angiography revealed no significant obstructive lesions. Computed tomography showed multiple abdominal abscesses. The diagnosis was TTC associated with abdominal sepsis. She received hemodynamic and respiratory support, drainage of abscesses and antibiotic therapy. Her evolution was favorable, with full recovery of LV systolic function and EF of 55%.

Discussion: Most common presenting symptom is chest pain¹, although our patient never experienced it. Absence of chest pain is relatively frequent among inpatients, in which diagnosis may be suspected after clinical worsening, ECG changes or biomarkers elevations³.

References:

1. Templin C, Ghadri JR, Diekmann J, Napp LC, Bataiosu DR, Jaguszewski M, et al. Clinical Features and Outcomes of Takotsubo (Stress) Cardiomyopathy. *N Engl J Med.* 2015;373(10):929-38.
2. Wittstein IS, Thiemann DR, Lima JA, Baughman KL, Schulman SP, Gerstenblith G, et al. Neurohumoral features of myocardial stunning due to sudden emotional stress. *N Engl J Med.* 2005;352(6):539-48.
3. Chockalingam A, Mehra A, Dorairajan S, Dellsperger KC. Acute left ventricular dysfunction in the critically ill. *Chest.* 2010;138(1):198-207.

Learning points:

- Inpatients with other medical conditions may also develop TTC
- Absence of chest pain is relatively frequent among inpatients
- Definitive diagnosis implies confirmation of LV function recuperation

14AP08-4

A case of Marfan syndrome with respiratory insufficiency after combined surgery for both pectus excavatum and acute aortic dissection type-A

Honda J., Sanbe N., Imaizumi T., Oishi R., Iseki Y., Murakawa M. *Fukushima Medical University Hospital, Dept of Anaesthesiology, Fukushima, Japan*

Background: There are some case reports of patients who simultaneously had surgical repair of the pectus excavatum and cardiovascular surgery resulting in improved cardio-respiratory function¹. We simultaneously performed a surgical repair of pectus excavatum and an aortic dissection, but the patient had difficulties in respiratory management after surgery.

Case report: The 42-year-old female patient had Marfan syndrome, severe pectus excavatum, and scoliosis. She visited the ER with an acute aortic dissection type-A. The Bentall procedure, replacement of the ascending aorta, and surgical repair of the pectus excavatum were performed at once to improve cardiopulmonary function. In the presurgical respiratory function test, %VC was 37%, FEV1.0% was 79%, and PEF was 2.7 L/s, demonstrating a significant decrease in respiratory function.

Since her cardiovascular status was stabilized early after the operation, ventilator support was gradually reduced. The patient was extubated on the postoperative day (POD) 4. However, the patient had difficulty expectorating sputa and had respiratory distress, requiring tracheal intubation again.

Finally, on POD 12, the patient was extubated again and controlled by mini track insertion and NPPV. PaCO₂ increased to around 70 Torr but P/F was 300. The patient was discharged from the ICU on POD 23.

Discussion: There are several case reports of improved cardio-respiratory function after pectus excavatum repair, but our patient was emaciated and had markedly decreased respiratory function before surgery. Though oxygenation was maintained after the surgery, it took time to return to stable respiratory function due to restricted chest movement and to the expectoration dysfunction. Patients with pectus excavatum are expected to have improved cardio-respiratory function after surgery but it takes time to recover after this type of surgery.

References:

1. Multicenter study of pectus excavatum, final report: complications, static/exercise pulmonary function, and anatomic outcomes. *J Am Coll Surg.* 2013 Dec;217(6):1080-9

Kelly RE Jr, Mellins RB, Shamberger RC

Learning points: This case of simultaneous surgical repair of both pectus excavatum and a cardiovascular surgery did not show dramatically improvement of postsurgical respiratory function. This was likely due to the emaciated condition of the patient and the limited thoracic mobility after surgery. Respiratory function should be sufficiently evaluated before and after similar surgery.

14AP08-5

The challenge of cancellations on the day of surgery: retrospective study

Francisco E., Santos J., Amaral R., Vico M., Assunção J.P. *Hospital de São Teotónio - Centro Hospitalar Tondela-Viseu, Dept of Anaesthesiology, Viseu, Portugal*

Background and Goal of Study: Cancellation of elective procedures on the day of surgery (DOS) is a recognized problem in hospitals throughout the world, ranging from 1,96% to 24%¹. Besides the inconvenience for the patients this represents a major cause of inefficient use of operating room (OR) time and a waste of resources. **Goal:** investigate the rate and reasons for DOS cancellations in our hospital and propose strategies to reduce its incidence.

Materials and Methods: Retrospective study of patients cancelled on the DOS in a 13 month period. OR listing and medical records were used for data collection: number of patients cancelled by specialty and reasons for cancellation. Reasons for cancellation were classified in 7 major categories: clinical risk, lack of OR time, equipment failure, lack of staff, change of priorities, lack of beds in the ward and patient refusal.

Results and Discussion: A total of 7314 patients were scheduled and the cancellation rate on DOS was 11%. Clinical risk was the main reason for cancellation (36%) followed by lack of OR time (35%). Lack of OR time was mainly due to overbooking. All other causes each were responsible for 8% or less of the cancellations (Grap1). Acute disease or worsening chronic illness were the main cause for cancellation due to clinical risk (75%) followed by analytical abnormalities (10%), absence of medication discontinuation (9%), lack of complementary exams (4%) and absence of fasting (2%) (Grap2). Orthopedics had the highest number of cancellation (2,3%) and Plastic Surgery the lowest (0,1%) (Grap3). These results are in line with literature and highlight the fact that the majority of cancellations were potentially avoidable by timely identification of medical problems. The number of cancellations can be decreased by improving communication between patient, doctors and nurses. Also the OR list booking should take into account not only surgeon's operating time but total theater time required to deal with each patient. Besides all that, required equipment for scheduled procedures should be discussed among staff at least one day prior to the procedure.

Conclusion: Determining the major avoidable contributors to DOS cancellation is an essential step to decrease it. Studies should be carried out at regular intervals to find the reality of the functioning of the operating theatre in order to increase its efficiency.

References: ¹Kaddoum et al. *BMC Healthy S. Research* (2016)

14AP08-6**Anesthetic challenges during interventional management of extra-cranial vascular malformations**

Hasan N., Venkatraghavan L.

University of Toronto, Dept of Anaesthesiology & Pain Medicine, Toronto, Canada

Background: Arteriovenous malformations (AVMs) are vascular anomalies characterized by shunting of blood from arterial to venous circulation by one or more fistulae. Advances in interventional techniques have rendered them more amenable to treatment. Anesthesia care of these patients is often challenging due to high cardiac output states warranting invasive monitoring, need for complex airway management, multiple anesthetics, difficult pain management and special concerns with sclerosing agents. Aim of our study is to review the anesthetic management of patients undergoing treatment of extracranial AVMs, determine challenges and perioperative complications.

Methods: After IRB approval we conducted a retrospective study on elective patients who underwent interventional treatment for extracranial vascular malformations at our institution from 2010-2016. Data collected included patient demographics, anesthetic techniques, airway management, invasive monitoring, sclerosing/embolizing agents used and perioperative complications. Descriptive statistics were used for analyzing the data.

Results: Total of 92 patients underwent 132 procedures (mean age 65.48 years, 51 female). General anesthesia was the commonly used technique. Eleven patients needed complex airway management [nasal intubation (4), tracheostomy (1), video-laryngoscopy (6)]. Six patients in the peripheral group presented with high output cardiac failure needing invasive cardiac output monitoring. Bleomycin was the sclerosing agent in all head and neck AVMs and alcohol was commonly used for peripheral AVMs. Most complications were minor except for unexpected ICU admission (n=2) with exacerbation of cardiac failure from use of alcohol and severe postoperative pain needing hospitalization (n=1).

	Head and neck AVMs N=50	Peripheral AVMs N=42
Location	Tongue (11), Lips (10), Neck (12), Others (19)	Lower limb (18), Upper limb (12), Pelvis (6), Others (3)
Anesthesia	GA (39) Sedation (11)	GA (74) Sedation (2) Regional (6)
Airway management	Oral airway (4), LMA (25), ETT (8), Nasal tubes (4) Tracheostomy (1)	LMA (17), ETT (57)
Sclerosing agents used	Bleomycin (50)	Alcohol (48), Onyx/Glue (20), Coils (2), Foam (6)
Complications	Skin discoloration with adhesive tapes (15)	Cardiogenic shock (1) Failed extubation (1) Failed treatment (1) Severe Pain (4)
Postoperative disposition	Day surgery (50)	Day surgery (76) Ward (2) ICU/HDU (4)

[Results - Table 1]

Conclusion: Extracranial vascular anomalies are rare and occasionally complex lesions. Anesthetic management of these patients can be challenging; main issues being underlying heart failure and location of the malformations. Although overall risk of complications is low, background knowledge of these potential occurrences and their management is useful for all anesthesiologists.

14AP08-7**Uhl's Anomaly: description of anesthetic management on an urgent context**

Pedrosa F., Damas M., Cruz A.

Centro Hospitalar Lisboa Norte - Hospital Santa Maria, Dept of Anaesthesiology, Lisboa, Portugal

Background: Uhl's Anomaly is a rare congenital heart disease characterized by absence of myocardial fibers of the right ventricle. A severe cardiomegaly due to right ventricle dilation is a hallmark of this syndrome. Progressive right cardiac failure with pulmonary hypertension are the main symptoms,

and start at an early age. Less frequent manifestations are arrhythmias and heart blocks. Mainstay treatment is symptomatic relief although surgical approaches have been described.

Case report: We describe a case of a 29-years-old, male patient diagnosed with Uhl's Anomaly requiring urgent perianal abscess drainage. First symptoms appeared at the age of 22 years old when he presented with fatigue for mild efforts. No other diseases are known. He had close cardiology follow-up and was on symptomatic treatment and oral anticoagulation with rivaroxaban. Preoperative evaluation showed peripheral cyanosis, digital clubbing and heart failure classified as NYHA class II. Among the preoperative blood tests done, a thrombocytopenia and a prolonged prothrombin time were highlighted. On chest X-ray a marked cardiomegaly was seen. Electrocardiography showed right bundle branch block and atrial fibrillation. Previous echocardiogram showed severe right ventricle dilation with systolic failure, pulmonary hypertension and moderate left ventricle dysfunction with an estimated ejection fraction of 35%.

After a multidisciplinary discussion, it was decided to perform surgery under general anesthesia with invasive arterial pressure monitoring, BIS along with standard monitoring care. Multifunction external electrode pads were on position before induction of anesthesia. During intraoperative period there was no critical events such as pulmonary complications, hypotension or cardiac arrest. No vasopressor drugs were used. The recovery period was at cardiology intensive care unit. Postoperative cardiac markers remained negative.

Discussion: The rarity of this heart condition and the urgent context of the procedure point out the relevance of this case. Preoperative evaluation of the patient, even in the urgent context, is of utmost importance. Understanding the disease and its limitations is essential before planning the anesthetic management of this patient.

Conclusion: A multidisciplinary approach to this patient was extremely important on deciding the perioperative management. Coordinated and timely actions of the different specialities involved contributed to the success of this case.

14AP08-8**Donor-receptor troponin transfusion with liver graft? A case during liver transplantation**

Vilchez Monge A.L., Hernández I., Olmedilla L., Garutti I., Jimenez de la Fuente C., Pérez-Peña J.M., Liver Transplantation Group

Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Elevation of troponins during surgery suggests underlying myocardial injury (MI). Donor-receptor troponin transfusion due to organ transplantation has not been previously described in literature, so we consider this case the first warning about the very special caution required when evaluating the elevation of perioperative troponins in receptors during solid organs transplantation.

Case report: A 52 year old male patient with normal Preoperative coronaryography and echocardiography undergoes elective LT with Continuous Intraoperative monitoring including 5 derivation ECG, PiCCO monitor and determination of cardiac markers such as HS-TnT at least in 3 key intraoperative phases. Just after graft reperfusion, isolated troponin very significative elevation occurs in repeated serialations with no hemodynamic, ECG or echocardiographic changes. After discarding monitoring errors the surgery continues with normality and patient is transferred to ICU. Blood samples from ICU show diminishing slope of HS-TnT together with normal clinical evolution ruling out underlying MI. No postoperative complications appear.

Notably, liver donor died due to brain death after massive cardiac ischemia presenting HS-TnT values prior to explantation of >10000 ng/L, requiring high doses of vasopressors, Extracorporeal Membrane Oxigenation and Intra-aortic balloon pump prior to death diagnosis.

Discussion: Although perioperative troponin monitoring has been recommended in several types of surgery, transplantation surgery has not been extensively studied and signification of intraoperative troponin elevation remains unclear. In our case, elevation of troponins in liver receptor is highly probable due to donor-receptor transfusion of troponins embedded in the graft, despite meticulous blood lavage during graft explantation. As solid organ might act as the source for troponins that would reach circulating peaks in receptor after reperfusion of the graft, special caution is needed when evaluating troponin samples in receptors of organ solid grafts. We consider this case of remarkable importance as no literature exists addressing this fact.

Learning Points: Graft donor medical state knowledge is required to put in context clinical and analytical behavior of receptor during and after LT. When grafts come from donors suffering major cardiac events, troponin measurements in receptors during LT should be evaluated cautiously.

14AP08-9

Perioperative management of insulinoma: a case report

Sarmento Castro J., [Peixoto A.R.](#), Fortunato Silva M.
Centro Hospitalar São João, Dept of Anaesthesiology, Oporto, Portugal

Background: Insulinoma is a rare (incidence: 1-4 in 1 million cases¹¹) neuroendocrine tumour that secretes insulin, deriving mainly from pancreatic islet cells. It is the most common cause of hypoglycaemia resulting from endogenous hyperinsulinism.

Case report: Male, caucasian, 38 year-old-man, BMI: 28 (92kg, 181cm), ASA 2. Presenting with pathognomonic Whipple's triad (symptoms of hypoglycaemia after fasting/exercise, low circulating glucose level during these episodes and prompt relief of symptoms when glucose is raised to normal), 72 hours fasting positive test and an abdominal CT, showing a nodular lesion in the head of pancreas, which confirmed the diagnosis of insulinoma. Proposed to elective cephalic duodenopancreatectomy with pylorus preservation. Preoperative treatment with diazoxide 175mg/tid and 10% glucose infusion (glycaemia monitorization every 2 hours).

After admission in the operating room, informed consent obtention, standard ASA monitorization, central venous pressure, invasive arterial pressure and cardiac output (PiCCO®) monitorization, the authors performed general anaesthesia induction with midazolam (0,02mg/kg), fentanyl (0,2mg/kg), propofol (2mg/kg) and rocuronium (0,6mg/Kg). Glucose levels were monitored every 30min, during the first hour, and every 15min thereafter until the end of surgery. No hypoglycaemic episodes were detected. Multimodal analgesic regimen included ultrasonographic bilateral *quadratus lumborum* block (Locoplex Vygon®, 50 mm, linear probe (13MHz), in plane technique, ropivacaine 0,2% (0,6mL/Kg) and systemic analgesia.

Postoperative admission in ICU, with rigorous glycaemic control with insulin infusion for 5 days. Subsequent 2 reinterventions due to anastomotic dehiscence. Discharge 88 days after hospital admission.

Discussion: In such rare clinical scenario, rigorous perioperative care is crucial to improve clinical outcome. Anaesthesiologists must be aware of large intra-operative glycaemic swings and their deleterious effects. Prevention of hypoglycaemia until tumoral resection and rebound hyperglycaemia after resection are the main goal of perioperative management.

References:

- Vaidakis D, *et al.* Pancreatic insulinomas: Current issues and trends. *Hepatobiliary Pancreat Dis Int.* 2010;9:234-41.
- Goswami J, *et al.* Insulinoma and anaesthetic implications. *Indian J Anaesth* 2012;56:117-22.

Learning points:

- Recognize insulinoma clinical features
- Describe perioperative management of insulinoma

14AP08-10

Exclusive use of diltiazem in the per-operative management of bilateral pheochromocytoma: anaesthetic double challenge

Caldeira A., [Galacho J.](#), Pereira I.
Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background: This study aims to report the exclusive use of diltiazem in the perioperative anaesthetic management of a patient with bilateral pheochromocytoma.

Case report: A 29-year-old asymptomatic male, with multiple endocrine neoplasia (MEN) type 2B syndrome, was admitted for bilateral laparoscopic adrenalectomy. Diagnostic was confirmed by abdominal CT scan, MIBG scan and raised urinary catecholamines. Blood pressure (BP) and heart rate (HR) were within normal range. Preoperative management strategy was diltiazem 60mg once daily, seven days before surgery.

Premature ventricular contractions, major intraoperative BP and HR fluctuations occurred during the manipulation of both tumours, followed by abrupt falls on BP and HR.

Discussion: Pheochromocytoma's pre-operative management and patient optimization are core aspects, as mortality rate can reach up to 50%¹, and they aim for adequate BP, HR and arrhythmias control, restore volume depletion and prevent induced catecholamine storm.²

There is still no consensus on the best approach, although the alpha adrenergic blockade for at least 2 weeks seems to be the most commonly used strategy. Once the patient is adequately prepared, beta blockade can then be instituted.

No distinction was found in hypertensive episodes during surgery for MEN and non-MEN-associated pheochromocytoma. As such, management with alpha and beta-adrenergic blockers remains a standard of care in both groups.³

In spite of lacking morbidity or mortality, our case represents how challenging a normotensive asymptomatic pheochromocytoma can be.

References:

- Desmots JM, le Houelleur J, Remond P, Duvaldestin P. Anaesthetic management of patients with pheochromocytoma: A review of 102 cases. *Br J Anaesth.* 1977;49:991-8
- Bajwa SS, Bajwa SK (2011) Implications and considerations during pheochromocytoma resection: A challenge to the anesthesiologist. *Indian J Endocrinol Metab* 15: S337-S344.
- Scholten A, Vriens MR, Cromheecke GJ, Borel Rinkes IH, Valk GD. Hemodynamic instability during resection of pheochromocytoma in MEN versus non-MEN patients. *Eur J Endocrinol.* 2011 Jul. 165(1):91

Learning points: The pheochromocytoma patient approach should be done by a multidisciplinary team with the early anaesthesiologist involvement. Alpha and beta-blockade play an essential role in the pre-operative management of these patients.

14AP09-1

Apixaban in the perioperative period

[Monteserín Matesanz C.](#), González-Moraga F.J., Sánchez Pedrosa G., Lema Tomé M., Garutti Martínez I., Sanz Fernández F.J.

Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Apixaban is a direct oral anticoagulant (DOAC) which inhibits factor Xa. It has predictable pharmacokinetics properties¹ and its anticoagulant effect is monitored by measurement of anti-factor Xa levels². Current management is based on apixaban pharmacology, but there is a lack of clinical studies in managing patients treated with DOAC who undergo surgery.

Case report:

CASE 1. A 81-years-old man with chronic atrial fibrillation treated with apixaban 5mg/12h was proposed for knee replacement. There were no renal test alterations (creatinine 0,98 mg/dL and creatinine clearance >60 mL/min).

Apixaban was stopped 24 h prior to surgery. Anticoagulation monitoring showed an elevated anti-factor Xa level (0,55 U/mL).

CASE 2. A 73-years-old woman with paroxysmic atrial fibrillation treated with apixaban 5mg/12h was proposed for cervical lymph node excision. She had normal renal function (creatinine 0,94 mg/dL and creatinine clearance 58 mL/min). Apixaban was discontinued 24 h before surgery. Residual anticoagulant effect (anti-factor Xa 0,67 U/mL) was noted at the time of surgery.

In both cases, surgeries were deferred until normal preoperative coagulation could be guaranteed.

Discussion: Only 25% of apixaban is eliminated by the kidneys¹, which make it suitable for patients with impaired renal function. Last dose of apixaban should be given one day before surgery to guarantee normal preoperative coagulation in most patients, however a more prolonged discontinuation should be advised in patients with creatinine clearance < 50 mL/min or > 65 years³. We could find ourselves in unexpected situations following such a generic guideline and, on the grounds of the reported cases, we suggest anti-factor Xa monitoring of every patient under apixaban.

References:

- Raghavan N, Frost CE, Yu Z, He K, Zhang H, Humphreys WG, *et al.* Apixaban metabolism and pharmacokinetics after oral administration to humans. *Drug Metab Dispos.* 2009;37(1):74-81.
- Castellone DD, Van Cott EM. Laboratory monitoring of new anticoagulants. *Am J Hematol.* 2010;85(3):185-7.

3. Llau JV, Ferrandis R, Castillo J, de Andrés J, Gomar C, Gómez-Luque A, et al. Manejo de los anticoagulantes orales de acción directa en el período perioperatorio y técnicas invasivas. *Rev Esp Anestesiología y Reanimación*. 2012;59(6):321-30.

Learning points:

- Randomized clinical trials are warranted to guide perioperative management of apixaban
- Anti-factor Xa should be monitored in every patient under apixaban

14AP09-2

Vasospastic angina in the same patient in two different surgical occasions

Ferreira P, Guedes A., Almeida C., Assunção J.P.

Hospital de São Teotónio - Centro Hospitalar Tondela-Viseu, Dept of Anaesthesiology, Viseu, Portugal

Background: Vasospastic angina is a condition characterized by coronary artery spasm in normal and diseased coronary arteries. Although rare in perioperative period, it can be triggered by either general and regional anesthesia¹. This is a case of two different events in the same patient in two different surgeries.

Case report: A 40 years old male patient, ASA II (smoker), submitted to femoral popliteal bypass surgery for a false popliteal aneurysm correction under general anesthesia. After intraoperative prone positioning, patient developed supraventricular tachycardia with apparent ST segment elevation. When extubated, patient referred severe thoracic pain and was immediately treated with aspirin, nitrates and morphine. EKG performed 10 minutes later showed no acute ischemic signs. Transferred to post anesthesia care unit (PACU) and then to coronary intensive care unit (CICU), where he remained for 48h with no elevation of cardiac markers. Coronarography performed 4 days later was normal. After 6 months, patient was submitted to new bypass surgery after occlusion of first one, under spinal anesthesia with femoral block for postoperative analgesia in dorsal decubitus. Immediate post-operative period with new episode of thoracic pain and ventricular dysrhythmia at PACU of 3 minutes duration. Patient was again monitored for 24h in CICU, always asymptomatic and with negative markers. No episode recurrence has been reported after last surgery.

Discussion: Vasospastic angina during anesthesia is rare. Its cause is unknown, with sympathetic-parasympathetic imbalance pointed as a possible one². Factors as specific positioning and anesthetic technique were ruled out as possible causes in this patient. Typical EKG changes include transient ST segment alteration. Prompt coronary angiography is needed for early diagnosis. No reports were found in the literature of an angina event in the same patient in two different surgeries.

References:

1. Green MS et al. Intraoperative coronary artery vasospasm: a twist in the tale! *Middle East J Anaesthesiology* 2011 Jun; 21(2):299-304
2. Easley RB et al. Coronary artery spasm during initiation of epidural anesthesia. *Anesthesiology* 2003; 99:1015-7

Learning points: Despite its rarity, perioperative period presents numerous triggering factors for patient vasospasm, and anesthetist should be sensitive to this possibility in the presence of typical symptoms and EKG changes. Timely interdisciplinary cooperation contributes to good patient outcome.

14AP09-3

Anesthesia in Brugada syndrome: problems and pitfalls case series

Alves P, Hipólito C., Rodrigues A., Alves J.

Hospital de Braga, Dept of Anaesthesiology, Braga, Portugal

Background and Goal of Study: Brugada Syndrome (BrS) is a rare autosomal disease caused by a mutation affecting the ion channels of the cardiac conduction system. Some routinely used anesthetic agents have shown to trigger ventricular malignant arrhythmias leading to sudden cardiac arrest. The purpose of this study is to review the anesthetic management and perioperative outcomes of patients with BrS treated at our institution.

Materials and Methods: Retrospective chart review of anesthetic records from patients with type 1 Brugada ECG pattern and BrS, from 2012 through 2016 at Hospital de Braga. Data collected included administered drugs, ST segment alterations and occurrence of complications.

Results and Discussion: Twelve patients who underwent a total of seventeen anesthetic procedures were identified. All patients exhibited a type 1 Brugada ECG pattern and seven had a diagnosis of BrS. Seven procedures were performed under general anesthesia, three under regional anesthesia and seven involved monitored anesthesia care. Postoperative surveillance was performed in either Intermediate or Post-Anesthetic Care Units for a period up to 46 hours. During the perioperative and recovery periods no arrhythmias or adverse events were observed. (Table 1) Because of the low prevalence of BrS and the absence of prospective studies, current guidelines for anesthetic management of these patients derive from theoretical models based on disease pathomechanism and observations from case reports and series. Our case series, and a limited body of existing evidence, report the safe use of anesthetic agents that theoretically are associated with possible complications, e.g. propofol, neostigmine and local anesthetics. Other triggers, including surgical insult, vagal tone, electrolyte abnormalities and fever may worsen ST elevation, a finding that is suspected to result in an increased risk of ventricular arrhythmias. Despite the generally favorable outcomes, specific concerns remain and more studies about anesthetic drugs and molecular biology are necessary to guide the optimal anesthetic approach.

Conclusion: Although rare, BrS accounts for 4% of all sudden deaths and up to 20% of sudden deaths in patients without structural cardiac defects. Expert consultation, close hemodynamic monitoring and careful management of triggers are essential to reduce potential morbidity and mortality.

14AP09-4

Internal carotid artery dissection after laparoscopic surgery

Martín-Mateos E.¹, Gómez-Ríos M.Á.¹, Casans Francés R.², Freire-Vila E.¹

¹Complejo Hospitalario Universitario A Coruña, Dept of Anaesthesiology & Intensive Care, A Coruña, Spain, ²Hospital Clínico Universitario 'Lozano Blesa', Dept of Anaesthesiology & Intensive Care, Zaragoza, Spain

Background: Headache is a common symptom. However, more serious, uncommon and life-threatening conditions as carotid artery dissection (CAD) can be associated with severe neurologic sequelae in otherwise young, healthy patients. Clinicians should be familiar with the presentation and management strategies for this complication.

Case report: The patient was a 39-year-old, 58 kg female without relevant medical history. She was scheduled for laparoscopic right adnexectomy due to mucinous cystadenoma. Induction and maintenance of anesthesia was uneventful. The procedure was carried out without incident, and the patient's trachea was extubated at the end of the operation, with minimal hemodynamic fluctuation. In the post-anesthesia care unit, patient developed a persistent oppressive right-sided frontotemporal headache and neck pain with swallowing, partial ptosis and reactive miosis without visual loss. Contrast angiography revealed a spontaneous CAD. Anticoagulation and antiplatelet therapy were initiated. Our patient was discharged home without any neurologic sequelae.

Discussion: CAD is a rare condition. Its etiology is either spontaneous or traumatic, although simple manipulation of the neck can evoke a dissection. Several factors may have contributed. The combination of pneumoperitoneum along with the steep Trendelenburg position affect cerebrovascular and hemodynamic homeostasis increasing the risk of arterial dissections. Neck hyperextension during endotracheal intubation could have played a role; however Totaltrack device allowed an ETI with the head in a neutral position. The classic triad of unilateral pain in the head, face or neck, partial Horner's syndrome and cerebral ischemia is found in fewer than 30% of cases. Cranial nerve palsies and pulsatile tinnitus have been reported. The gold standard for diagnosis of CAD is contrast angiography. Treatment of CAD consists of avoiding or limiting neurological deficit through the prevention of thrombus formation or associated embolism. Therefore, anticoagulation and antiplatelet therapy are the mainstay of the treatment.

References: Ortiz J, Ruland S. Cervicocerebral artery dissection. *Curr Opin Cardiol* 2015;30:603-10.

Educational Points: CAD should be considered in the differential diagnosis of postoperative headache. Early recognition is important to avoid serious and potentially life-threatening neurologic deficits.

14AP09-5

Perioperative fatal cerebrovascular accident after radical prostatectomy

Cristelo D., Azevedo B., Pina M.F.
 Centro Hospitalar São João, Dept of Anaesthesiology, Porto, Portugal

Background: Cerebrovascular accident (CVA) is a rare event associated to radical prostatectomy.

Case report: 50-year-old man, ASA III, smoker, chronic obstructive pulmonary disease, obstructive sleep apnea under CPAP, dyslipidemia, no controlled hypertension, left ventricular hypertrophy and diastolic dysfunction with a prostate adenocarcinoma was submitted to radical prostatectomy (Trendelenburg position) under combined epidural-general anesthesia, with intermittent pneumatic compression.

The procedure last 2 hours and the patient was extubated in the operating room, uneventfully. In the post anesthesia care unit, when he spontaneously mobilized his members, it was found that he presented left hemiplegia, anisocoria, facial drooping, slurred speech and his head was turned to right.

CT scan showed an extensive hemispheric right CVA. Angio-TC showed a right internal carotid artery with atherosclerotic plaques and no collateral circulation to superior plans. Besides medical treatment and decompressive craniectomy, patient died one week later.

Discussion: Perioperative CVA occurs in approximately 0.08-0.7% of patients after non-cardiovascular surgery.[1] Radical prostatectomy is associated with high risk of deep venous thrombosis(16.8%) and pulmonary embolism(5.8%). [2] Potential causes of embolism include acute venous thrombus in lower extremities, deep pelvic veins or in the stretched iliac veins by the surgical manipulation, which under positive pressure ventilation might embolize and cause CVA. A hypercoagulable state is also common, although perioperative study was normal.

Besides smoking and no controlled hypertension, there was no significant patient risk factors. Perioperative risk factors related to the procedure like perioperative hemodynamic instability, stasis, prolonged immobilization were absent.[3]

References:

1. Kikura, M., Bateman, B.T. & Tanaka, K.A. Perioperative ischemic stroke in non-cardiovascular surgery patients. J Anesth 2010, 24: 733.
2. Beyer J, Wessela S, Hakenberg OW, Kuhlisch E, Halbritter K, Froehner M, Wirth MP, Schellong SM. Incidence, risk profile and morphological pattern of venous thromboembolism after prostate cancer surgery. J Thromb Haemost 2009; 7: 597-604
3. Caplan LR. Caplan's stroke. 4th ed. Philadelphia PA: Saunders Elsevier; 2009.

Learning Points: Early identification and treatment of perioperative hemispheric CVA, while excluding a drug-induced state.

14AP09-6

New approaches in peripheral venous catheterization: JLB®, a new catheter for large veins

Nicolini M.¹, Bertellini E.¹, Mori F.², Scarabottini S.², Barchetti M.³, Brugioni L.⁴

¹Azienda Unità Sanitaria Locale Modena - Azienda Ospedaliero Universitaria di Modena, Dept of Anaesthesiology & Intensive Care, Modena, Italy, ²University of Modena and Reggio Emilia, Internal Medicine and Critical Care, Modena, Italy, ³Ospedale Civile di Sassuolo, internal Medicine and Critical Care, Sassuolo, Italy, ⁴Azienda Ospedaliera Universitaria Policlinico di Modena, Internal Medicine and Critical Care, Modena, Italy

Background: Patients with difficult intravenous access represent a contextual problem of emergency medicine setting. The spreading of ultrasound and the increasing fragility of the in-hospital population led to find new approaches of peripheral venous catheterization, trying to avoid invasive, expensive, time-consuming and prone to serious adverse events procedure, such as central venous catheterization. JLB® (Deltamed Inc) is an over the needle catheter designed for large peripheral veins, such as Internal Jugular vein (IJV). Its hyperechoic tip enables to perform easily an eco-guided bedside non-sterile (aseptic) technique.

Materials and Methods: JLB® was distributed to 3 Emergency Medicine wards, 2 Anesthesiology and 1 Internal Medicine ward. A retrospective observational multicentric study was conducted from July 2015 to April 2016. The device was inserted using a high frequency linear probe. Data have been collected referring to demographics, device specifications (available in 80/70/60 mm length, 14/16/17/18 Gauge diameter), procedure times and complications.

Results: Preliminary data refer to 214 cases of 400 enrolled. Mean age 72.9 years ± 16, SD; 121 women. Main indication for cannulation with JLB® were peripheral venous pool depletion and need of inotropes. Positioning site: IJV (90,6%), Basilic/Cephalic (8,9%). No major adverse events (iatrogenic pneumothorax, arterial cannulation, thrombosis, major arrhythmia and devices related infection); 3 minor complications (soft tissues haematoma, atrial fibrillation, self-removal); Indications to removal: no more requirement and death. Mean procedure time: <4min. Success at first attempt of cannulation: 77.5%.

Conclusion: Actually JLB® results safe and improves patient management and costs, especially when alternative techniques could be an overtreatment.

14AP09-7

Comparison of systemic vascular resistance index and aortic augmentation index under anaesthesia in patients undergoing laparoscopic surgery - a pilot study

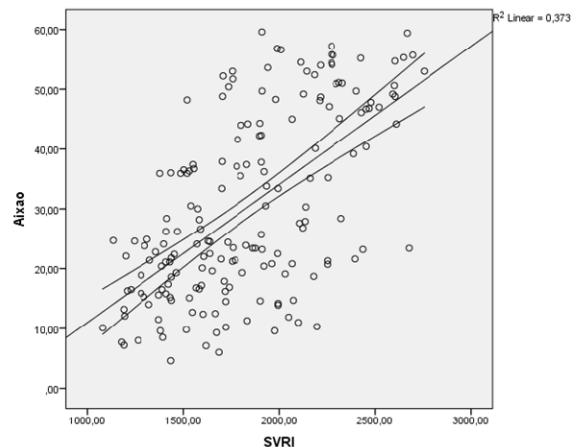
Öveges N.¹, László I.¹, Szabó Z.¹, Rudas L.¹, Illyés M.², Molnár Z.¹

¹University of Szeged, Dept of Anaesthesiology & Intensive Care, Szeged, Hungary, ²University of Pécs, Heart Institute, Pécs, Hungary

Background and Goal of Study: High risk patients may benefit from advanced haemodynamic monitoring targeted perioperative management. In addition to invasive monitoring, several non-invasive methods have been developed. Our aim was to test a new non-invasive device applying occlusive oscillometry (Arteriograph®, TensioMed, Hungary) during major surgery, with special interest in the correlation between the aortic augmentation index (Aixao) and its correlation to systemic vascular resistance (SVRI) determined by invasive monitoring.

Materials and Methods: The study was approved by the Regional Ethics Committee. After obtaining informed consent, patients undergoing major laparoscopic surgery were instrumented with: the Arteriograph's blood pressure cuff was placed on the right arm; continuous haemodynamic monitoring was performed by via an indwelling catheter in the left radial artery (PulsioFlex, PULSION, Germany); a central venous catheter was placed in the right internal jugular vein. Data were collected in every 5 minutes throughout the operation and for 1 hour postoperatively. Matching data points were analysed. For statistical analysis Pearson's correlation, and linear regression was used. For analogous parameters, Bland-Altman's test was performed.

Results and Discussion: 179 valid data points were obtained from 6 patients. Heart rate, systolic, diastolic and mean arterial pressures showed similar correlation and good agreement to invasive measurements as reported earlier [1]. We found significant (p<0.01), positive correlation between Aixao and SVRI. Despite being considered as a stationary indicator of arterial stiffness, Aixao showed quick responses to acute changes in SVRI. These results suggest that Aixao might be a useful non-invasive alternative of monitoring vascular resistance intraoperatively.



[Correlation between Aixao and SVRI]

Conclusion(s): In this pilot study we found significant correlation between the non-invasively measured Aixao and SVRI. The role of Aixao in intraoperative decision making will be tested in future trials.

References: 1. Horváth IG et al. *J Hypertens* 2010;28(10):2068-75.

14AP09-8

Extrapericardial tamponade due to gastric dilatation: role of bedside focused cardiac ultrasound

Caballero M.¹, Vives M.²

¹Hospital Universitari de Bellvitge, Dept of Anaesthesiology & Intensive Care, Sitges, Spain, ²Hospital Universitari de Bellvitge, Dept of Anaesthesiology & Intensive Care, Barcelona, Spain

Background: Extrapericardial tamponade is a life-threatening compression of the heart with an extrapericardial etiology. Common causes of extrapericardial tamponade are hematoma, tumors, ascites, and hernias.

Case report: This report describes the case of a 75-year-old man with an obstructive shock secondary to a very large gastric dilatation compressing the left ventricle, who was diagnosed by a Focused Cardiac Ultrasound (FCU) which led to gastric decompression improving hemodynamics and reversing the circulatory shock state.

Discussion: Chest X ray and ECG are poor diagnostic tools of cardiac tamponade. Diagnosis of cardiac tamponade is based on clinical signs. However, bedside FCU may definitely help in the differential diagnosis of the cause of hypotension and therefore leading to early treatment.

In patients with hemodynamic instability, FCU in these setting clearly adds to the bedside physical examination and can be performed immediately at the bedside [1].

Findings on an FCU examination should not be considered definitive, but integrated with the other bedside patient data (history and physical examination) to form an initial diagnostic impression

References:

1. Labovitz AJ, Noble VE, Bierig M, Goldstein SA, Jones R, Kort S et al. Focused cardiac ultrasound in the emergent setting: a consensus statement of the American Society of Echocardiography and American College of Emergency Physicians. *J Am Soc Echocardiogr: official publication of the American Society of Echocardiography* 2010;23:1225-30.

Learning points: This report emphasizes the importance of the bedside focused cardiac ultrasound to diagnose the cause of the circulatory shock state.

14AP09-9

Perioperative management of a patient with carnitine palmitoyltransferase 2 deficiency

Máximo M., Pereira M.

Hospital Prof Doutor Fernando Fonseca, Dept of Anaesthesiology, Amadora, Portugal

Background: Carnitine palmitoyltransferase 2 (CPT-2) deficiency is a rare condition that results from a defective mitochondrial fatty acid oxidation. It is the most commonly inherited metabolic cause of recurrent rhabdomyolysis in adults. Fasting and stress are the usual triggers and propofol, neuro-muscular blocking drugs and volatile anesthetics have also been implicated. Accompanying cardiomyopathy or conduction defects can occur.

Careful perioperative management of these patients is of great importance to prevent disease exacerbation and rhabdomyolysis-related acute kidney injury (AKI).

Case report: We report an ASA II 43 year-old male patient, with the diagnosis of CPT-2 deficiency and a past history of rhabdomyolysis with severe AKI, as well as mild episodes of muscle pain and weakness induced by exercise and stress. He was submitted to an elective stapled haemorrhoidopexy. Spinal anesthesia with bupivacaine (5 mg) was performed with insufficient block. General balanced anesthesia was then induced with fentanyl (0,05mg) and propofol (180mg) and maintenance was made with sevoflurane 2%. Perioperative management included individualized analgesic and fluid therapy, minimizing fasting and monitoring glycemia and creatine kinase (CK) levels. The postoperative period occurred uneventfully. Glucose levels were 159 mg/dL and CK was moderately raised (605 U/L), as expected after surgery. He was discharged at the first postoperative day.

Discussion: The ideal anesthetic strategy in CPT-2 deficiency is still not defined and there are only around 300 reports worldwide^{1,2}. Minimizing fasting period, providing adequate carbohydrate intake and reducing surgical stress is always required as there is no etiological therapy. Past history of stressors may guide the approach. Additionally, patients' disease-related co-morbidities and metabolic status must be carefully assessed. Although local anesthesia is preferred¹, general anesthesia can be safely performed. An action plan in case of massive rhabdomyolysis should be predefined.

References:

1. Lilker S, et al. *Can J Anaesth*. 2006; 53(5):482-6.

2. Moundras JM, et al. *Ann Fr Anesth Réanim*. 2000; 19:611-6.

Learning points: Perioperative management of CPT-2 deficiency should be guided by patients' past history and identified stressors. An optimized preventive strategy is essential and allows for safe general anesthesia in these patients. Perioperative massive rhabdomyolysis is a possible event and should be anticipated.

14AP09-10

Carboxythracs at video-assisted thoracoscopy in patients with penetrating wounds of the chest

Volchkov V.¹, Kundius U.¹, Boyarkina A.¹, Volchkova E.², Nefedov A.²

¹Saint Petersburg State University, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation, ²Pavlov First Saint Petersburg Medical University, Dept of Anaesthesiology & Intensive Care, Saint Petersburg, Russian Federation

Background and Goal of Study: The usage of CO₂ insufflation into the pleural cavity during the theranostic video-assisted thoracoscopy (VATS) can become an acknowledged alternative to dual-lumen separate bronchial intubation. The goal of study was to evaluate the efficiency and safety of surgically operated lung collapse using method of carboxythracs during VATS.

Materials and Methods: Within the survey the anaesthesia of 81 patients with hemopneumothorax caused by penetrating wounds of the chest was examined. The severity of the victims' condition, who are mostly working-age males (n=76) was due to the type of injury (gunshot (n=4) or stab and slash wound (n=77)) and blood loss. Middle hemothorax (corresponds to IV ASA) - was detected in 51 patients and small hemothorax (III ASA) - in 30 patients.

In the first group (n=56) was implemented the tracheal intubation with the usage of single-tube and CO₂ was insufflated into the pleural cavity with p = 2-4 mm Hg during the endosurgical stage. In the second group (n=25) was used separate bronchial intubation with unipulmonary ventilation. All patients underwent VATS (33,4 + 3,8 min.) under intravenous anaesthesia with the use of benzodiazepines, barbiturates or ketamine, opioids and muscle relaxants.

Results and Discussion: During surgery the condition of patients in both groups remained stable at all stages, which was confirmed by breath data and hemodynamics parameters, by pH and acid-base balance of arterial blood. Patients with significant chest organs damage and heavy blood loss (n=11) were transferred to the intensive care unit (ICU) on prolonged mechanical ventilation where they stayed up to 3 days. The majority of patients (n=74) were transferred from the ICU to the surgical department during the first 24 hours after surgery, the others (n=7) - on the 3rd-4th day. Lung expansion after VATS did not depend on the method of its collapse. All patients were dismissed from hospital on the 6th- 14th day.

Conclusions: CO₂ insufflation into the pleural cavity provides rapid and adequate lung collapse and can be an alternative to the use of dual-lumen tube during emergency VATS in patients with chest injuries. This is particularly important for anaesthesiologists in urgent thoracic surgery, who are able to implement in practice different methods of artificial lung collapse.

14AP09-11

Audit on coagulation testing for American Society of Anesthesiologists (ASA) class 1 patients for emergency surgery

Wong T.M., Yeo S.H.L., Koh K.F.

Khoo Teck Puat Hospital, Dept of Anaesthesiology, Singapore, Singapore

Coagulation tests including prothrombin time (PT), activated partial thromboplastin time (PTT) and international normalized ratio (INR) are commonly done for preoperative patients. NICE guidelines published in April 2016 recommend that coagulation tests should not be routinely performed for ASA class 1 and 2 patients planned for elective surgery.

Coagulation tests should be performed in patients who have a suspected or known tendency for bleeding or are taking anti-coagulants. This can be identified by taking a bleeding history and taking a detailed drug history.

Disadvantages of performing routine coagulation tests pre-operatively include increased cost to patient, increased workload for laboratory staff, unnecessary delays to surgery and risks of false positive results. In addition, point-of-care testing of coagulation, such as thromboelastography, may be more accurate and useful in the setting of an acute bleeding episode.

We aim to investigate the proportion of ASA 1 patients in our institution who have coagulation tests performed for emergency surgery, and the clinicians who ordered the tests.

We exported data from OTSystem version 2.0 over a period of 6 months from March to August 2016, searching in particular for type of surgery, type of anaesthesia, ASA status and whether coagulation tests were performed pre-operatively. Although ASA 1 patients are unlikely to be suffering from liver cirrhosis or be taking anticoagulants, these 2 parameters have been included in the search for completeness.

Over the 6 month period, there were 261 cases that were classified as ASA 1E. Most of them are presenting for minor or intermediate surgery (220 of 230 cases). Of these, there are 102 cases (39%) who have coagulation tests performed pre-operatively. Of these 102 cases, 76 cases (74.5%) had their coagulation tests ordered by clinicians from the Accident and Emergency department. The rest of the coagulation tests were mainly performed by house officers of the various surgical disciplines, most commonly General Surgery and Orthopaedics.

A high proportion of ASA 1E patients have coagulation tests ordered pre-operatively and most of the clinicians ordering the test are from the Accident and Emergency department. These clinicians may be working on the assumption that the surgical disciplines will require the tests, although that may not be the case. Pre-operative coagulation testing should not be performed routinely for ASA1 patients presenting for emergency surgery.

14AP09-12

Perioperative transfusion predicts poor prognosis after hepatectomy for colorectal metastases

Zavridis P¹, Tsitskari M.², Petrou A.³, Neofytou K.⁴

¹American Medical Center, Cyprus, Dept of Anaesthesiology & Pain Medicine, Nicosia, Cyprus, ²Apollonion Private Hospital, Department of Interventional Radiology, Nicosia, Cyprus, ³Nicosia General Hospital, Department of Surgery/Div.HPB, Nicosia, Cyprus, ⁴American Medical Center, Surgery Department, Nicosia, Cyprus

Background and Goal of Study: Hepatectomy for colorectal liver metastases can be associated with significant blood loss. Allogeneic Red Blood Cell (RBC) transfusion has been recently associated to adverse effect on survival in patients with a variety of cancers. In this study, we analysed perioperative transfusion with disease free (DFS), cancer specific survival(CSS) and overall survival (OS) in liver colorectal metastases treated with liver resection.

Materials and Methods: In this retrospective study, 122 patients were enrolled. Disease free survival (DFS), cancer specific survival (CSS), and overall survival(OS) were analyzed in relation to perioperative transfusion by using both Kaplan-Meier and multivariate Cox-regression methods.

Results and Discussion: Perioperative transfusion was associated with decreased DFS, CSS, and OS (HR 1.70; 95% CI, 1.14-2.52 ;P=0.008, HR 1.90; 95% CI, 1.67-3.12 ;P=0.012, and HR 1.38; 95% CI, 1.15-2.84 ;P=0.020) in univariate analysis. Perioperative transfusion remained significant in multivariate analysis for DFS, CSS, and OS and OS (HR 1.52; 95% CI, 1.04-2.37

;P=0.022, HR 1.67; 95% CI, 1.09-2.85 ;P=0.039, and HR 1.76; 95% CI, 1.09-3.68 ;P=0.044). For patients who received perioperative transfusion the five-years DFS was reduced from 33% to 13% comparing with patients who did not receive perioperative transfusion, the CSS was reduced from 67% to 37%, and OS was reduced from 64% to 39%.

Conclusion(s): In this study, we indicate that perioperative transfusion is an adverse prognostic factor in patients who undergo liver resection for colorectal metastases.

14AP10-1

Effect of lidocaine and substance P on migration and proliferation “in vitro” of human adipose derived stem cells (HascS) and breast cancer cells (mda-mb-231)

Cassinello F¹, Moris L.², López Pérez V.², Olmedillas S.³, Villagrana A.³, García Arranz M.³

¹Hospital Universitario Nuestra Señora de Candelaria, Dept of Anaesthesiology, Santa Cruz de Tenerife, Spain, ²Fundación Jiménez Díaz, Dept of Anaesthesiology, Madrid, Spain, ³Fundación Jiménez Díaz, New Therapies, Madrid, Spain

Background and Goal: Local anaesthetics inhibit proliferation and migration while Substance P (SP) has demonstrated the opposite effect (1,2,3). Local anaesthetics seem to inhibit both SP binding and the related increase in intracellular calcium (4). Our objectives were:

To demonstrate migration and proliferation inhibition induced by lidocaine of hASCs and MDA-MB-231 breast cancer cells. And to demonstrate SP can reduce the effect of lidocaine on migration and proliferation of hASCs and MDA-MB-231 breast cancer cells.

Materials and Methods: Cells were treated with different doses of lidocaine (4000, 10000 y 20000 µM) and/or SP (50 y 500 nM). Migration was evaluated with a wound healing scratch assay after incubation at 37°C and 5% CO₂ for 24 hours. The wounded area was imaged at the beginning and at 12 hours and analyzed with Image J Software. The results are shown as a percentage of remaining denuded area.

Proliferation was evaluated with AlamarBlue reagent viability assay. After 24 hours, cells were treated with different doses of lidocaine (4000,10000 y 20000 µM) and/or SP (50 y 500 nM).

All assays were repeated (x3) and the percentage difference between treated and control cells were calculated. Kruskal-Wallis test was used to compare mean values and p<0,05 considered significant.

Results and Discussion: Lidocaine inhibited significantly migration at 4000µM compared with control of hASCs cells (p=0,05) and also of MDA-MB-231 (p=0,0001). Substance P did not influence migration alone or with lidocaine (Figure 1).

Lidocaine inhibited proliferation at 20000 µM compared with control of hASCs cells (p=0,0001) and also of MDA-MB-231 (p=0,0002). Adding substance P (50 nM) reduced the inhibition effect of lidocaine on viability of hASCs cells (p=0,03) and also of MDA-MB-231 (p=0,006).

Conclusions:

- Lidocaine inhibited migration and proliferation.
- Substance P partially antagonizes the inhibition of proliferation induced by lidocaine, but does not alter the decrease on migration.

References:

1. Cassinello F, Prieto I, Del Olmo M, Rivas S, Strichartz G. Cancer Surgery: How may anesthesia influence outcome. Journal of Clinical Anesthesia 2015; 27: 262-272.

14AP10-2

A randomised controlled trial comparing perioperative intravenous insulin, GIK or GLP-1 treatment in patients with diabetes - PILGRIM trial

Hermanides J.¹, Polderman J.¹, Godfried M.², Thiel B.², van Steen S.³, Preckel B.¹

¹Academic Medical Centre, University of Amsterdam, Dept of Anaesthesiology & Pain Medicine, Amsterdam, Netherlands, ²Onze Lieve Vrouwe Gasthuis, Dept of Anaesthesiology & Pain Medicine, Amsterdam, Netherlands, ³Academic Medical Centre, Internal Medicine, Amsterdam, Netherlands

Background and Goal of Study: The prevalence of patients with diabetes (DM) is growing worldwide. Consequently, an increasing amount of patients presenting for surgery will have DM. Hyperglycaemia is associated with post-operative complications and should be prevented during the perioperative period. However, the evidence for the optimal glucose lowering protocol is lacking and all glucose lowering protocols are insulin based. Glucagon-like-peptide-1 (GLP-1) agonists have the potential of lowering glucose without increasing risk of hypoglycaemia. Therefore, we investigated the optimal perioperative treatment protocol for patients with DM type 2 undergoing non-cardiac surgery, comparing an insulin based approach to a GLP-1 based approach. We hypothesized that a GLP-1 based approach would improve post-operative glucose values.

Materials and Methods: This was a multicentre randomised trial in patients with DM type 2 undergoing non-cardiac surgery. Patients were randomly assigned to one of three study arms; two insulin based study arms (intraoperative glucose-insulin-potassium infusion (GIK) and intraoperative insulin boluses regimen (BR)) and one GLP-1 based study arm (pre-treatment with liraglutide (LG)). Capillary glucose was measured every hour. If necessary, glucose was adjusted with an intravenous bolus of insulin in all study arms. The main outcome measure was the difference in median glucose between the insulin based approach and the GLP-1 based approach 1 hour postoperatively. Secondary outcomes included the amount of insulin used in each study arm, incidence of hypoglycaemia and postoperative complications. We aimed to include 150 patients, to detect a 1 mmol/l difference in glucose between the insulin based arms and the GLP-1 based arm, randomised in a 2:1 ratio.

Results and Discussion: When writing this abstract, we have included 148 of the 150 patients. We expect to complete the trial in January 2017. The final data will be ready present at the Euroanaesthesia 2017.

Acknowledgements: This study was supported by the European Foundation for the Study of Diabetes (EFS) for the research grant from the EFS/Sanofi Fellowship 2012 #94653. Trial registration at ClinicalTrials.gov, NCT02036372

14AP10-3

Current perioperative management of antiplatelet use in patients undergoing elective non-cardiac surgery in a university hospital

Ikeda M.¹, Sakimura S.¹, Hoka S.²

¹Kyushu University Beppu Hospital, Dept of Anaesthesiology, Beppu, Japan, ²Kyushu University, Dept of Anaesthesiology, Fukuoka, Japan

Background and Objectives: As the population ages, more elderly patients who tend to have cardiovascular diseases are undergoing surgery. Antiplatelet agents which are the essential component of the treatment of these comorbidities increase bleeding risk. Optimal management of perioperative antiplatelet therapy, balancing ischemic and bleeding risk, has been discussed and documented in several guidelines recently. The purpose of this study is to describe the change of clinical characteristics and perioperative antiplatelet management in the recent 4 years in a large metropolitan university hospital.

Materials and Methods: The authors retrospectively analyzed data collected in our Anesthesia Information Management Systems (PrimeGaia, Nihon Kodan, Japan) between January 2013 and November 2016 in a large metropolitan university hospital in Japan. Patients under 40 years old, cardiac surgery, dental surgery and emergency cases were excluded. Data included the use of antiplatelet, coexisting thrombotic complications, type of previous percutaneous coronary intervention (PCI), surgical and anesthetic procedures, and the amount of bleeding during the surgery. Group differences were evalu-

ated using Chi-square test, test for trend or Student's t-test, as appropriate.

Results: In 16,487 elective non-cardiac surgeries, 1,960 (11.9%) patients received antiplatelet therapy. The rates of ischemic heart disease (6.1%) and stroke (7.2%) did not change over the 4-year study period, and neither did the proportion of patients who were on antiplatelet. However, cases continuing perioperative antiplatelet therapy increased with years (2013: n=127/449 (28%), 2014: n=169/512 (33%), 2015: n=238/501 (48%), and 2016: n=230/498 (46%), $P < 0.01$). The use of local anesthesia slightly decreased (49.0%, 47.4%, 47.2% and 46.6%, respectively, $P = 0.025$). There was no significant difference in surgical bleeding between continued cases and discontinued cases (226 ± 545 mL vs 248 ± 848 mL, $P = 0.52$).

Conclusion: In the present study, we found that perioperative continuation of antiplatelet therapy increased year by year in our hospital, which may be due to the shift of PCI technique from bare metal stent to drug eluting stent, and may be a reflection of the guidelines. The continuation of antiplatelet did not significantly increase the surgical bleeding in this study. Further analysis is needed to evaluate the perioperative adverse event and the inherent bleeding risk depending on certain procedures.

14AP10-4

TAP block is useful in laparoscopic bowel surgery

Becerra A., Hernández Y., Valencia L., Cabrera L., Domínguez Y., Rodríguez-Pérez A.

Hospital Universitario de Gran Canaria Dr. Negrín, Dept of Anaesthesiology & Intensive Care, Las Palmas de Gran Canaria, Spain

Background and Goal of Study: TAP block has demonstrated to be useful in laparoscopic cholecystectomy, providing better postoperative comfort and shorter hospital stay.

The aim of this study is to compare the analgesic effect of TAP block in laparoscopic bowel resection versus conventional analgesic strategies.

Materials and Methods: After approval of the Ethics Committee of our hospital was obtained, we carried out a prospective controlled study in patients who underwent laparoscopic bowel resection. Patients were divided into a TAP group and a non-TAP group.

The following data was recorded: intraoperative analgesia, pain score (post-operative VAS), length of stay in Post Anesthetic Care Unit (PACU), and overall patient satisfaction using a scale from 0 - unsatisfied, to 3 - very satisfied.

Results of the TAP group were compared to the non-TAP group using SPSS 24. **Results and Discussion:** Thirteen men and 6 women were included with an average age of 62 (21-87) years old. ASA physical status was ASA II: 42.1%, ASA III: 52.6% and ASA IV: 5.3%. TAP block was done bilaterally in the preoperative stage on 47.4% of patients using ropivacaine 0.3%, 40cc. The non-TAP group comprised 52.6%. Both groups were comparable as to gender, age and ASA physical status.

Intraoperative analgesic management was performed using continuous infusion of remifentanyl, as well as bolus fentanyl before the end of surgery. The fentanyl dosage in the TAP group was 0.9 mcg/kg (CI 95 0.4-1.4), significantly lower than in the non-TAP group 1.7 mcg/kg (CI 95 1.5-1.9).

Nevertheless, no differences were found between groups with regards to remifentanyl dosage.

The VAS scale at the arrival in PACU was significantly lower in the TAP group (score: 1) than in the non-TAP group (4.1) (CI 95 2.4-5.8). Global satisfaction was statistically significant higher in the TAP group (2.9) (CI 95 2.6-3.2) than in the non-TAP group (1.3) (CI 95 0.8-1.8). No statistically significant differences were found between groups as to length of stay in PACU or in hospital.

Conclusion(s): TAP block in laparoscopic bowel surgery provides better analgesic management with lower VAS at the arrival in PACU and greater patient satisfaction. Further studies with a larger sample size are needed to provide stronger evidence that this should be the analgesic technique of choice for laparoscopic bowel surgery.

14AP10-5

Antiemetic efficacy comparison of dexmedetomidine versus dexmedetomidine-dexamethasone in highly-susceptible patients: a prospective randomized placebo-controlled study

Kwak H.J.¹, Choi J.J.¹, Jo Y.Y.¹, Kim Y.B.¹, Kim J.Y.²

¹Gachon University Gil Medical Center, Dept of Anaesthesiology & Pain Medicine, Incheon, Korea, Republic of, ²Ajou University School of Medicine, Dept of Anaesthesiology & Pain Medicine, Suwon, Korea, Republic of

Background and Goal of Study: We investigated the antiemetic efficacy of dexmedetomidine and combination of dexmedetomidine and dexamethasone on prophylaxis of postoperative nausea and vomiting (PONV) in female patients receiving opioid-based intravenous patient-controlled analgesia (PCA) after breast surgery.

Materials and Methods: A total of 149 female patients (19-65 years) undergoing elective breast surgery after sevoflurane anesthesia were enrolled. Patients administered either normal saline (control group, n=50) or dexmedetomidine of 0.5 µg/kg (DEX group, n=49) or dexmedetomidine of 0.5 µg/kg and dexamethasone of 0.5 mg (dual group, n=50) at 30 min before the end of surgery. The incidences of shivering and oversedation and the severity of pain in postanesthesia care unit were assessed. The incidence and severity of PONV was assessed for first 24 hours.

	Control group (n=50)	DEX group (n=49)	Dual Group (n=50)	P-value
Age, years	48.7 (6.4)	48.2 (7.1)	48.4 (7.5)	0.918
BMI, kg/m ²	24.1 (2.8)	24.4 (3.4)	23.1 (2.9)	0.066
Operation time, min	168 (39)	155 (35)	157 (39)	0.083
Risk score for PONV, 3/4	44/6	46/3	43/7	0.422

Mean (SD) or a number of patients

[Patient's characteristics]

Results and Discussion: The demographic data were similar among the groups. During first 24 hours, the incidence of complete response to PONV was significantly different among the control, DEX and dual groups (30% (15/50) vs. 60% (29/49) vs. 76% (38/50), respectively, p<0.001). Rhodes index (median [interquartile range]) was significantly lower in the DEX and dual groups than in the control group during first 1 to 6 hours (0 [0-5.5] and 0 [0-0.5] vs. 5 [0-12], p=0.014 and <0.001, respectively) and also during 6 to 24 hours (0 [0-3.5] and 0 [0-0] vs. 3.5 [0-13], p=0.007 and <0.001, respectively).

	Control group (n=50)	DEX group (n=49)	Dual Group (n=50)	P-value
0 to 1 h PONV (in the PACU)	12 (24%)	4 (8%)	3 (6%)	0.013
1 to 6 h PONV	30 (60%)	19 (39%)	10 (20%)	<0.001
6 to 24 h PONV	22 (50%)	14 (29%)	6 (12%)	<0.001
0 to 24 h PONV	35 (70%)	20 (40%)	12 (24%)	<0.001

[Incidence of postoperative nausea and vomiting]

Conclusion(s): Combined with dexamethasone reduced the incidence of PONV more effectively than dexmedetomidine alone during first 24 hours in female patients.

References: 1. Geng ZY, Liu YF, Wang SS, Wang DX. Intra-operative dexmedetomidine reduces early postoperative nausea but not vomiting in adult patients after gynaecological laparoscopic surgery: A randomised controlled trial. *Eur J Anaesthesiol.* 2016;33:761-6.

14AP10-6

Dose-ranging study of ramosetron for the prevention of nausea and vomiting after gynecologic laparoscopic surgery: a prospective randomized study

Sun-Joon B., Jin Woo J.

Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Patients undergoing laparoscopic gynecological surgery are at high risk of postoperative nausea and vomiting (PONV). The aim of this study was to determine the effective dose of ramosetron, a 5-hydroxytryptamine type 3 receptor antagonist, for prophylaxis of PONV in this patient population.

Materials and Methods: In this prospective, randomized, double-blinded study, 180 patients received a single administration of either IV ramosetron 0.3 mg (R0.3 group), 0.45 mg (R0.45 group), or 0.6 mg (R0.6 group) immediately after the end of surgery. In all groups, ondansetron 8 mg was added to an intravenous patient-controlled analgesia (IV-PCA) fentanyl solution. The primary outcome was the incidence of PONV during the first 48 h after surgery. The severity of nausea, pain score, and adverse events were assessed.

Results and Discussion: The incidences of PONV were not different among three groups (35%, 38%, vs. 35%, P = 0.905). The severities of nausea, pain scores, and additional analgesic requirements were similar among the groups. The incidence of adverse events including dizziness, headache, and sedation were not different among the groups. However, more patients in R0.3 group required early IV-PCA discontinuation compared to those in R0.45 and R0.5 groups, primarily because of PONV and/or dizziness (24% vs. 9% and 5%, P = 0.038).

Conclusion(s): Increased dose of ramosetron was not found to reduce the incidence of PONV in high risk patients undergoing laparoscopic gynecological surgery.

14AP10-7

Logistic regression predicts generalized sedation as well as response surface models for midazolam and alfentanil sedation in gastrointestinal endoscopy

Liou J.Y., Ting C.K., Lin S.P., Tsou M.Y.

Taipei Veterans General Hospital and National Yang-Ming University, Dept of Anaesthesiology, Taipei, Taiwan, Republic of China

Background and Goal of Study: Researchers have used logistic regression (LR) and response surface models (RSMs) to predict patient responses. The reduced Greco and hierarchy RSMs have proven to be accurate in gastrointestinal endoscopies using midazolam and alfentanil. In this study, we evaluate how a simpler model such as LR will perform as compared to the RSMs.

Materials and Methods: Patients who received esophagogastroduodenoscopy (EGD) and colonoscopy sedation with midazolam and alfentanil were candidates for the study. LR was performed for the EGD group and validated using the colonoscopy group. The two RSMs went through the same process. Their performance and ROC curves were evaluated.

Results and Discussion: Thirty-three patients were included and the native EGD LR model had an ROC curve area of 0.94. For external validation, ROC curve was 0.92, 0.94 and 0.94 for the reduced Greco RSM, hierarchy RSM and LR model respectively. Pairwise comparison was not significant.

Conclusion(s): The LR model performed as well as RSMs in generalizing the predicted sedative effect of midazolam and alfentanil during gastrointestinal endoscopies. LR may be used for generalization across patients experiencing procedures that produced similar stimulus intensity.

References:

- Liou, J. Y., Tsou, M. Y. & Ting, C. K. Response Surface Models in the Field of Anesthesia: A Crash Course. *Acta Anaesthesiol Taiwan* 53, 139-145,
- Liou, J. Y. et al. Predicting the Best Fit: A Comparison of Response Surface Models for Midazolam and Alfentanil Sedation in Procedures with Varying Stimulation. *Anesth Analg* 123, 299-308,
- Greco, W. R., Bravo, G. & Parsons, J. C. The Search for Synergy: A Critical Review from a Response Surface Perspective. *Pharmacol Rev* 47, 331-385 (1995)

14AP10-9

The effect of aprepitant combined with palonosetron for the prevention of postoperative nausea and vomiting in women patients using intravenous patient-controlled analgesia: aprepitant plus palonosetron vs palonosetron alone

Kim S.I., Yoo J.H., Cho A.

Soonchunhyang University, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Palonosetron is 3rd generation of 5-HT₃ antagonist, which has unique mechanism compared with other 5-HT₃ antagonists. Aprepitant is a selective NK1 receptor antagonist, which has demonstrated efficacy against postoperative nausea and vomiting (PONV) in combination with ondansetron or ramosetron.[1, 2]

However, there is no report about the effect of aprepitant combined with palonosetron for the prevention of PONV.

The aim of this study was to evaluate the effect of combination of aprepitant and palonosetron compared to palonosetron alone for the prevention of PONV in female patients receiving intravenous patient-controlled analgesia (IV-PCA) using fentanyl.

Materials and Methods: In this randomized, open label, case-control study, 100 female patient scheduled elective surgery under general anesthesia were investigated. Patients were randomly allocated to receive 80mg of aprepitant PO. (AP group, n=50) or none (P group, n=50) 2-3 hours before the operation. All patients received 0.075 mg of palonosetron after induction of anesthesia. The incidence of nausea and vomiting, severity of nausea, and the use of rescue drugs were evaluated for 24 hours after operation.

Results and Discussion: The incidences of nausea (55%), vomiting (1%) in the AP group were not different significantly compared with that of nausea (48%), vomiting (14%) in the P group during 24 hours after surgery. The patient required rescue drugs in the AP group (31%) was similar compared with P group (32%) during 24 hours after surgery.

Conclusion(s): The aprepitant combined with palonosetron did not reduce the incidence of PONV compared to palonosetron alone during the 24 h after operation in woman patients receiving IV-PCA using fentanyl.

References:

1. Vallejo MC, et al. Aprepitant plus ondansetron compared with ondansetron alone in reducing postoperative nausea and vomiting in ambulatory patients undergoing plastic surgery. *Plast Reconstr Surg.* 2012;129:519-26.
2. Lee SJ, et al. The effect of aprepitant for the prevention of postoperative nausea and vomiting in patients undergoing gynecologic surgery with intravenous patient controlled analgesia using fentanyl: aprepitant plus ramosetron vs ramosetron alone. *Korean J Anesthesiol.* 2012; 63:221-6.

14AP10-10

Comparison of Peripherally Inserted Central Venous Catheter (PICC) versus Central Venous Catheter (CVC) - a consecutive selection study

Hubrich M., Lundholm K., Snygg J., Lindgren S., Engström C.

Sahlgrenska Academy, Gothenburg University, Institute for Clinical Science, Gothenburg, Sweden

Background: The safest and most cost efficient choice of central venous access is still a matter of concern in clinical care and research. A safe and long lasting central venous catheter (CVC) with a low number of side effects is preferred. Few clinical trials have been published comparing complications and patency of CVC:s and peripherally inserted catheters (PICC:s). We performed a consecutive selection study on patients referred to the Department of Surgery at Sahlgrenska University Hospital.

Methods: In 2014-15, 155 patients admitted for upper gastrointestinal cancer surgery and in need of a CVC/PICC were enrolled. End-points were development of complications requiring catheter removal, catheter related infection, thrombophlebitis, pneumo- and hemothorax. Anaesthesiologists performed CVC insertions. PICC:s were inserted by a registered nurse or anesthesiologist. A study protocol followed the patients where baseline-data, catheter days, patient experience and complications were registered.

Results: 114 patients received a CVC and 41 a PICC. No difference between treatment groups was found regarding gender, age, BMI, associated diagnosis, antibiotic, antitrombotic or corticosteroid treatment at postop day one. However, days of treatment reached significant difference, with more days in the PICC line (21 days) vs. CVC (15 days) group, $p < 0.05$. The number of leukocytes was significantly higher in PICC patients (10.1) compared to CVC patients (7.9), $p < 0.005$. Accordingly, the CRP sample results in the PICC group were higher (51.0) compared to the CVC group (16.3). However there were not significantly more infections at time of insertion among the PICC line treated patients. We found very few local infections or septic complications over all. We did not find any difference in catheter comfort between treatment groups.

Conclusions: In this clinical consecutive selection study of patients referred to advanced surgical treatment and in need of either a CVC or PICC, we found no statistically significant difference regarding complications or patient comfort during the time period of catheter treatment, which was significantly longer with PICC than CVC. The results of this study imply that the choice of CVC or PICC in this study population should be based only upon the potential duration of treatment postoperatively.

References: Pikwer A et al *Anaesthesia* 2011, Chopra V et al *Lancet, Inf Control* 2013, Johansson E et al *Acta Oncol* 2013, Chopra V et al (*MAGIC*) 2015

Geriatric Anaesthesiology

15AP01-1

Influence of frailty on the incidence of postoperative delirium in elderly patients

Birkelbach O., Spies C., Brauner M., Weiss B., Treskatsch S., Balzer F.

Charité - Universitätsmedizin Berlin, Dept of Anaesthesiology & Intensive Care, Berlin, Germany

Background and Goal of Study: Postoperative delirium is a common complication in elderly patients undergoing surgery. It increases morbidity and mortality as well as the risk for admittance to a nursing home [1]. To identify reduced resources in elderly patients, frailty assessments are administered [2]. The aim of this study was to examine the influence of frailty on the incidence of postoperative delirium.

Materials and Methods: After IRB approval (EA1/227/16) and approval of the data protection controller, a random sample of patients 65 years of age or older that were seen in the anaesthesiology outpatient department between June and November 2016 for an elective surgery was included. Preoperative frailty was identified through assessing exhaustion, weight loss, weakness, slowness as well as low physical activity; the severity of frailty was categorized according to the number of pathological assessments as non-frail (0), pre-frail (1-2) and frail (≥ 3) [Fried criteria; 3]. Postoperative delirium was assessed according to the ICD-10 coded diagnosis (F05.8), comorbidities according to the Charlson-Comorbidity-Index [4]. Statistical group comparisons were carried out non-parametrically, univariately significant factors were included in multivariate analysis.

Results and Discussion: In total data from 1,055 patients was analyzed. Of these patients 48.8% (n=515) were classified as pre-frail and 16.6% (n=175) as frail. Patients in the frail group were significantly older (77 [75;80] vs. 73 [68;76]), more often of female sex (58.9% vs. 39.5%), had more comorbidities (CCI 6 [4;8] vs. 5 [3;7]) and more commonly more than four drugs prescribed (83.4% vs. 37.8%, all $p < 0.001$) compared to the non-frail group. The incidence of delirium was 8.3% (n=88).

A significant influence was shown for duration of surgery [min] (OR 1.009; 95%CI 1.007-1.011), polypharmacy (OR 3.802; 95%CI 2.017-7.587) and frailty (OR 4.001; 95%CI 1.872-8.903; all $p < 0.001$).

Conclusion: Preoperative frailty significantly predicts postoperative delirium; age alone is an insufficient predictor. The results show that these patients preoperatively already differ from patients without delirium. Patients with an elevated risk for delirium should be identified through routine clinical frailty screenings and treated accordingly.

References:

1. Robinson et al. Ann Surg 2009
2. Buta et al. Ageing Res Rev 2016
3. Fried et al. J Gerontol A Biol Sci Med Sci 2001
4. Charlson et al. J Clin Epidemiol 1994

15AP01-2

Intraoperative hypotension and outcomes after non-cardiac surgery in the oldest old

Yifat H., Matot I.

Tel Aviv Medical Center, Sackler School of Medicine Tel Aviv University, Dept of Anaesthesiology & Intensive Care, Tel Aviv, Israel

Background: Recent data suggest that intraoperative hypotension (IOH) is associated with postoperative morbidity and mortality. The 'oldest old' (patients ≥ 85 years) have not been studied thoroughly and are the focus of this study. Due to changes that accompany the aging process these patients might be more susceptible to the adverse effects of IOH. We therefore evaluated the association between IOH and the risk of acute kidney injury (AKI) and 30-day mortality in this population.

Methods: Retrospective study, patients ≥ 85 years, having non-cardiac surgery at our institute in 2008-2013. The association between the cumulative time exposed to intraoperative MAP values < 70 or 60 mmHg and SBP < 100 , 90 or 80 mmHg and postoperative AKI and 30-day mortality was assessed. Analysis was performed with multivariable logistic regression, adjusted for possible confounding variables such as comorbidities, gender, emergency

procedures, ASA classification, preoperative renal function, surgical duration and subspecialty. The study was approved by the local IRB.

Results: 3558 patients with a mean (SD) age of 88.5 (3.4), of whom 2524 had laboratory results to enable evaluation of AKI. The incidence of postoperative 30-day mortality and AKI was 7.5% and 14.9%, respectively.

Mortality: The adjusted odds ratio (OR) for 30-day mortality associated with exposure > 20 minutes to IOH was 1.67(95% CI 1.15-2.44) for MAP < 70 mmHg and 1.95(1.21-3.16) for MAP < 60 mmHg. With exposure of > 20 minutes to SBP < 100 , < 90 and < 80 mmHg the OR was 1.98(1.35-2.91), 2.02(1.32-3.09) and 3.18(1.45-6.99), respectively. With exposure of 11-20 minutes to SBP < 80 mmHg the OR was 2.13(1.17-3.87).

AKI: The OR for AKI associated with exposure > 20 minutes to IOH was 1.37(1.00-1.87) for MAP < 70 mmHg and 2.22 (1.5-3.29) for MAP < 60 mmHg. With exposure of > 20 minutes to SBP < 100 , < 90 and < 80 mmHg the OR was 1.4(1.02-1.92), 2.17(1.52-3.1) and 3.03(1.59-5.76), respectively. With exposure of 11-20 minutes to SBP < 90 and < 80 mmHg the OR was 1.6(1.13-2.28) and 1.77(1.07-2.93), respectively. With exposure of 6-10 minutes to SBP < 80 mmHg the OR was 1.57(1.01-2.44).

Conclusions: In the 'oldest old' we found an association between IOH and postoperative adverse events. This association can be observed at higher MAP and SBP thresholds than those reported for the general population. Further research is needed to determine whether interventions to prevent IOH in this population will affect postoperative outcome.

15AP01-3

Sex-related differences in the effect-site concentration of remifentanyl for preventing cough following extubation during anesthetic emergence in elderly patients

Ji Eun K., Sang Kee M., Jiyoung L., Suhyun S., Sook Young L.

Ajou University School of Medicine, Dept of Anaesthesiology & Pain Medicine, Suwon, Korea, Republic of

Background and Goal of Study: Cough on anesthetic emergence should be prevented considering dangerous complications. Target-controlled infusion (TCI) of remifentanyl can reduce emergence cough effectively, and the sex-related differences in effect-site concentrations (Ce) of remifentanyl was evaluated in young patients. We determined the Ce of remifentanyl for preventing emergence cough following extubation in males and females among elderly patients.

Materials and Methods: Twenty-three male and 22 female elderly patients aged between 60 and 75 years were enrolled. Anesthesia was maintained with sevoflurane and remifentanyl TCI. The Ce of remifentanyl for preventing emergence cough was determined for each sex using the isotonic regression method with a bootstrapping approach, following Dixon's up-and-down method.

Results and Discussion: The Ce of remifentanyl for preventing emergence cough in 50 % (EC₅₀) and 95 % (EC₉₅) of the population were significantly lower in females than in males. Isotonic regression revealed the EC₅₀ (83 % confidence interval) of remifentanyl was 1.67 (1.55-1.83) ng/mL in females and 2.60 (2.29-2.91) ng/mL in males. The EC₉₅ (95 % confidence interval) of remifentanyl was 2.30 (2.02-2.62) ng/mL in females and 3.41 (3.27-3.58) ng/mL in males. Mean arterial pressure and heart rate were not different between the sexes, but those in males were significantly lower at the end of operation compared to baseline. The sex-related differences in opioid efficacy may contribute sex-related differences in basal pain perception and sensitivity to opioid. Although being conflicting, there is a greater opioid efficacy in female patients. In current study, Ce value of remifentanyl for preventing emergence cough in elderly patients may be affected by Minto pharmacokinetic model that was applied to infusion pump used for remifentanyl TCI. Minto model takes height, weight, and age into account as covariates.

Conclusion(s): The remifentanyl requirement for preventing emergence cough following extubation was lower in females than in males, and the sex-related differences in Ce of remifentanyl existed in elderly patients. Both sex and age should be considered to using of remifentanyl TCI for preventing emergence cough.

15AP01-4**Comparative study between palonosetron and ondansetron in the prophylaxis of postoperative nausea and vomiting in women with 60 years or older, submitted to laparoscopic cholecystectomies**

Braga E.¹, Benitez M.², Berlandi R.², Neves A.², Verçosa N.³, Cavalcanti I.¹

¹UFF, Dept of Anaesthesiology, Niterói, Brazil, ²HFB, Dept of Anaesthesiology, Rio de Janeiro, Brazil, ³UFRJ, Dept of Anaesthesiology, Rio de Janeiro, Brazil

Background and Goal of Study: Cholelithiasis is the most common abdominal surgical disease in the elderly. Laparoscopic cholecystectomy is considered the gold standard treatment of this condition, but it is cited in the literature as an independent risk factor for postoperative nausea and vomiting (PONV). In this double-blind, randomized clinical trial we compared the efficacy of palonosetron with ondansetron to prevent PONV in women with 60 years of age or older who underwent laparoscopic cholecystectomy.

Materials and Methods: The total of 80 patients, ASA I to III, were randomized and allocated to one of the groups containing 40 individuals in each group. Group P received 75 mcg I.V of Palonosetron in the induction of anesthesia, whereas the O group received 4 mg I.V of Ondansetron in the induction and followed with regular administration of 8 / 8H of 4 mg I.V of Ondansetron. The incidence and intensity of nausea and vomiting, as well as presence of adverse effects, need for rescue medication were evaluated during clinical postoperative visits with 2,6,24 and 48 hours.

Results and Discussion: There were no significant differences in the incidence of postoperative nausea and vomiting, nor was there any difference in the total adverse effects and the need for rescue medication when comparing the two drugs. The intensity of nausea and vomiting in the period of 0-2H was less intense in the Palonosetron Group.

Conclusion(s): Single-dose administration of palonosetron in induction of anaesthesia was as effective as regular administration of ondansetron at induction of anaesthesia, followed by regular 8/8-hour use in prophylaxis of PONV in women 60 years of age or older who underwent laparoscopic cholecystectomy.

References:

1. Bala I, Bharti N, Murugesan S, Gupta R. Comparison of palonosetron with palonosetron-dexamethasone combination for prevention of postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy. *Minerva Anesthesiol.* 2014 Jul;80(7):779-84.
2. Bhalla J, Baduni N, Bansal P. Comparison of palonosetron with ondansetron for postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy under general anesthesia. *Journal of Minimal Access Surgery.* 2015;11(3):193-197. doi:10.4103/0972-9941.140219.

15AP01-5**Retrospective study of perioperative complications in elderly patients undergoing surgery for cervical spine pathology**

Kumar S., Kumar K.

All India Institute of Medical Sciences, Dept of Anaesthesiology & Intensive Care, New Delhi, India

Background and Goal of Study: Elderly patients going for surgery pose special challenges because of associated comorbidities and their vulnerability to have more perioperative complications. Moreover, cervical spine surgeries place an additional risk based on motor/sensory deficit, therefore we planned to evaluate the types and incidence of various complications associated with cervical spine surgery in elderly patients.

Method: After obtaining approval from the institutional ethics committee and permission to access the patient's records, data of the elderly patients (age equal or more than 60 years) who underwent surgery for different cervical spine pathology at neurosciences centre, AIIMS from 1st January 2008 to 31st December 2012 was collected by reviewing the patient's medical records and anaesthesia notes.

Results and Discussion: We reviewed the data of 189 elderly patients who underwent cervical spine surgery in the study period of 5 years at Neurosciences centre. 28 patients were excluded from the study because of incomplete data and data was analyzed for 161 patients. Majority of patients presented for degenerative pathology (76.9%) followed by tumours (11.5%).

Comorbidities like hypertension (46.6%) and diabetes mellitus (19.9%) were very common. Abnormal chest X-ray and ECG were present in 16.8% and 21.7% patients respectively. Difficult intubation was encountered in 18.6% cases. Fiberoptic intubation was done in 58.4% patients. Hemodynamic fluctuations during intraoperative period occurred in 8.7% patients. Twenty five percent patient were ventilated in the postoperative period and the mean duration of ventilation was 16 hours. The incidence of postoperative complications like fever (33.5%), neurosurgical (17.4%), pulmonary (10.6%), cardiovascular (9.9%), electrolytes abnormalities (8.7%), others (8.7%) complications and coagulopathy (4.3%) were quite common.

Conclusion: Most of the geriatric patients undergoing spine surgery have comorbidities, mainly hypertension and diabetes mellitus. Almost half of the patients have major perioperative complications.

References: 1. Y. Raja Rampersaud, Eduardo R.F.Moro, Mary Ann Neary, et al. Intraoperative adverse events and related postoperative complications in spine surgery: implications for enhancing patient safety founded on evidence-based protocols. *Spine* 2006 ;31(13):1503-1510.

15AP01-6**Depression in the elderly: missed opportunities in the perioperative period?**

Powell A., Mills D., Saxena S.

Scunthorpe District General Hospital, Dept of Anaesthesiology, Scunthorpe, United Kingdom

Background: Depression in patients 71 years and older is approximately 11% and is a leading cause of disability adjusted life years, second only to stroke. Depression is associated with higher pain perception, increased perioperative analgesic use and directly contributes to patient morbidity. It is also correlated with increased mortality in high risk surgery.

The elderly population is projected to increase considerably over the next few decades. Any increased hospital morbidity and length of stay will result in a drastically increased financial burden. Depression should therefore be actively sought and managed in the peri-operative elderly population. The National Institute for Clinical Excellence recommend using the PHQ-2 to screen for depression when appropriate.

Methods: We performed a prospective study of all patients aged 75 years and older who were admitted to 2 general surgical and 1 orthopaedic wards over 3 weeks. We identified elderly patients at risk of depression and whether clinicians had considered referral to specialists for assessment.

In total 33 elderly patients were identified. Patients were asked the PHQ-2 to identify those that should be referred for review. A score of 1 or 2 indicated a positive response. A detailed review of the patient's notes was undertaken to determine whether 'at-risk' patients were identified and whether there was any documented consideration of specialist referral.

Results and Discussion: Approximately one third (10 patients) of the cohort had positive PHQ-2 scores. Of these, only 1 patient was already taking an antidepressant medication. Additionally, 9 of the 33 elderly patients were taking medications with depression listed as a potential side effect.

No patients had any documentation indicating that mental state had been assessed at any point during their admission and no patients had been referred for further specialist review.

Conclusion: There is a significant unidentified cohort of elderly patients with depression in the peri-operative population. This patient group is not being actively identified and referred for specialist review and an important opportunity to reduce morbidity in this group is therefore being lost.

There are also significant implications regarding increased morbidity in this patient group. This is likely to compromise both the quality of care delivery as well as impact on increased financial burden on secondary care hospitals in a time of financial austerity.

15AP01-7**Getting it wrong: avoidable perioperative delirium in our elderly?**Powell A.¹, Khan A.R.², Saxena S.¹¹Scunthorpe District General Hospital, Dept of Anaesthesiology & Intensive Care, Scunthorpe, United Kingdom, ²Scunthorpe District General Hospital, Dept of Anaesthesiology, Scunthorpe, United Kingdom

Background: By 2080, 1 in 7 of the European population will be over the age of 80 years. The elderly have greater comorbidities and require more frequent hospital admissions. There is a consequent responsibility for medical professionals to 'get it right' for this cohort. Any rise in avoidable hospital complications and length of stay therefore has potentially huge implications for quality and safety of care and greatly increased financial cost.

Pre-existing cognitive impairment in the elderly strongly predicts post-operative delirium. This is associated with longer hospital stays, increased peri-operative mortality and post-operative functional decline. Cognitive impairment should be routinely screened for and delirium risk factors aggressively minimised in the elderly. We performed a snapshot study of elderly patients admitted to 2 general surgical and 1 orthopaedic wards to investigate this issue.

Methods: All patients over 75 years old (in total 37) admitted over 3 weeks were screened for delirium risk factors and their cognitive function was assessed daily using the Mini-Cog tool. A score of 0-2 indicated impairment and a drop in daily score was also noted. Drug charts and patient notes were also reviewed to identify patients that were taking cognition-affecting ('Beer's criteria' positive) medications and whether peri-operative screening for cognitive impairment had occurred.

Results and Discussion: 100% of our patients had 2 or more delirium risk factors. Notably, none had any documented pre-operative cognitive screening in hospital.

35% of patients had a Mini-Cog score of 2 or less during their admission. Over 1 in 5 of patients dropped scores at least once and of these 3 were taking Beer's positive drugs. Interestingly, 1 patient had scores that dropped over 3 days - in retrospect this clearly heralded clinical deterioration and subsequent admission to ITU.

More than 40% (16 patients) of the patients were on 1 medication with cognition-altering effects, 12% were on 2 such drugs. Of these, 6 patient's drugs were started in hospital.

Conclusion: Despite the clear risks posed by cognitive impairment and peri-operative delirium in our elderly patients, these remain poorly recognised. Screening at any time throughout admission appears scant. Single point assessment can be misleading as it doesn't identify all those with peri-operative delirium. Assessment should occur more frequently in 'at-risk' elderly patients.

15AP01-8**The markers of inflammatory response in elderly patients after anaesthesia**

Ploshchenko Y., Klygunenko O.

SE Dnipropetrovsk Medical Academy MHU, Dept of Anaesthesiology & Intensive Care, Dnipro, Ukraine

Background and Goal of Study: Increase in the number of elderly patients is a serious problem for anaesthesiology. The incidence of systemic inflammation in elderly is 20 to 30%, depending on the severity of the patient and other factors [Nearman H. et al., 2014]. In 40% of patients with SIRS promotes post-operative multiple organ dysfunction. This increases the number of post-operative complications and mortality increases to 50% [Menyar A. et al., 2012]. The goal of our study was to examine and evaluate markers of Inflammatory Response in elderly after general anaesthesia.

Material and methods: We examined 105 patients aged 60 to 82 years for abdominal surgery with total intravenous anaesthesia. There were representative of the gender, age, ASA, BMI, Euroscore. Preoperative patients with CVD managed in accordance with ESC Guidelines (2014). IL-1 α , TNF, IL-6, IL-10 in EDTA-plasma determined by enzyme immunoassay (set Biomedica). Data are presented as M \pm m, statistically significant value of p<0,05.

Results and Discussion: The severity of the patients corresponded to 48% of ASA II, 52% - ASA III. We compared the levels of IL-1 α , TNF, IL-6, IL-10 in elderly preoperatively, after anaesthesia and to 5 days postanesthesia. Preoperatively the level of proinflammatory IL 6 exceeded the norm by 64,2%,

TNF α - on 61,5%. The level of anti-inflammatory IL 10 exceeded the norm by 58,4% (p = 0,00001). The inflammatory activity index (IL 6/IL 10) was normal. After anaesthesia the level of IL 1 α increased by 35.9% (p = 0.04). The level of IL 6 increased output value to 2651% (p = 0.002). The concentration of IL 10 not statistically different from the norm and output levels. IL 6 level higher than the initial value by 2971% (p=0,002). Not found significant changes in the level of TNF α . The index IL 6/IL 10 was 4125 % (p=0,000018) above normal.

Conclusion: Elderly patients preoperative showed a non-specific activation of the inflammatory response that manifested as high in pro-inflammatory and anti-inflammatory cytokines. After anaesthesia in elderly we detected the inflammatory activation, which was confirmed by the increasing levels of cytokines and value index IL 6/IL 10.

15AP01-9**Peri-operative fluid management: non-therapeutic drowning of the elderly**

Powell A., Klassen J., Saxena S.

Scunthorpe District General Hospital, Dept of Anaesthesiology, Scunthorpe, United Kingdom

Background: In October 2006, a broad consensus was achieved and guidance was produced on the principles of good peri-operative fluid management. A clear distinction was made between resuscitative and maintenance fluid prescriptions. Emphasis was also placed on the prescription of fluids as an active process requiring frequent assessment of patient's fluid status. The GIFTASUP trial recommended maintenance fluid replacement should vary between 1500-2400mls/day however this study wasn't specific to elderly patients. NICE (National Institute for Clinical Excellence) has also issued clear guidance in this area. Overhydration in this group, particularly in the presence of borderline or overt renal failure can precipitate acute cardiac failure and pulmonary oedema. These complications often require additional treatment and potentially avoidable prolonged hospital admissions.

Methods: All patients aged 75 years and older, totalling 43 patients, admitted over 3 weeks onto Orthopaedic and surgical wards were followed up. These were patients scheduled for elective or emergency surgery. Fluid prescriptions and patient notes were reviewed daily to identify the volume of daily maintenance fluids and fluids prescribed intra-operatively.

Results and Discussion: The mean weight of our patient cohort was 61.45kg (Range 43.3-89kg) compared to the average adult weight of 71-83kg. One third of patients (16 out of 43) received more than the recommended maximum limit of intravenous fluids on at least one day of their admission. On 9 occasions, patients received 4 or more litres of maintenance fluids in a 24 hour period.

Worryingly, 1 patient received 16.5 litres in the immediate post-operative 72 hour period as they received repeated boluses due to ongoing hypotension that was related to continued epidural infusion. This resulted in an ITU admission and prolonged hospital stay.

Conclusion: The elderly peri-operative patient cohort are extremely vulnerable to the effects of intravenous fluid mismanagement. However replacement is rarely tailored appropriately to their individual requirements.

There is likely a significant amount of iatrogenic morbidity and mortality in this group and a resultant hugely increased financial cost. We have recommended that fluid prescriptions should routinely document patient weights and additional support from Peri-Operative Physicians should be sought in euvoalaemic and hypervolaemic patients with ongoing hypotension.

15AP02-1**Association between preoperative transthoracic echocardiography and clinical outcomes after scheduled hip fracture surgery in geriatric patients**

Lee M.-S., Kim S.-H.

Soonchunhyang University Bucheon Hospital, Soonchunhyang University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Bucheon, Korea, Republic of

Background and Goal of Study: Hip fracture has become one of main problem in the elderly patients by progress of the aging society. Transthoracic echocardiography (TTE) is still widely performed for purpose of assessing the

risk associated cardiovascular disease in individuals who undergo hip fracture surgery while routine echocardiography was not recommended for the preoperative assessment in individuals undergoing noncardiac surgery by recently published international guidelines. Thus, we evaluated the relevance of the variables of TTE and the outcomes in elderly patients with hip fracture.

Materials and Methods: We conducted single-center, retrospective medical record review including a total of 356 patients. The study population included patients 65 years of age and older underwent TTE within a month before the scheduled hip fracture surgery for the pre-operative assessment between January 2013 and October 2016. Primary outcome was 30-day mortality after surgery, secondary outcomes were postoperative neurologic and cardiovascular complications. Univariable and multivariable logistic regression were performed to identify whether echocardiographic variables are related to postoperative mortality and complications.

Results and Discussion: The mean age was 79.7 years (SD=6.7) and 78 (21.9%) were male (Table 1). Six patients died within 30 days. Age is only variable that was found to be associated with 30-days mortality. Among TTE variables, only LA volume index was found to be associated with postoperative cardiovascular complication in both the univariable and multivariable logistic regression analysis (Table 2).

Conclusion: This study shows that patient's age was associated postoperative mortality. More careful screening of the elderly patients for pre-operative echocardiography will be necessary.

Variables	Total (N=356)	Survival group (N=350)	Death within 30 day groups (N=6)	P
Age (year)	79.7 ± 6.7	79.6 ± 6.7	87.5 ± 3.3	0.003
Gender				0.616
Male	78 (21.9%)	76 (21.7%)	2 (33.3%)	
Female	278 (78.1%)	274 (78.3%)	4 (66.7%)	
Height (cm)	156.7 ± 7.9	156.8 ± 7.8	152.2 ± 9.2	0.263
Weight (kg)	54.1 ± 9.9	54.1 ± 9.8	52.7 ± 15.5	0.671
BSA (m ²)	1.5 ± 0.2	1.5 ± 0.2	1.4 ± 0.2	0.26
Echo-related factor				
LVEF (%)	62.8 ± 7.6	62.7 ± 7.6	67.3 ± 7.9	0.161
LV Mass	135.0 ± 119.6	135.1 ± 120.3	129.2 ± 21.1	0.779
LVMI (g/m ²)	84.5 ± 23.0	84.5 ± 23.1	81.3 ± 5.0	0.945
LAVI (ml/m ²)	24.1 ± 12.5	24.2 ± 12.6	23.1 ± 9.2	0.953
E (cm/sec)	67.9 ± 18.1	67.9 ± 18.0	69.6 ± 22.8	0.99
A (cm/sec)	92.8 ± 21.3	92.5 ± 21.0	112.4 ± 34.4	0.157
RVP (mmHg)	32.0 ± 7.2	32.0 ± 7.2	33.2 ± 7.6	0.722
E' (cm/sec)	4.8 ± 1.3	4.8 ± 1.3	4.0 ± 1.3	0.141
A' (cm/sec)	8.6 ± 1.9	8.6 ± 1.9	7.8 ± 2.0	0.419
E/E'	15.0 ± 6.7	15.0 ± 6.7	18.5 ± 6.5	0.176
Comorbidity				
Hypertension	224 (62.9%)	221 (63.1%)	3 (50.0%)	0.674
Diabetes mellitus	108 (30.3%)	106 (30.3%)	2 (33.3%)	1
Coronary arterial disease	37 (10.4%)	36 (10.3%)	1 (16.7%)	0.485
Heart failure	22 (6.2%)	20 (5.7%)	2 (33.3%)	0.047
Valvular disease	9 (2.5%)	9 (2.6%)	0 (0.0%)	1
Arrhythmia	20 (5.6%)	19 (5.4%)	1 (16.7%)	0.295
Stroke	65 (18.3%)	63 (18.0%)	2 (33.3%)	0.302
Neurologic disease	83 (23.3%)	81 (23.1%)	2 (33.3%)	0.627
Kidney disease	35 (9.8%)	33 (9.4%)	2 (33.3%)	0.11
Pulmonary disease	57 (16.0%)	56 (16.0%)	1 (16.7%)	1

A, mitral peak velocity of late filling; BSA, body surface area; E, mitral peak velocity of early filling; E', early diastolic mitral annular velocity of the septal mitral annulus; E/E', the ratio of mitral peak velocity of early filling(E) to early diastolic mitral annular velocity of the septal mitral annulus(E'); LAVI, left atrial volume index; LVEF, left ventricular ejection fraction; LV Mass, left ventricular mass; LVMI, left ventricular mass index; LV

[Table 1. Demographic characteristics, echocardiologic findings and patient's comorbidities]

	Death within 30 days			Delirium			Cardiovascular complication		
	OR (%)	95% of CI of OR	P	OR (%)	95% of CI of OR	P	Odds ratio	95% of CI of OR	P
Univariable regression analysis									
Transthoracic echocardiographic variables									
LVEF (%)	1.1	0.98-1.25	0.132	0.96	0.91-1.02	0.21	1	0.96-1.04	0.871
LVMI (g/m ²)	0.99	0.95-1.04	0.809	1.01	0.99-1.03	0.409	1.01	0.99-1.02	0.455
LAVI (ml/m ²)	0.99	0.88-1.06	0.885	1.05	1.02-1.09	0.005	0.99	0.95-1.03	0.764
E (cm/sec)	1.01	0.95-1.05	0.831	1.01	0.98-1.04	0.471	0.99	0.97-1.01	0.575
A (cm/sec)	1.03	1.1-0.6	0.044	0.99	0.96-1.02	0.493	1	0.98-1.01	0.874
RVP (mmHg)	1.02	0.88-1.12	0.748	1	0.92-1.07	0.995	1	0.95-1.05	0.85
E' (cm/sec)	0.52	0.2-1.13	0.131	1.15	0.64-1.65	0.511	0.04	NA-1023642395	0.99
E/E'	1.04	0.94-1.11	0.258	0.97	0.87-1.05	0.585	0.99	0.94-1.04	0.748
Age	1.21	1.06-0.4	0.007	1.01	0.97-1.06	0.572	1.06	0.99-1.44	0.122
Multivariable regression analysis									
Age	1.19	1.03-1.36	0.016	-	-	-	-	-	-
LAVI (ml/m ²)	-	-	-	-	-	-	1.21	1.03-1.42	0.02

E, early diastolic mitral annular velocity of the septal mitral annulus; E/E', the ratio of mitral peak velocity of early filling(E) to early diastolic mitral annular velocity of the septal mitral annulus(E); LAVI, left atrial volume index; LVEF, left ventricular ejection fraction; LV Mass, left ventricular mass; LVMI, left ventricular mass index

[Table 2. Results of the univariable and multivariable regression analysis of between the transthoracic echocardiographic variables and the 30-days mortality and the postoperative neurologic and cardiovascular complications]

15AP02-2

Hypobaric versus isobaric bupivacaine to prevent anesthesia-induced hypotension in elderly patients undergoing surgical repair of hip fracture under continuous spinal anesthesia: a prospective randomized controlled study

Bargaoui A., Raddaoui K., Oueslati M., Bousselmi R., Shili A., Kaabachi O.

Institut Mohamed Kassab d'Orthopédie, Dept of Anaesthesiology & Intensive Care, Ksar Said, Tunisia

Background and Goal of Study: Continuous spinal anesthesia (CSA) for surgical repair of hip fracture in elderly patients has been shown to preserve hemodynamics better than general and single shoot SA [1]. However, hypotension still occurs with CSA [1, 2]. Our goal is to show that hypobaric bupivacaine in CSA is more effective in preserving hemodynamics than isobaric bupivacaine when patients are operated in the lateral position.

Materials and Methods: It is a randomized, controlled, single-blinded study. Patients more than 65 years and scheduled for a surgical repair of a hip fracture were eligible. In order to provide analgesia for positioning, ultrasound guided femoral nerve block was performed. Patients were then placed in the lateral position with the operated side up. A spinal catheter was inserted. Patients were randomized to receive either hypobaric (HB) or isobaric bupivacaine (IB). Repeated doses of 2.5 mg bupivacaine were injected until sensory blockade reached T12, so surgery can start.

Hypotension and severe hypotension were defined as a decrease of more than 20% and 30% from the baseline systolic arterial blood pressure. Hypotension was treated with ephedrine.

Our primary outcome was the incidence of hypotension among the 2 groups. Severe hypotension incidence and ephedrine consumption were secondary outcomes.

Qualitative data were analyzed by χ^2 test and quantitative data by Student t-test if the distribution was normal or Mann-Whitney U-test if the distribution was not normal.

Results: Ninety two patients were included. The two groups were comparable in age, BMI and ASA class. There were significantly more patients in HB group with medical history of diabetes mellitus and on ACE inhibitors. There was no difference in type and course of surgery. Significantly less patients experienced hypotension and severe hypotension in HB group than in IB group (respectively 49% vs 70%; p=0,02 and 50% vs 22%; p<0,01). Significantly less ephedrine was used in HB group (6 vs 2,2 mg; p=0,01). Total consumption of bupivacaine was not different (4,7 mg in both groups).

Conclusion(s): In elderly patients operated in the lateral position under CSA, hypobaric bupivacaine may be used rather than isobaric bupivacaine for further preserving hemodynamics.

References:

1. Eur J Anaesthesiol. 1998 Nov;15(6):656-63.
2. Anesth Analg, 2006 May;102(5):1559-63.

15AP02-3

The relationships between the stand-by time within 24 hours for hip fracture repair and postoperative agitation or early gait training: a propensity score analysis

Sakai N., Takada M.

Daiyukai General Hospital, Dept of Anaesthesiology & Intensive Care, Ichinomiya, Japan

Background and Goal of Study: Hip fracture is a common trauma for elder patients. Postoperative agitation or hyperactive delirium is one of the main concerns after hip surgery and induces a negative outcome. In addition, early postoperative rehabilitation is also a big issue after surgery. We hypothesized that early decision to hip fracture repair from hospital admission would influence the postoperative agitation and standing rehabilitation.

Materials and Methods: This research was a retrospective chart review with the approval of the institutional review board. We examined 600 patients aged 50 years and older underwent hip fracture repair between January 2012 and November 2016. We collected the data of postoperative agitation (defined as Richmond Agitation-Sedation Scale +1 to +4) and the postoperative hours of starting gait training (defined as bedside standing and walking with or without physiotherapists' help except caused by agitation). The patients were divided to two groups; early group (Group E) spent the stand-by time within 24 hours

from hospital admission to operation theatre admission, and delayed group (Group D) spent more than 24 hours. To compensate for the differences in patient characteristics, we used a propensity score matching analysis, and comparable patients, 295 patients from each group, were identified for final analysis. The same analysis was also provided when the stand-by time was within or more than 48 hours.

Results and Discussion: There were no statistical difference in postoperative agitation during patients groups (Group E versus Group D: n=72 versus n=84, 95% confidence interval: 0.54 to 1.16, odds ratio 0.80, p=0.29). Postoperative possibility of gait training after hip fracture repair was significantly higher in patients in Group E (Group E versus Group D: n= 234 versus n=202 respectively, 95% CI: 1.2 to 2.6, odds ratio 1.8, p=0.003). There was no statistical difference in the same outcomes when the threshold of stand-by time was 48 hours.

Conclusion: Our results suggest that preoperative shortage of stand-time could not make a reduction to the postoperative agitation however we could have a chance to produce the postoperative early gait training, which might contribute to the early rehabilitation and self-reliant life.

15AP02-4

Surgical and anaesthetic consultant impact on outcomes in Hip fracture surgery

Martins N.¹, Cohen M.R.A.¹, Dart P.², Margaron M.P.¹

¹St Richard's Hospital, Dept of Anaesthesiology & Intensive Care, Chichester, United Kingdom, ²King's College Hospital, Dept of Anaesthesiology, London, United Kingdom

Background and Goal of Study:

Hip fracture is the leading cause of geriatric accidental death in the UK¹. Introduction of the National Hip Fracture Database (NHFD) has revolutionised its management. Early surgical intervention and multidisciplinary team involvement have shown to reduce mortality rates. It is unknown if mortality is affected by the training grade of doctors involved. We reviewed if the presence of a consultant surgeon or anaesthetist affected the mortality of patients undergoing surgical fixation for a fractured neck of femur (NOF).

Materials and Methods: Analysis was performed on retrospectively collected data of fractured NOF patients treated between 2010 and 2016 at our regional centre. Patient demographics and 30-day mortality were collected from NHFD submissions and the Hospital Information System. Theatre logbooks were cross-referenced to ascertain the grade of anaesthetist and surgeon involved. Patient groups were further split into two ASA subgroups to adjust for case mix (ASA 1-3 and ASA 4-5). The primary endpoint was to determine if the presence of a consultant surgeon or anaesthetist made a significant difference in 30-day mortality. Statistical significance was tested using a two-tailed chi-squared test.

Results and Discussion: Data was fully complete for some 2,028 (81%) of 2516 patients from Jan 2010 - Nov 2016. The median age was 85 years (IQR 79.5-90) and 75% were female. Over this period there was an overall decrease in 30-day mortality from 7.8% (2011-12) to 5.3% (2013-14), associated with an increased anaesthetic consultant involvement, from 54% (2010-11) to 70% (2012-13). Mortality differences between consultant and non-consultant grades is shown in tables 1 and 2.

Anaesthesia	Consultant Mortality	Non-consultant Mortality	P value
All patients	77 of 1472 (5.2%)	45 of 569 (7.9%)	0.022
ASA 4-5 patients	33 of 274 (12.0%)	11 of 68 (16.2%)	0.41 (ns)

[Table 1]

Surgery	Consultant Mortality	Non-consultant Mortality	P value
All patients	43 of 738 (5.8%)	83 of 1290 (6.4%)	0.65 (ns)
ASA 4-5 patients	16 of 136 (11.8%)	30 of 172 (14.9%)	0.52 (ns)

[Table 2]

Conclusion(s): Fractured NOF remains an injury with high associated mortality. Recommendations from international bodies agree that anaesthesia should be provided by the highest grade of anaesthetist available. The presence of a consultant anaesthetist for NOF surgery is associated with a reduced mortality, although it is unlikely to be the sole cause. The grade of surgeon made no significant difference.

References: 1. National Hip Fracture Database 2016 report, RCP

15AP02-5

Perioperative goal-directed hemodynamic optimization using the noninvasive CNAP™ monitoring device in high-risk hip fracture patients

Acevedo Bambaren I., Pestaña D., Domínguez F

Ramón y Cajal Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal: In the last years, there is a growing interest in the improvement of prognosis and shortening of hospital length of stay in high-risk surgical patients. Several evidence-based protocols ("fast-track" surgery) have been developed and implemented in some hospitals for this purpose. Cardiovascular optimization through the so-called "goal-directed therapy" (GDT) is a key element in these protocols. Previous studies in the literature use invasive monitors to assess hemodynamics.

The aim of the present randomized, multi-center, open-label clinical trial is to use a GDT protocol (including fluid boluses and vasoactive drug infusion) based on data obtained from the CNAP™ device (systolic volume, cardiac index and mean arterial pressure) to test the hypothesis that GDT is superior to standard practice in terms of reduction in the incidence of perioperative complications. We present an intermediate analysis as a continuation of a preliminary study previously presented.

Materials and Methods: A total number of 212 patients has been estimated for this study. All patients scheduled for hip surgery secondary to fracture, and who present at least, one risk factor: Age ≥80 years, New York Association Score (NYHA) III/IV and American Society of Anesthesiologists score(ASA) III/IV. All patients will followed from the day of surgery up to hospital discharge (determined by a surgeon specialist not involved in the study) or death.

Results: In this intermediate analysis 45 patients were included. The mean age was 87(105/81), all patients were ASA III. The hemodynamic protocol were applied according to randomization in 22 patients. Of these, 10 patients required dobutamin and 15 one noradrenaline. All patients needed at least 1 bolus of 250 ml crystalloids. The average value of cardiac index and medium arterial pressure before the spine anesthesia was 3,5 and 90 in both groups. All were carried to the Post Anesthetic Care Unit (PACU) and after discharged between 4 and 6 hours.

9 patients presented acute kidney injury in the control group and 3 in the GDT group respectively.

2 patients died in the control group and no one in the GDT group.

Conclusion: The goal directed therapy seems to be usefull to reduce perioperative complications in these patients.

15AP02-6

Prevention of cognitive dysfunctions in patients under orthopedic surgery

Artemenko V.¹, Tokar I.², Vorokhta Y.³

¹MC ,MEDIKAP', Dept of Anaesthesiology & Intensive Care, Odessa, Ukraine, ²INTO-SANA, Dept of Anaesthesiology & Intensive Care, Odessa, Ukraine, ³University Clinic of Odessa National Medical University, Neurology, Odessa, Ukraine

The number of orthopedic surgery in elderly patients have grown numerically. Postoperative cognitive dysfunction (POCD) remains the important problem in those pts. The anaesthesiologists aim is to reach adequate analgesia and sedation, avoid respiratory depression, ventilator-associated pneumonia and cognitive dysfunction. Dexmedetomidine can decrease the rate of POCD even in our local Ukrainian circumstances.

Our study evaluate the efficacy of dexmedetomidine in reducing POCD by estimate an ability to perform the Mini-COG test compared with propofol.

Case cohort study included 59 pts. ASA III-IV, age 78.5 ±5.5 y.s, 2014-15y. randomised in two group: main group (n=30) the patients were sedated by dexmedetomidine infusion 3.5 - 2 mkg/kg/h.

In the control group (n=29) - the patients were sedated by propofol infusion at 6-10 mg/kg/h. The RASS score -3-4. In both group anaesthesia reached under plexus lumbar block + n. Sciatic block. Ropivacain was used 0.7%-30 ml in both group. Initial target was: HR, SpO2, RR, Et Co2.

First we evaluated performing Mini-COG test before and after orthopedic surgery. Second - to evaluate rate of postoperative delirium. Successful Mini-Cog test was in 25 pts. (83.3%preop)/24 pts.(80%postop).(Chi2 =0.001 p=0.95).

In control group successful Mini-Cog test was in 23 pts (22.91%preop)/18 pts.(62.06%postop)(Chi² = 1.48 p=0.22). The case of postoperative delirium in main group was 1 patient (3.33%), in control group 5 pts. (17.24%).(Chi² = 3.12 p=0.07)

The analysis of the results was performed and we can concluded that the main and control groups were fully compatible by sex, age, volume of surgery and type of anesthesia. Filed Mini-Cog test and rate of postop. delirium were significantly lower in the main group.

Conclusion: in elderly patients under orthopedic surgery:

1. Dexmedetomidine is effective drug for sedation.

2. The dexmedetomidine infusion decreased the rate of POCD and delirium in postoperative period.

References:

1. J.Mantz. Dexmedetomidine - new look.//EJA-2011.- vol.28.-P256-258.
2. Bondar V.,First experience of using propofol in ENT-surgery//Med.neotlozh. status.-2013.№3.-C.91-95.
3. Borson S.The mini-cog:a cognitive "vitals signs" measure for dementia screening in multi-lingual elderly//Int.J.Geriatri. Psychiatry. - 2000 . - Vol. 15. - P1021.

Patient Safety

16AP01-1

Communication critical incidents: how to improve human factor?

Hernández I., Romera A., Lema M., Palencia M., Gago S., Garrido A.

Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Half of the critical incidents (CI) at hospital environment occur in the operating room. The main contributory factor involved is the so-called "human factor". This term refers to both the non-technical skills that each one has as well as teamwork. The main non-technical skills are communication, coordination, shared mental model and leadership skills. Of these, communication capacity is essential because it connects the other elements.

The aim of the study is to review the national base of the CI reported ("SENSAR database") to analyze those in which communication is a contributing factor.

Materials and Methods: Retrospective observational study in which 6205 CI reported in SENSAR database were reviewed during the period from January 2009 to October 2016, identifying those in which the communication error appears as a contributing factor.

Results and Discussion: We found a total of 1957 (32%) cases in which some communication error influenced the production of CI. Up to 591 of them it was the main contributing factor.

46% of the CI were caused by errors in communication between doctor and other staff, 34% communication errors between doctors, 11% absence of close supervision, 8% errors in communication between doctor and patient and 1% delay or denial in looking for help. Taking into account the consequences, 2% produced major morbidity, 4% intermediate morbidity and 8% did not cause harm to the patient, but resulted in suspension surgery. 73% of the incidents did not cause any damage. There were 7 deaths (1%) related to communication CI. In order to optimize communication among the members of a teamwork and thus contribute to giving importance to the "human factor", several improvement measures have been locally developed through service sessions, sending alerts in bulletins via mail and Training programs through simulation and online courses in "Crisis Resource Management" and Helsinki Declaration through Sensor.

Conclusion(s): In other international series, human factor is the main one involved in CI development. Effective communication in a team is an essential aspect of it. The standardization of information transmission, simulation, Crisis Resource Management courses and debriefing are some of our tools available to enhance non-technical skills.

16AP01-2

Confidentiality in operating theatres: a survey of practice

Powell A., Ali H., Saxena S.

Scunthorpe District General Hospital, Dept of Anaesthesiology, Scunthorpe, United Kingdom

Background: In this era of Information Governance, it is imperative that patient confidentiality be maintained at all times. Besides, respect for patient privacy has remained both an ancient and contemporary professional responsibility of physicians.

Despite being clinical-only environments, operating theatre changing rooms have a significant volume of traffic passing through. Staff members shouldn't have access to confidential information regarding patients that they have no duty of care towards. We undertook a quality improvement project to reduce the incidence of patient identifiable data being left within the theatre environment.

Methods: In the first part of this project, staff changing areas were reviewed at 08:30 and 16:30 over 9 days in Jan 2016. We looked to determine whether confidential information (theatre lists, 'Handover' documents and referral letters) was left in an unsecured environment. After discussion with staff it was identified that having confidential waste bins in the changing rooms would be the most effective preventative method. These were placed in all changing rooms and staff were informed of their importance. The changing areas were then reviewed 6 months later to identify whether a significant cultural shift had occurred.

Results and Discussion: Initially on over 75% of the days, patient identifiable information was discovered within at least one of the changing rooms. Information included trauma lists with names, NHS numbers and patient addresses and theatre lists with planned operations. A detailed referral from a General Practitioner to the Surgical team was also found containing an extensive patient medical history. From each piece of information an average of 3 patients could be identified.

Following the change, confidential information was still found in all changing rooms on each of the 'follow up days'. However this was promptly disposed of appropriately when the cleaning staff arrived in the evening.

Conclusion: Despite the accepted importance of maintaining patient confidentiality, theatre changing rooms remain a potential source of breaches. Prominently displayed confidential waste bins and information regarding seriousness of confidentiality breaches should be available for all staff to reduce this incidence. Despite the provision of an appropriate disposal facility for the confidential information, little change in practice was seen. We intend to explore the human factors further to address this problem.

16AP01-3

"Tunnel vision" as a possible cause of medical error.

A gangrene of Fournier that should never have happened

Aracil Escoda N., Pretel Merlo M., Martínez Hurtado E., Abubakra Abubakra S., Ripollés-Melchor J., Calvo Vecino J.M.

Hospital Infanta Leonor, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: Medical practitioners tend to focus too much in certain disorders, overlooking others that can cause greater damage on the patient. A patient with no diagnosis of diabetes was admitted to hospital with a severe perianal abscess, sepsis and diabetic ketoacidosis. He was followed up by several doctors, including endocrine, but they never detected his diabetes.

Case report: 58 years-old man, came to the hospital with signs of gangrene of Fournier. Blood test at admission showed hyperglycemia, metabolic acidosis, signs of infection and coagulopathy. He became septic and needed three aggressive surgeries in 24h to control the source of infection. We assumed it was a diabetes debut, but checking his analytical results of last years, we found hyperglycemia since 4 years ago. These results were seen by Primary care, Digestive and Endocrinology practitioners, but they didn't take measures to correct them.

Discussion: In medicine is common to lose the global vision of the patient. That is what we call "tunnel vision", we tend to see just the information we are interested in, losing the rest. This attitude can drive to medical mistake and supposes a threat for the patient's safety¹. Safety culture is based on the idea that even a qualified and motivated professional can make a mistake. Every incident supposes an opportunity to learn to identify and correct them. We have used the Spanish Anesthesia and Recovery Safety Notification System to communicate this incident². We made the following analysis: The active error is the omission due to the tunnel vision. Some contributing factors are involved too: lack of attention, welfare pressure, fatigue and inadequate use of material (as the information obtained in blood test wasn't handled properly)³. The corrective measures we suggest are:

1. Debriefing with the implied professionals.
2. Making the case visible by Informative Service Meetings.
3. Creating a computer alert that shows up when certain number of laboratory abnormalities are found repeatedly.
4. Stressing the importance of safety culture

References:

1. Helsinki declaration on patient safety. EJA.2010;27:592-97
2. Incident reporting in anaesthesiology. Best Pract Res Clin Anaesthesiol. 2011;25:207-14
3. Int J Qual Health Care 2009; 21 n1:18-26

Learning Points: Any clinical practitioner can make mistakes with consequences on the patient's health. Communicating and analyzing the incident with a Safety Notification System is the best way to avoid repeating it.

16AP01-4

Audit on fulfillment of the European and Spanish guidelines for safety at a tertiary university hospital: a comparison after 2 years

Latorre J., Brogly N., Kollmann Camaiora A., Alsina E., Guasch E., Gilsanz F

La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background: 50% of medication errors in anesthesiology are due to error in the choice of the ampoule or syringe, labeling or preparation. Prevention of such errors should be a major concern in our daily practice.

Method: We performed an audit on labeling, reutilization and usage of syringes/pumps in our department to assess the compliance of European and Spanish guidelines on medication handling. We recorded the area, presence of anesthesia residents, type of anesthesia, the medication present in the operating room (OR) during the day and amount of medication prepared vs administered. We then compared this data to the one recorded 2 years ago¹ and assess the evolution of safety culture after internal promotion in our department.

Results and Discussion: We assessed 101 OR between November 14th to 28th 2016, involving 628 syringes/pumps charged. 13% of the medication wasn't labeled (64% corresponding to propofol and the remaining to: local anesthetics 22%, antibiotics 7%, remifentanyl 2,5%, ketamine, midazolam and fentanyl 1,5%), p=NS for type of anesthesia or presence of residents in the OR. 3,2% of medication (20/628) was reused between surgeries, mainly pumps containing propofol 5/20, phenylephrine 4/20 and remifentanyl 3/20. On the most common dilutions used, 88% used atropine at 1mg/ml (3 other dilutions), 99% ephedrine at 5mg/ml (1 other dilution), 100% phenylephrine at 100mcg/ml and for remifentanyl 57% used 20mcg/ml and 43% 50mcg/ml. Compared to the 2014 audit we observed a decrease in unlabeled medication from 29% to 13%, with just 1 unlabeled syringe of muscle relaxant compared to 18 and none of atropine compared to 22. Reutilization decreased from 13% to 3,2%, the greatest decrease being in midazolam: 18% to 2%. The number of dilution decreased consistently, specially for phenylephrine, going from 5 dilutions to just 1.

On pharmacoeconomic we observed that 293/628 (47%) syringes/pumps were prepared and discarded without being used, mainly atropine (141/168, 84% discarded) and ephedrine (67/111, 60% discarded).

Conclusions: Although great improvements have been done to promote a safety culture we still a long way to go; however, we can remark that even a simple intervention, like promoting safety during our weekly meetings has had a great impact. With the pharmacoeconomic data, the next step will be to promote preloaded syringes, for safety and costs reduction.

References: Kollmann et al. Should we improve our safety practice? EJA 2004;31,e-sup:256

16AP01-5

Audit on fulfillment of the European new guidelines for safety in anaesthesia practice: storage

Latorre J., García Sanchez D.E., Brogly N., Kollmann Camaiora A., Alsina E., Gilsanz F

La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: The European Board of Anaesthesiology stated with the recommendations for safe medication practice that drugs should be stored in ways designed to facilitate their easy identification and minimize the risk of error or misidentification, and that local anaesthetics should be stored separately from anaesthetic drugs and high-risk i.v. medicines. The aim of our study was to evaluate the level of application of the safety guidelines in a tertiary university hospital.

Materials and Methods: We performed an observational based audit about the correct storage of diferents drugs in a Spanish tertiary hospital. We inspected all the anaesthesia trolleys (AT) and evaluated if the medication was correctly stored.

Results and Discussion: Forty four anaesthesia stations were audited, including operating rooms and non surgical areas. In all AT inspected, at least one socket stored more than 1 medication. 8/44 (18%) ATs presented empty sockets and in 2/44 (4%), muscle relaxants were stored with no cooling system. Only 14/44 (31%) had standard labels for use on syringes of medications. In all these areas, drugs were stored without a clear distinction between different pharmacological groups: anaesthetic drugs were classified alphabetically independently from being high-risk i.v. medicines and local anesthetics.

Conclusion: These results should be used to set the basis for improvement and aim at creating a culture of safety among our colleagues. Even though the anaesthesiologists are not at charge of organizing and refilling the anaesthesia trolley in our institution, this type of survey should encourages them to take the lead in applying these practice guidelines to improve patient outcomes and reduce adverse events.

Reference: D. Whitaker et Al. The European Board of Anaesthesiology recommendations for safe medication practice. First update. Eur J Anaesthesiol 2016; 33:1-4

16AP01-6

Helsinki Declaration implementation after 6 years: evaluation of current status in hospitals in Catalonia

Alarcón A., Moret E., Canet J.

University Hospital Germans Trias i Pujol, Dept of Anaesthesiology & Intensive Care, Badalona, Spain

Background and Goal of Study: The Helsinki Declaration (HD) on Patient safety in Anaesthesiology was signed in June 2010 in Europe in order to improve patient safety in perioperative anaesthesia care. The aim of this study was to assess the current state of accomplishment among hospitals in Catalonia, which cover a population of 7.5 million people.

Materials and Methods: After Ethics Committee approval in our University Hospital, an on-line survey was sent by email to the heads of departments of all hospitals in Catalonia. The survey analysed the accomplishment of all recommendations outlined in the HD: presence of recovery room and standard monitoring, protocols in emergency situations, use of sedation guidelines, implementation of surgical checklist, delivery of annual safety reports including measures taken and results obtained in improving patient safety, annual report on patient morbidity and mortality and the use safe practice and critical incident reporting systems. Data are presented as absolute numbers and/or percentages.

Results and Discussion: A total of 29 completed questionnaires were collected out of 40 Anaesthesiology Departments (response rate of 72.5%). The recorded variables were: 96% of the responding hospitals had a recovery room, 51.7% of them 24 hours/day. 96% of the hospitals used standard monitoring routinely in operating rooms and the recovery room. 79.3% of the hospitals followed all protocols according to the HD. 62.5% of them used recognised sedation guides. 72.4% had a modified surgical checklist version from the WHO. 65.5% of the hospitals carried out an annual safety report, including safety measures in 78.9% of them. Morbidity and mortality annual reports were carried out periodically in 62% of the hospitals surveyed. 88.2% of these had established feedback mechanisms after analysis of critical incidents and

94.1% discussed improvement measures in sessions. 82.3% published the results in annual reports. 75.8% had already implemented critical incident reporting systems and 65.2% published annual reports.

Conclusion(s): Patient safety is an essential component of risk management, clinical management and quality improvement in Anaesthesiology. Our results showed that most of the safety standards recommended in the HD were already applied in Catalan hospitals. Annual reports about morbidity/mortality and reported critical incidents should be improved in Catalan hospitals in the future.

16AP01-7

Patient's perspectives on informed consent for anaesthesia: our reality and thoughts for the future

Martins P, [Amorim J.](#), Resende A., Ormonde L.
Centro Hospitalar Lisboa Norte, Dept of Anaesthesiology, Lisboa, Portugal

Background and Goal of Study: Anaesthesiology informed consent may be different from other medical and surgical specialties since patients rarely decide whether or not they want to be anaesthetized, but rather which of the anaesthesia techniques they prefer for procedure. On the other hand, patients often only know their anaesthesiologist the day before or on the day of the surgical procedure, which influences the relationship and the doctor-patient communication. The aim of our study was to evaluate patients' expectations about the informed consent of anaesthesia in the preoperative period.

Materials and Methods: Longitudinal study with application of a survey, performed on the day before surgery to all patients proposed for elective surgery at Hospital de Santa Maria on October 20th, 2016. Patients younger than 18 years were excluded.

Results and Discussion: Thirty-four patients were inquired (aged 24-91 years), of which 20 were females (58.8%). Four patients were classified as ASA I (11.8%), 21 ASA II (61.8%) and 9 ASA III (26.5%). Eight patients (23.5%) had anaesthesia consultation and 13 (38.2%) had pre-anaesthetic visit. 10 patients (29.4%) were informed before going to the operating room about the type of anaesthesia planned, of which 5 (50%) were informed by the anaesthesiologist during anaesthesia consultation, 3 (30%) by the anaesthesiologist at pre-anaesthetic visit and 2 (20%) by the surgeon; 80% of them felt clear about the explanation of the anaesthetic procedure.

Twelve patients (35.3%) considered risks that are serious but very rare should not be discussed prior to anaesthesia; on the other hand, risks that are less serious but more frequent should be discussed prior to anaesthesia in the opinion of 28 (82.4%).

Six patients (17.6%) considered 1 week before surgery the best time to discuss anaesthetic risks, 3 (8.8%) more than 1 month of surgery, 10 (29.4%) the day before surgery, 9 (26.5%) on the same day and 6 (17.6%) had no opinion.

Conclusion(s): Our findings highlight the value of pre-anaesthetic informed consent, despite the potential of increasing patient's anxiety. Most of them prefer discussion of less serious but more frequent risks, and prefer it close to surgery. Although challenges to effective pre-anaesthetic informed consent exist, Anaesthesiologist should acknowledge patient's desire for information and we should probably improve it in our pre-anaesthetic visit.

16AP01-8

Preoperative evaluation of adult patients undergoing elective non-cardiac surgery in Lithuanian hospitals

[Jaremko I.](#)¹, [Stremaityte V.](#)², [Gudaityte J.](#)¹

¹Lithuanian University of Health Sciences, Department of Anaesthesiology, Kaunas, Lithuania, ²Vilnius University, Department of Emergency Medicine, Vilnius, Lithuania

Background and Goal of Study: The aim of this study was to assess the extent of preoperative evaluation of adult patients undergoing elective non-cardiac surgery in Lithuanian hospitals (LH) compared to ESA guidelines [1].

Materials and Methods: The prospective study was approved by local Ethics Committee. LH containing surgery departments were included. A questionnaire according to ESA preoperative evaluation guidelines [1] was formed and mailed to 42 hospitals. Questionnaires were answered by qualified anaesthesiologists. Answers were received from 30 hospitals (response rate 71.4%).

Results and Discussion:

Recommendation (Grades)	Results in LH, % of cases
Preoperative assessment should at least be completed by an anaesthetist (D), but the screening of patients could be carried out effectively by either trained nurses (C) or anaesthesia trainees (D)	100% by anaesthesiologist
Pre-operative evaluation should be carried out with sufficient time before the scheduled procedure to allow for the implementation of any advisable pre-operative intervention aimed at improving patient outcome (D)	39.2% done <2h before surgery
Pre-operative standardized questionnaires may be helpful in improving anaesthesia evaluation in a variety of situations (D)	76.6% standardized questionnaires
Screening for DMV and difficult intubation should be conducted, whenever feasible, in all patients potentially requiring airway management for anaesthesia (A). No single predictive sign for difficult airway management is sufficient by itself and the pre-anaesthesia assessment needs the combination of different validated evaluation criteria (A)	96.6% screening is done. History of previous anaesthesia's evaluated 96.6%, assessment of Mallampati class - 96.6%, thyromental distance - 72.4%, head and neck mobility - 75.9%, length of neck - 82.8% thickness of neck - 3.4%, interincisor distance (mouth opening) - 100%, jaw protrusion - 86.2%, BMI - 75.9%, age - 58.6%, snoring and sleep apnoea - 51.7%, sex - 31%
Pre-operative assessment of obese patients includes at least clinical evaluation, Berlin or STOP questionnaire, ECG, polysomnography and/or oximetry. (D) Laboratory examination is indicated in obese patients in order to detect pathological glucose/HbA1C concentrations and anaemia (D)	Clinical evaluation - 100%, Berlin/STOP questionnaires - 3.3%, ECG - 90%, polysomnography/oximetry - 6.6%, glucose/HbA1C - 96.6% for obese patients
Routine use of coagulation tests is not recommended unless there are specific risk factors in the history (D)	86.6% done routinely
Smoking cessation before surgery is recommended. It must start early (at least 6 to 8 weeks prior surgery, 4 weeks at a minimum) (B)	Smoking cessation recommended 10%
In patients currently taking b-blocking or statin therapy, this treatment should be continued peri-operatively (A)	72.4% continued
Patients should be asked explicitly about their intake of herbal drugs (D). Herbal medicines should be discontinued 2 weeks prior to surgery (D)	Asked - 44.8%, stopped - 20.6%

[Parameters of preoperative assessment]

Conclusion(s):

1. Evaluation in LH is done by a doctor anaesthesiologist, 2 hours or less before the surgery, using standardized questionnaires.
2. Patients with comorbidities and/or taking medication before surgery are evaluated and prepared according to the ESA recommendations in most of LH. However, some recommendations related to smoking cessation, the assessment of obese patients, usage of herbal preparations, are performed in a small number of LH.
3. Airway evaluation is done in most of LH according to ESA recommendations.

References: 1. De Hert S, Imberger G, Carlisle J, et al. Preoperative evaluation of the adult patient undergoing non-cardiac surgery: guidelines from the European Society of Anaesthesiology. *Eur J Anaesthesiol* 2011; 28:684 - 722.

16AP01-9

Interventions to improve the safety culture in an anaesthetic department

[Koers L.](#), [Metske H.](#), [Schlack W.](#), [Preckel B.](#)
Academic Medical Center, University of Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands

Background and Goal of Study: True patient safety can only be achieved in a healthcare culture that fully embraces patient safety. Currently there is little information about the safety culture within Dutch hospitals. We assessed the safety culture within our anaesthetic department to target the direction of cultural changes that might be needed to further improve patient safety.

Materials and Methods: The instrument used to evaluate the safety culture was developed by the Dutch Institute for healthcare research.¹ This instrument describes 8 dimensions that are important to manage safety: Priority

and responsibility of patient safety, incident reporting, resource allocation, communication, teamwork, personnel, competency and compliance. For every dimension there are 5 cultural levels of safety: pathological, reactive, calculative, proactive and generative. A Patient Safety Board was instituted to coordinate the improvement process. After the first assessment we targeted identified deficits. For example, we improved our difficult airway trolleys, incident reporting and we defined a fit-to-fly for personnel. Two years later we evaluated our safety culture again and aimed that 80% of staff would perceive at least a proactive safety culture.

Results and Discussion: Hundred and twelve members of staff completed the survey in 2014 and 151 in 2016. A proactive safety culture was perceived by 73% of staff in domain 1, 67% in domain 2, 60% in domain 3, 40% in domain 4, 50% in domain 5, 51% in domain 6, 23% in domain 7 and 46% in domain 8. For domains 4, 5, 7 and 8 the percentage of staff perceiving a proactive safety culture was the same as in 2014. For domain 1 and 3 there were a 6% and 4% increase respectively, and for domains 2 and 6 there were a 9% and 4% decrease respectively. These domains should be targeted for further interventions. The instrument used for this study is a quality assessment instrument and not a meter, therefore, the validity of this instrument cannot be expressed in a measure.

Conclusion(s): Performing an assessment of safety culture within a department can reveal and help target specific deficits within the culture of patient safety. It can also increase awareness of patient safety issues amongst staff. Despite our interventions we did not achieve a perceived proactive safety culture by 80% of staff.

References: V. Struben, C. Wagner, Ontwikkeling van een Instrument voor Zelf Evaluatie van de Patiëntveiligheidscultuur, NIVEL 2006

16AP01-10

The incidence of acute kidney injury (AKI) between sequential bilateral total knee arthroplasty (TKA) and staged bilateral TKA: a propensity score matched analysis

Kim K., Koh W.U., Kim H., Song J.G., Ro Y.J., Yang H.S.

Asan Medical Center, University of Ulsan College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Several studies support the economic and functional outcome advantage of sequential bilateral total knee arthroplasty (TKA). But sequential bilateral TKA is known to have greater risk of major complications and higher mortality compared with staged bilateral TKA. However, there was no previous study comparing the incidence of acute kidney injury (AKI) between two groups. The aim of this study was to assess the incidence of AKI in these two groups and further evaluate the major complication rate, intensive care unit stay (ICU) and 30 day mortality.

Materials and Methods: The study included a retrospective review of medical records of 1453 consecutive patients who underwent bilateral TKA between January 2008 and December 2014. The patients were divided into 3 groups according to the type of surgical technique: sequential bilateral TKA performed under single anesthesia; early staged bilateral TKA performed under 2 separate induction of anesthesia within 7 days after the first operation; staged bilateral TKA performed under 2 separate induction of anesthesia after 7 days and within 1 year. The incidence of AKI, major complications of \geq stage 3a according to the Clavien-Dindo classifications, incidence of ICU admission, major cardiovascular and cerebral events (MACE), and 1 year mortality were compared between the 3 groups. We performed a weighted propensity score analysis using the inverse probability of treatment weights and the population standardized bias was used to diagnose the balance after propensity analysis.

Results and Discussion: Of total 1453 patients, 820 patients underwent sequential bilateral TKA, 368 patients underwent early staged bilateral TKA and 265 patients underwent staged bilateral TKA. The incidence of AKI was 92 (11.2%), 9 (2.45%) and 16 (6.04%) in sequential, early staged and staged groups based on Kidney Disease Improving Global Outcomes criteria, respectively ($p < 0.001$). The incidence of ICU admission was 15 (1.83%), 4 (1.08%) and 6 (2.26%) in sequential, early staged and staged groups, respectively ($p = 0.029$).

Conclusion(s): In this study, we demonstrated that patients receiving sequential bilateral TKA operations were associated with a higher risk of AKI development and ICU admission compared with early staged or staged bilateral TKA.

16AP01-11

Post anesthesia care unit oxygen saturation as an anesthesiology department quality indicator

Weinstein J.¹, Orkin D.¹, Zimlichman E.², Berkenstadt H.¹

¹Sheba Medical Center, Dept of Anaesthesiology & Intensive Care, Ramat Gan, Israel, ²Sheba Medical Center, Patient Safety and Risk Management Unit, Ramat Gan, Israel

Background and Goal of Study: Oxygen desaturation is one of the commonest complications affecting patients during the immediate postoperative period, occurring in up to 19% of patients upon arrival to the PACU¹. Maintaining adequate saturation has been proven to improve surgical outcome in regards to immune defense, surgical site infection and postoperative nausea and vomiting².

In view of this, we decided to adopt oxygen saturation upon arrival to the PACU as a quality indicator in our department.

Materials and Methods: Data on oxygen saturation on arrival to the PACU of all patients were collected from the patients' electronic charts on a monthly basis, regardless of whether oxygen supplementation was used during the transfer from the OR.

Results and Discussion: During a 12 months' period data from 13552 patients were available (Table 1). Notably, only 2.5% of patients arriving at the PACU were found to have oxygen desaturation ($\text{SaO}_2 < 90\%$). Desaturation frequency was not consistent across all age groups, occurring more frequently in younger children (significant at $p < 0.05$).

Age	n Patients	SaO2 >97%	SaO2 93%-96%	SaO2 90%-92%	SaO2 <90%
< 1 year	169	108 63.9%	45 26.6%	6 3.6%	10 5.9%
1-3 years	460	276 60.0%	147 32.0%	20 4.3%	17 3.7%
4-8 years	454	301 66.3%	133 29.3%	12 2.6%	8 1.8%
9-18 years	818	611 74.7%	170 20.8%	18 2.2%	19 2.3%
> 19 years	11651	8379 71.9%	2574 22.1%	410 3.5%	288 2.5%
Total	13552	9675 71.4%	3069 22.6%	466 3.4%	342 2.5%

[Table 1]

Conclusion(s): The data shows the incidence of oxygen desaturation upon arrival to the PACU is significantly lower in our department compared to recent published data, suggesting adequate operating standards among our staff. Although recent studies have shown that supplementary oxygen during transfer to the PACU may be beneficial, in our department is not mandatory and is used only at the anesthesiologists' discretion, with no negative outcome on desaturation incidence. Our results suggesting higher incidence of desaturation among young children is consistent with recent studies. Notably, desaturation incidence is even more pronounced in the infant group.

References:

- Siddiqui N. *et al.* J Clin Anesth. **25**, 612-617 (2013).
- Kabon B. *et al.* Curr Opin Anaesthesiol. **19**, 11-18 (2006).

16AP02-1

A suspicion of past history of Kawasaki disease in an adult patient with acute myocardial ischemia

Hinokuchi M., Imabayashi T., Irie Y., Hagihara S., Matsunaga A., Kanmura Y.

Kagoshima University Hospital, Dept of Anaesthesiology & Intensive Care, Kagoshima, Japan

Background: Kawasaki disease is an acute febrile illness with unknown cause in childhood as reported in 1967. The number of patients is gradually increasing. Coronary aneurysm is the most important complication. Myocardial infarction occurs when the blood flow in the coronary artery aneurysm is reduced and a thrombus is formed.

Case report: A 58-year-old man had a history of rheumatoid arthritis. He got severe pain after exercise chest pain for several minutes from about two weeks ago. Suspected of acute myocardial infarction, emergency cardiac catheterization was performed. Percutaneous coronary balloon dilation surgery was performed for total occlusion of main stem in left coronary artery. Reflux flow was obtained, but the coronary artery in the obstruction was expanded, forming an aneurysm and a large amount of thrombus was con-

firmed. Calcification was found at the limbus of the knob in fluoroscopy, and it was suspected that the thrombus occlusion of coronary aneurysm due to Kawasaki disease. Since the coronary artery was also very large, it seemed difficult to place a stent. There was a lot of thrombus, a high risk of occlusion even if recirculation was obtained. Emergency coronary artery bypass surgery (4 place anastomosis) was performed using the thoracic artery and the gastroepiploic artery, after insertion of intra aortic balloon pumping.

Discussion: In adults with Kawasaki disease, the past history is often unclear, and no history was observed in this case. In the diagnosis of Kawasaki disease, about 18% patients are incomplete type. They are not mild patients, but are frequently associated with coronary aneurysms. The frequency of cardiac disorders such as coronary artery aneurysm is 2.8%. The past history of Kawasaki disease are 5% in adult patients with coronary artery aneurysm and the past history itself is being concerned as the risk of arteriosclerosis in young adults. In addition, giant coronary artery aneurysm may cause myocardial ischemia with or without stenosis.

Reference: Lori B et al: Prevalence of Kawasaki disease in young adults with suspected myocardial ischemia. *Circulation* 125: 2447-2453, 2012.

Learning Point: Note that some adult acute myocardial infarctions suspect Kawasaki disease.

16AP02-2

Can we predict the risk of pressure ulcers in patients in intensive care unit?

Gherghina V.¹, Cindea I.¹, Balcan A.¹, Popescu R.², Costea D.²

¹Faculty of Medicine, Ovidius University, Dept of Anaesthesiology & Intensive Care, Constanta, Romania, ²Faculty of Medicine, Ovidius University, Dept of Surgery, Constanta, Romania

Background and Goal of Study: Pressure ulcers are the third most expensive disorder after cancer and cardiovascular diseases. Although it is well known that pressure ulcers are associated with negative patient outcomes and increased hospital cost, there is little research related to pressure ulcers in an intensive care unit population.

Objectives: To determine the risk factors for pressure ulceration in an intensive care setting, to evaluate the Braden scale as a predictor of pressure ulcer risk in critically ill patients, and to determine whether pressure ulcers are likely to occur early in the hospital stay.

Materials and Methods: Patients were enrolled in the study within 24 h of admission to the intensive care unit; data were collected every other day until discharge from the intensive care unit. We collected data, using a form we developed that contained demographic and clinical factors found in previous research and in our clinical practice to be associated with pressure ulcers. The Braden scale was used to assess repeatedly 60 adult patients without pressure ulcers in a surgical intensive care unit, and the patients' skin was inspected routinely for pressure ulcers.

Results and Discussion: Twelve of 60 patients developed at least one pressure ulcer (incidence = 20.0%) after an average stay of 4.3 days. The Braden scale, which measures six characteristics of skin condition and patient status, proved to be a primary predictor of ulcer development. No ulcers developed in the 31 patients whose Braden score was 14 or higher. The likelihood of developing a pressure sore was predicted mathematically from the Braden score. A lower Braden Scale score, the presence of diabetes mellitus, being underweight, and patient age 70 years or older independently predicted the development of a pressure ulcer.

Conclusion(s): Findings from this study suggest that, in addition to a low Braden Scale score

(Braden scores B 13), age ≥ 65 years and a diagnosis of diabetes may represent clinically relevant pressure ulcer risk factors in the surgical intensive care population and that patients with these factors may benefit from more aggressive preventive care.

16AP02-3

Exercise induced anaphylaxis (EIA) and pregnancy

Hoskote H., Eradio Lopez Pradere A.

Luton and Dunstable Hospital, Dept of Anaesthesiology & Intensive Care, Luton, United Kingdom

Background: Exercise-induced anaphylaxis (EIA) is a rare disorder with a few well documented cases, often associated with some kind of food allergy^{1,2}. Anaphylaxis itself has a high incidence of cross reactivity to many drugs used in medicine, including some common Anaesthetic drugs.

We present and highlight the anaesthetic management of this rare disorder in a pregnant lady who had two deliveries at the Luton and Dunstable Maternity Unit.

Case report: A 36 yr old lady first noticed rashes and hives on her arm whilst dancing after a meal which resolved on topical application of ice. Over the following years, she reported further episodes of rashes, itching on her back and retro-auricular regions, more often during Zumba classes or following an intense period of physical activity at work. Some of these episodes resulted in frank anaphylaxis with tongue swelling and respiratory distress requiring hospital admissions to manage the anaphylaxis.

She has been tested negative to many common food allergens. However, she has been declared to potentially develop wheat-dependent exercise-induced anaphylaxis. She has been prescribed an epinephrine pen for use, as essential, with advice to avoid intensive physical activities. With this regime, she has been free of such anaphylactic reactions to exercise and has had two successful pregnancies.

Discussion: EIA is rare and can pose challenges during stressful situations such as pregnancy and labour. In the present case, both pregnancies were successfully managed with a planned pre-anaesthetic work-up for elective Caesarean section (CS). This reduced the stress of labour and a potential trigger to EIA. Pre-medication with anti-histaminics (chlorphenamine and ranitidine) and hydrocortisone reduced the chances of mast cell degranulation. Avoiding intrathecal opioids in regional anaesthesia for CS reduced histamine release. This ensured safe management of this obstetric case on both occasions.

Reference:

1. Sheffer AL, Austen KE. Exercise-induced anaphylaxis. *J Allergy Clin Immunol*. 1980 Aug;66(2):106-11.
2. Soyer OU, Sekerel BE. Food dependent exercise induced anaphylaxis or exercise induced anaphylaxis? *Allergol Immunopathol (Madr)*. 2008 Jul-Aug;36(4):242-3.

Learning points:

1. Awareness about EIA.
2. A pre-determined anaesthetic management plan for patients with known generalised allergic reactions to non-specific allergens would lead to a comfortable, stress free and successful outcome.

16AP02-4

Intraoperative hyperglycemia increases the risk of postoperative delirium in nondiabetic patients

Lachmann G., Wollersheim T., Kurpanik M., Kuenz S., Spies C.,

BIOCO Study Group

Charité - Universitätsmedizin Berlin, Dept of Anaesthesiology & Intensive Care, Berlin, Germany

Background and Goal of Study: Hyperglycemia *per se* is associated with increased morbidity and mortality (1). Some authors found that hyperglycemia during intensive care unit stay can lead to an increased rate of delirium (2). However, this is not prospectively investigated in patients after intraoperative hyperglycemia. Our hypothesis is that intraoperative hyperglycemia increases postoperative delirium rate.

Materials and Methods: We analyzed 49 patients of a prospective, ethically approved (EA2/092/14), observational study undergoing elective surgery of at least 60 min surgical time. These patients were planned to receive an arterial catheter perioperatively and therefore, blood glucose was measured during surgery every 20 min via arterial blood gas analyses. Glycemic variability was calculated by standard deviation. Delirium was detected up to postoperative day 7 via DSM-V and NuDesc. Statistical analyzes were performed using univariate, non-parametric analyses.

Results and Discussion: 13 out of 49 patients had diabetes mellitus in history. 15 out of 49 patients developed postoperative delirium, 3 of these patients had diabetes. Overall, no differences were seen for intraoperative glucose

maximum, mean, minimum and variability between delirious and non-delirious patients. However in nondiabetic patients, maximum intraoperative glucose levels were significant higher in patients who developed postoperative delirium ($p = 0.032$). Mean glucose levels showed tendencial higher values for delirious patients ($p = 0.067$) but were not significant within the preliminary results.

Conclusion(s): Increased intraoperative maximum and mean glucose levels are associated with postoperative delirium. It has to be investigated if increased glucose levels lead to neuroinflammation which in turn is a risk factor of postoperative delirium. Further studies are warranted to evaluate the benefit of intraoperative tight glycemic control on postoperative delirium.

References:

1. van den Berghe G et al. Intensive insulin therapy in critically ill patients. *The New England journal of medicine*. 2001;345(19):1359-67.
2. Heymann A et al. Hyperactive delirium and blood glucose control in critically ill patients. *J Int Med Res*. 2007;35(5):666-77.

Acknowledgements: The research leading to these results has received funding from the European Union Seventh Framework Programme [FP7/2007-2013] under grant agreement n° 602461. TW is participant in the BIH Charité Clinician Scientist Program.

16AP02-5

Risk Factors of postoperative shivering after oral-maxillofacial surgery

Tsukamoto M.¹, Hitosugi T.², Yokoyama T.²

¹Yushu University Hospital, Department of Dental Anesthesiology, Fukuoka, Japan, ²Yushu University, Department of Dental Anesthesiology, Faculty of Dental Science, Fukuoka, Japan

Background and Goal of Study: Postoperative shivering is relatively frequent complication of anesthesia. It is usually triggered by hypothermia after laparotomy. We had often experienced postoperative shivering in patients after osteotomy of maxilla and/or mandible for recent 7 years. Furthermore, it occurred even in normothermic patients during perioperative period. However, there are few reports about postoperative shivering after these surgery. In this study, we investigated the risk factors of postoperative shivering in oral-maxillofacial surgery retrospectively.

Materials and Methods: The study period was from April 2008 until September 2015. Anesthesia records of the patients who underwent osteotomy of maxilla and/or mandible were checked. The patients with preoperative fever (temperature $>38^{\circ}$), with thyroid disease and receiving medication with the potential to influence thermoregulation, were excluded. Patient's background (gender, age, height, weight), anesthesia time, operative time, fentanyl, remifentanyl, fluid volume, urine volume, blood loss volume, agents for anesthetic maintenance, rectal temperature at the end of surgery and type of surgery were recorded in addition to the occurrence of postoperative shivering. Statistical analysis was performed using Fisher's exact test, the χ^2 test and stepwise logistic regression to determine the risk factors of postoperative shivering.

Results and Discussion: In this study, 233 cases were investigated. 24 patients (11.5%) had postoperative shivering. The occurrence of postoperative shivering was correlated with blood loss volume (Shivering group: 633.9 ± 404.8 ml vs Non-shivering group: 367.0 ± 312.6 ml) ($p < 0.01$) and core temperature at the end of surgery (Shivering group: $37.2 \pm 0.6^{\circ}$ C vs Non-shivering group: $37.5 \pm 0.5^{\circ}$ C) ($p < 0.01$). Two variables were associated with postoperative shivering. Rectal temperature at the end of surgery was the highest risk factor (odds ratio = 2.560277; 95% CI = 1.236774-5.327362), and the second was blood loss volume (odds ratio = 0.997733; 95% CI = 0.999-0.998). In this study, mean rectal temperature was 37.2° C in patients with postoperative shivering, including 4 patients with rectal temperature more than 38.0° C. The thresholds of the thermoregulatory system might be increased by bleeding, hypovolemia and surgical stress during surgery.

Conclusion: We should pay attention to the postoperative shivering not only in patients with hypothermia but also in patients with much bleeding.

16AP02-6

Risks of accidental exposure to blood in Tunisian intensive care units

Nakhli M.S.¹, Kahloul M.¹, Kacem I.², Guedri S.², Mhamdi S.¹, Mrizak N.²

¹Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse, Tunisia, ²Farhat Hached Hospital, Department of Occupational Medicine, Sousse, Tunisia

Background and Goal of Study: The rapid turnover of staff members, and subsequently sometimes their lack of experience, emergency situations, and the wide diversity of care procedures performed are important factors contributing to the increased risk of occupational exposure to blood and body fluids in intensive care units.

The purpose of the study is to determine the prevalence and the characteristics of accidental exposure to blood in Tunisian intensive care units.

Materials and Methods: This is a retrospective study including all the cases of the accidental exposure to blood declared in the department of Occupational medicine of the teaching Hospital Farhat Hached of Sousse during the year of 2015.

Results and Discussion: Overall, 109 cases of accidental blood exposure were declared, of which 46 happened in the intensive care units (42.2%). The mean age of the study population was 34.4 ± 10.7 years with a sex ratio of 0.27. The victims were paramedicals in 43.4% of cases, doctors in 31.9% of cases and workers in 17.4% of cases. The vaccination against hepatitis B was complete and correctly done in 68% of the cases.

The accident was secondary to a needle stick in 84.8%. The wearing of gloves was noted in 32.6% of the cases. The serological status of the source patient was unknown in 86.9%. Serological surveillance was recommended for 18 patients and only 4 victims had performed surveillance.

The immediate management after the accidental blood exposure was consistent with universal recommendations in 43.4% of cases.

This compliance with the applicable universal recommendations was significantly higher for staff with less than 5 years' seniority ($p < 0.05$).

Conclusion(s): Education, training, the strict application of standard/universal procedures (protective gowns, gloves, masks, glasses, etc...), and also the implementation of local standardized procedures are of paramount importance.

16AP02-7

Spinal anesthesia in aortic valve regurgitation

Domi R., Abdyl A., Sula H., Jano A., Ohri I., Gani H.
Mother Theresa University Hospital of Tirana, Dept of Anaesthesiology & Intensive Care, Tirana, Albania

Background: Regional anesthesia in patients with valve diseases has always been a challenge for anesthesiologist because such patients always tend to develop several hemodynamic problems during the application of anesthesia. Many of these patients do not have any complaint at all and a diagnosis of valve disease is found during routine presurgical check-up for non-cardiac surgery.

Case report: A 65 years old male presented for a routine transurethral resection of prostate, being already catheterized. He complained a poor life quality because of his prostate, making the surgery inevitable. His medical history was uneventful, but preoperatively was diagnosed with moderate to severe aortic valve regurgitation with a regurgitation fraction of 60%. Both cardiovascular surgeons and urologists decided the patient undergoes first prostate surgery and in another period valve replacement. Invasive monitoring was applied. Spinal anesthesia was uneventful performed. Low dose adrenaline infusion helped us maintain stable hemodynamic avoiding bradycardia and increased systemic vascular resistance. Endocarditis prophylaxis was done. The surgery and postoperative period was uneventful.

Discussion: We maintained a high heart rate during anesthesia to shorten the systole, so reducing the regurgitation volume. Since these patients are sensitive to volume overload we must be very careful with fluid infusion and avoid dramatic changes in afterload and preload. The anesthesiologist must avoid bradycardia, increased afterload (hypertension), and volume overload. The use of small doses of ephedrine may be a choice however dobutamine, low dose adrenaline, and milrinone are all acceptable inotropic choices for continuous infusion.

References:

1. Sukernik MR, Martin DE. Anesthetic management for the surgical treatment of valvular heart diseases. In Hesley FA, Martin DE, Gravlee GP (eds): A practical approach to cardiac anesthesia, 4-th ed. Philadelphia, LWW, 2008: 316-347.
2. Freeman WK, Gibbons RJ. Perioperative Cardiovascular Assessment of Patients Undergoing Noncardiac Surgery. *Mayo Clin Proc.* 2009; 84(1): 79-90.
3. Scott IA, Shohag HA, Kam PC, Jelinek MV, Khadem GM. Preoperative cardiac evaluation and management of patients undergoing elective non-cardiac surgery. *Med J Aust* 2013; 199 (10): 667-673.

Learning Points:

1. Avoid hypertension
2. Avoid bradycardia
3. Avoid overfilling
4. Stable hemodynamic
5. Careful choice of anesthesia and proper pre operative evaluation

16AP02-8**Unilateral blurred vision following lumbar spine surgery**

Lee J.S., Ha D.H., Ban S.Y.

Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background: Visual loss is a disastrous complication after general anesthesia. During spine surgery, patients are placed in prone positions that are not physiologic and may lead to complication¹⁾. We present a case of unilateral acute angle-closure glaucoma(AACG) after lumbar spine surgery.

Case report: A 71-year-old woman presented for posterior lumbar interbody fusion L4-S1. She had no past medical history. Anesthesia was induced with propofol and maintained with desflurane and remifentanyl. Anesthesia lasted almost 3 hours. The patient was positioned prone on a Jackson frame table. The Gentle Touch® (foam head rest) supported the head.

On the first postoperative day (POD #1), the patient complained mild headache, and POD #2 she complained of swelling, blurred vision in her left eye. She was immediately examined by an ophthalmologist. She had 0.3 of visual acuity in her right eye but hand motion(HM) perception in her left eye. Portable slit lamp examination revealed lid edema, conjunctival hyperemia, circumcorneal injection. The iris showed fixed, mid-dilated pupils. Intraocular pressure (IOP) were 14.5 mmHg and 55 mmHg in the right and left eye, respectively. The ophthalmologist diagnosed AACG for left eye. Medical therapy was started. On POD #3 IOP was 9 mmHg(OD) and 12 mmHg(OS). On POD #4, Argon Laser Peripheral Iridoplasty(ALPI) for her left eye was done. IOP was 9 mmHg(OD) and 13 mmHg(OS). On POD #6, ALPI was expanded. IOP was 13 mmHg(OD) and 9 mmHg(OS). Her visual acuity of left eye recovered 0.15. On POD #10, the patient recovered normal vision and on POD #11 she was discharged.

Discussion: The balance between fluid production and drainage determines IOP²⁾. In AACG, the iris obstructs the trabecular meshwork in the angle of the eye. Risk factor for increased IOP include asian ethnicity, female gender, shallow anterior chamber, hypermetropia, increased lens thickness, small corneal diameter, and increased age. Our patient has a shallow anterior chamber therefore might have shifted the lens forward, resulting in increased IOP. AACG is amenable to treatment but can result in permanent vision loss if not recognized and treated in a timely manner.

References: 1. Effects of Positioning and General Anesthesia on IOP. *Anesthesiology*, V 95, p1351

Learning points: Even postoperatively, any patient who has a red eye and a subjective vision loss should be referred to an ophthalmologist as soon as possible. It can be an emergent situation.

16AP02-9**Radiation exposure affecting anaesthetic personnel during Endoscopic Retrograde Cholangiopancreatography (ERCP)**

Suton P, Vichitpaisal P

Siriraj Hospital, Mahidol University, Dept of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: Radiation now becomes a dreadful effect. The ray is inversely proportional to the distance between the origin and the target. During ERCP, all medical personnel particularly anaesthetists are rinsed by radiation since they have to monitor patients closely during the operation. As a result, we would like to know the radiation effect relating to the distance of x-ray source.

Materials and Methods: This study has been approved by Siriraj IRB (270/2558) and registered by ClinicalTrials.gov (NCT02985164). Inclusion criteria were the patients who underwent ERCP. A total of 222 cases was included without informed consent. A nurse performed venous cannulation on the right forearm and transfused with normal saline. Then the patients with standard monitoring was transferred to the theatre. The PDSa1 and PDSa2 were placed on the outside and inside of a lead shirt respectively. The shirt-covered box was close to an anaesthetic machine (96.5 cm from the tube). The PDSb1 and PDSb2 were placed on the outside and inside of the glass shield (204 cm from the tube) of control room respectively. Both position A and B were 160 cm. above the floor. Data were expressed as mean and standard deviation. Categorical data were compared by using Chi-square test; while, the recorded data using dependent t-test. A $p < 0.05$ was considered statistically significant difference at 95% confidence interval.

Results and Discussion: The amount of radiation recorded on the outside of the box and the glass shield was higher significantly than that of the inside. Though, the outer parts of these two points exposed to the ray differently; it was not statistically significant (Table1).

	Outside (x10-3 mSv)	Inside (x10-3 mSv)	% difference	P
Lead shirt-covered box	5.3±7.9	0.2±0.6	96.2	0.00
Lead glass shield	4.4±5.9	0.2±0.7	96.5	0.00

[The amount of radiation at the outside and inside]

This seemed to agree with Cecen GS, et al. who claimed that the radiation dose was decreased with distance from the tube. Moreover, the shirt apron and the glass shield were effective to block the emission 96.22% and 95.46% respectively. These numbers were higher than that claimed by Hyun SJ, et al. who cited that the radiation blocked by the aprons was only 37.1%. In his study, the surgeon might pretty close to the C-arm fluoroscopy.

Conclusion(s): An ERCP operating theatre was a place of radiation risk. The effective protection devices were highly recommended for all personnel with distance during the operative procedure.

References: 10³

16AP02-10**Ureteral double J stent: where did it go?**

Ferreira C., Rego S., Almeida V., Moinho N.

Coimbra Hospital and University Centre, Dept of Anaesthesiology, Coimbra, Portugal

Background: Urethral catheterization is one of the most common procedures when treating urological conditions and although it is considered a safe procedure, it is not without complications and in very rare cases potentially fatal. This case describes a rare complication of urethral double J stent migration to the inferior vena cava (IVC) in an asymptomatic patient.

Case report: Male Caucasian, 65 years old, ASA II with placement of a right urethral double J stent for urolithiasis. 4 months later the follow up abdominal CT incidentally showed the location of the proximal extremity of the urethral stent in IVC, with a trajectory along the right common iliac vein. The point of exit from the urethra occurred at the anatomical junction between the urethra and the iliac vessels and the distal extremity was clearly in the bladder.

Discussion and Learning points: Following multidisciplinary discussion between vascular and urological surgical teams this patient was immediately prepped for emergency surgery and the anaesthetic team was carefully briefed for the purpose of planning the best anaesthetic strategy considering

that the surgical procedure would initially involve a careful attempt at extraction of the urethral stent via bladder or ultimately involve open abdominal surgery if the extraction led to sudden catastrophic hemorrhagic venal rupture. All safety issues were taken into consideration and the patient underwent general anaesthesia for ureterorenoscopy for the removal of the urethral stent under fluoroscopic control. The careful extraction was uneventful. The patient was stable following surgery and the abdominal CT scan at 24 hours showed no surgical complication.

References:

1. Nature Reviews Urology 2015; 12(1):17-25;
2. Urology 2014; 84:36-41;
3. RadioGraphics 2002; 22: 1005-1022

16AP02-11

Central venous catheters and its complications among trainees in a tertiary university hospital ICU

Fariña González T.F, Maichle S., Sanchez Cesteros C., Velasco Lopez E., Alvarez González M., Sanchez García M. *Hospital Clinico San Carlos, Dept of Intensive Care, Madrid, Spain*

Background and Goal of Study: Complications concerning invasive procedures are common cause of patient morbimortality. Central venous catheters (CVC) are one of the most common techniques in Intensive Care. Experience, mechanical ventilation or night shifts were proposed as risk factors for CVC failure or complication. The aim of our study was to assess the complication rate and characteristics of them in our Unit.

Materials and Methods: Prospective, observational study conducted in a 40-bed ICU during a 3-month period. 15 residents (3 per year during 5 years) and the staff were asked to prospectively fill a survey every invasive procedure they had performed. The items collected were: year of residency, time (day or night), urgency, presence of invasive mechanical ventilation or hemodynamic instability. Also type of procedure, who started and who finally made, supervision, number of attempts and the complications that might have occurred. We classified operators in groups (R1-R3, R4-R5, and staff) and number of attempts (<3 and ≥3).

Results and Discussion: 100 CVC were performed: 17 during the night (0-9 hs). 72 were carried out, from the beginning, by young trainees (R1-R3), 24 by R4-R5 and only 4 by the staff. 33 were not supervised. Median of attempts was 1 (1-7). Complications occurred in 33 (33%). They were not associated with time of day ($p=0,41$) or supervision ($p=0,66$), but with ≥3 attempts ($p<0,001$). R1-R3 had more complication than others groups (38,9%) compared to the other groups, R4-R5 20,8% or staff 0% ($p=0,049$).

Complications were: arterial puncture (n 15), difficulty advancing the guide wire (n 18), hematoma (n 5), malposition (n 2). No pneumothorax was found. In 4 patients more than one complication occurred.

In an emergency situation (57%), the most chosen access was femoral vein (73%, $p=0,34$). Ventilation was not associated to complication ($p=0,64$) nor the site of catheterization (femoral, subclavian or yugular, $p=0,11$).

Conclusion(s): young trainees should be encouraged to try as many techniques as they can without worrying about the time of day or mechanical ventilation but a limit of 3 attempts is recommended to avoid complications. Although supervision had no statistic significance in this study, probably due to a small sample size, it is fundamental for education and patient safety.

References: 1. Roux D et al. Acquiring Procedural Skills in ICUs: A Prospective Multicenter Study. *Care Med* 2014; 42:886-895.

16AP02-12

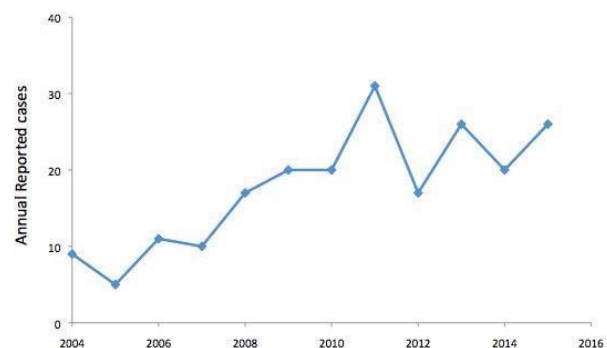
Guidewire retention: reported incidence, location and timing of error

Mariyaselvam M.¹, Walters H.², Callan C.², Mathew K.², Jackman S.², Young P.³

¹Cambridge University, Dept of Anaesthesiology & Intensive Care, Cambridge, United Kingdom, ²Cambridge University, School of Clinical Medicine, Cambridge, United Kingdom, ³Queen Elizabeth Hospital, Kings Lynn, Dept of Anaesthesiology & Intensive Care, Kings Lynn, United Kingdom

Background and Goal of Study: Guidewire retention has been reported at 1:3291 central venous catheter (CVC) insertions, resulting in avoidable harm (1). It is a never event in the UK thereby considered wholly preventable. Human factors interventions, and engineered solutions exist aiming to improve recognition during the procedure. We sought to determine the reported incidence, location and timing of recognition of guide wire retention.

Materials and Methods: With institutional IRB approval, NHS England provided confidential data of centrally reported guidewire events (2004-2015) from the National Reporting and Learning System (NRLS) for analysis. Data was sifted, anonymised and provided for classification by 2 independent investigators and adjudicated by a third investigator. Guidewire loss was categorised as recognised during the procedure, recognised on post-procedural X-ray, or missed on X-ray. Location of CVC insertion and annual reporting incidence was also determined.



[Annual Incidence of Guidewire Retention]

Results and Discussion: Guidewire retention was reported in the ICU (48%), the general ward (25%), the operating room (17%) and other (10%). There were 239 cases identified and 46 excluded for insufficient information reported. The increasing incidence of reported guidewire retention is shown in the figure. There were 25% recognised before the procedure conclusion, 23% were detected by the X-ray and 52% were undetected by both.

Conclusion(s): The majority of lost guidewires are forgotten and identified after conclusion of the procedure. For forgotten guidewires, interpretation of an X-ray has poor sensitivity, identifying less than a third of the remaining guidewire retentions. Efforts to avoid guidewire retention should be concentrated on prevention and recognition of forgotten guidewires prior to completion of the procedure when retrieval may be more easily immediately achievable, after this embolisation may occur over time.

References: 1. Vannucci A et al. Retained guidewires after intraoperative placement of CVCs. *Anesth Analg* 2012.

Acknowledgements: Helmi Burton-Papp and Quang Nguyen (both of University of Cambridge, School of Clinical Medicine) for contributions to the data analysis.

16AP03-1

Descriptive analysis of patient misidentification from incident report system data in academic centres

Abraham P.¹, Augey L.², Duclos A.³, Michel P.³, Piriou V.¹
¹Hospices Civils de Lyon, Dept of Anaesthesiology & Intensive Care, Lyon, France, ²Hospices Civils de Lyon, Haemovigilance Departement, Lyon, France, ³Hospices Civils de Lyon, Pôle Information Médicale Evaluation Recherche, Lyon, France

Background and Goal of Study: Patient misidentification continues to be an issue in our everyday practice and may be particularly harmful. Incident reporting systems are thought to be cornerstones to enhance patient safety by learning from failure and finding common root causes that can be corrected. Aim of the study was to describe patient misidentification incidents related to the perioperative care reported over four years.

Materials and Methods: We have conducted a multicentre retrospective analysis of incident report system data aiming at collecting and classifying all patient misidentification incidents during the perioperative care. We reviewed every report submitted by any health professionals from 2011 to 2014 at a large university hospital. Incident type, contributing or associated factors, error type and consequences for the patient and for the organisation were investigated for each incident report.

Results and Discussion: Among 293 reported incidents, missing wristbands (33.8%), wrong charts or note in file (20.1%), administrative issue (19.5%) and wrong labelling (14.5%) were the most frequent errors. Main contributing factors included the absence of patient identity control (30.5%), patient transfer (29.9%) and emergency condition (8.6%).

Data on patient and institutional consequence were scarce. Missing and wrong ID on wristbands events were rarely detected when patients were transferred from the admission ward to the operating room or the radiology department.

Conclusion(s): This retrospective analysis will help to focus our safety improvement strategy and action plan related to misidentification errors, in terms of administrative issues, and patient transfer process. Incident report system provides useful, yet heterogeneous, information on incident type, consequences or recovery functions.

References:

- Thomas MJW, Schultz TJ, Hannaford N, Runciman WB. Mapping the limits of safety reporting systems in health care--what lessons can we actually learn? *Med J Aust.* 2011 Jun 20;194(12):635-9.
- Makary MA, Daniel M. Medical error—the third leading cause of death in the US. *BMJ.* 2016 May 3;353:i2139.
- Michel P, Quenon JL, de Sarasqueta AM, Scemama O. Comparison of three methods for estimating rates of adverse events and rates of preventable adverse events in acute care hospitals. *BMJ.* 2004 Jan 24;328(7433):199.

16AP03-2

Institutional response to adverse events: review of critical incidents reported in Spanish critical incident reporting system (SENSOR)

Cabrerizo P.¹, De Miguel Á.², Gago S.², Hernández I.², Chamorro E.², Galve A.I.²
¹Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: An adverse event (AE) is a critical incident (CI) that harms the patient. Medium incidence in developed countries is known to be 9.2%. Two thirds are associated to surgical process, and more than 50% are avoidable.

AE are a consequence of a combination of factors with failures of system barriers. They are rarely medical malpractices. Institutional response is determinant for patient recovery and involved professionals psychological reestablishment (second victims). Not only it is expected that the institution repairs the harm, but also gives an open disclosure and support, assumes responsibility and works out on a learning process. The goal of the study was search AE reported in SENSOR database, and evaluate measures proposed, seeking after institutional response.

Material and Methods: Retrospective, observational study consisting of a search in SENSOR database using as keywords: death directly related to CI; death with contribution to the CI; regional anesthetic blockade in wrong body zone; surgery in wrong patient; surgery in wrong body zone/ right patient; and wrong surgery/right patient. From January 2009 to October 2016. We evaluated proposed measures involving institutional response and second victim support.

Results and Discussion: We found out 52 AE from 6205 reported CI. 33 of them resulted in death: 19 directly related to, and 14 with contribution to CI. 10 regional anesthetic blockade in wrong body zone, 3 surgery in wrong patient, 5 surgery in wrong body zone/right patient, 1 wrong surgery/right patient. We only found out an institutional response in 2 out of 52 AE: one clinical session to the implicated service, and one clinical session to several implicated services. There is no professional support as a second victim, even in the patient death cases.

Conclusion: We found a scarce institutional response to AE, even at patient death, and no professional support. In 2015 SENSOR published "Recommendations for institutional response to AE", in an attempt to guide institutions in the developing of these procedures. Ideally each institution should perform its own guide, adapting the recommendations to their local environment, and favoring a systematic approach to the AE.

16AP03-3

Manual editing and artefacts marking of vital signs in an anesthesia information management system: a retrospective study on 193,414 anesthesia records

Avidan A.¹, Weissman C.¹, Levin PD.²
¹Hadassah Hebrew University Medical Center, Dept of Anaesthesiology & Intensive Care, Jerusalem, Israel, ²Shaare Zedek Medical Center, Dept of Intensive Care, Jerusalem, Israel

Background and Goal of Study: Vital signs recorded automatically into anesthesia information management systems (AIMS) are more accurate than those in the classic paper based anesthesia records. Alternately, artefacts (e.g. tachycardia caused by interferences with electric cauterization, hypoxia due to a misplaced pulse oximeter probe) are frequent and also recorded by the AIMS installed in our institution (Metavision, iMDSof, Israel). The value of each vital sign recorded automatically can be changed or marked manually as an error. Alternatively, a nonspecific "Artefact Monitor" flag can be entered. The goal of this study was to assess the rate of vital signs changed or marked as error and the use of the nonspecific "Artefact Monitor" flag.

Vital Sign	Automatically Recorded	Changed		Marked Errors		Total Manual Changes	
		n	%	n	%	n	%
Heart Rate	18,998,098	19,026	0.1	24,473	0.1	43,499	0.23%
SpO2	18,407,827	14,800	0.1	20,571	0.1	35,371	0.19%
NIBP-Systolic	3,344,018	1,827	0.1	465	0.01	2,292	0.07%
NIBP-Mean	3,357,238	1,498	0.1	447	0.01	1,945	0.06%
NIBP-Diastolic	3,342,755	1,804	0.1	226	0.01	2,030	0.06%
IBP-Systolic	5,306,598	1,238	0.02	1,026	0.02	2,264	0.04%
IBP-Mean	5,425,001	1,193	0.02	1,914	0.04	3,107	0.06%
IBP-Diastolic	5,304,334	1,193	0.02	958	0.02	2,151	0.04%
Total	63,485,869	42,579	0.07%	50,080	0.08%	92,659	0.15%

Total number of case: 193,414	Cases with recordings		Cases with Changes		Cases with Marked Errors		Cases with manual changes	
	n	%	n	%	n	%	n	%
Heart Rate	191,288	98.9	5,112	2.7	8,337	4.4	13,449	7.0%
SpO2	190,840	98.7	4,715	2.5	8,949	4.7	13,664	7.2%
NIBP-Systolic	186,231	96.3	807	0.4	356	0.2	1,163	0.6%
NIBP-Mean	186,261	96.3	723	0.4	333	0.2	1,056	0.6%
NIBP-Diastolic	186,261	96.3	804	0.4	159	0.1	963	0.5%
IBP-Systolic	24,526	12.7	357	1.5	368	1.5	725	3.0%
IBP-Mean	23,869	12.3	335	1.4	538	2.3	873	3.7%
IBP-Diastolic	24,476	12.7	340	1.4	348	1.4	688	2.8%

Legend: NIBP: Non-invasive blood pressure, IBP: Invasive blood pressure

[Figure]

Materials and Methods: This study was approved by the Hadassah Institutional Review Board (IRB). Data (absolute numbers, number of changes, number marked as error) for vital signs (heart rate, SpO₂, non-invasive and invasive blood pressure) and number of artefact flags were retrieved from the AIMS for the period February 2007 to December 2016.

Results and Discussion: Data from 193,414 anesthesia records were analysed (Figure).

In 20,689 (10.7%) cases anesthesiologists made changes to vital signs or marked them as error. This was mostly done for heart rates and SpO₂ values. In 24,002 (12.4%) cases, 46,838 (mean 2.0±1.8) "Artefact Monitor" flags were used. In 151,901 (78.5%) cases no vital signs were changed or marked as error and no "Artefact Monitor" flags were used. Overall, very few vital signs were changed manually (0.15%).

Conclusion(s): Anesthesiologists rarely changed automatically collected vital signs data or marked them as errors. This may be related to the fact that changing the numeric value of a vital sign requires which requires several mouse clicks and may be too cumbersome. When changes are made, they were most frequent for heart rate and saturation.

16AP03-4

National safety reporting systems in anesthesia (SENSAR). Agreement in adverse events reporting by communicators and safety system evaluators. Part 2. Relationship with latent factors, incident type, and severity

Errando C.L., Alós L., Catalá J.C., Hernández J., Pallardó M.A., Muñoz L.

Consorcio Hospital General Universitario de Valencia, Dept of Anaesthesiology & Intensive Care, Valencia, Spain

Background and Goal of the Study: In Spain through a national incident reporting system, professionals communicate adverse events (AE), and local experts analyze the cases. Agreement (AG) between communicators/analyzers in qualification of the events, have never been evaluated. Primary objective: AG communicators/analyzers in qualifying active errors reported. Secondary objectives: AG depending on latent factors, type of communication, subtype of incident and severity.

Materials and Methods: AE reported online, may 2013-july 2016. Active error was the main qualifier (8 items). Latent factors (6), type of incident, type of communication were considered. A composite index of the 6 latent factors was quantified (agreement >5/6 coincidence). Global trigger tool (GTT) to evaluate severity (E, contributes to temporary harm requiring intervention; F, contributes to temporary harm needing hospital admission; G, contributes to permanent harm; H, an intervention is needed to sustain life; I, patient death). **Statistics:** Data as frequency (%), z-test to compare proportions, signification at $p < 0.05$.

Results and discussion. 168 incident reports analyzed. Latent factors: AG was high in the case of no active errors vs misleading due to unsafe practice happened (91.9% vs 68.4%, $p < 0.05$); AG in task-related factors if no errors occurred was higher than if misleadings due to unsafe practices, and lack of knowledge were reported (80.6% vs 52.6% and 44.4%, $p < 0.05$); AG by factors of individuals were higher if no active errors vs lapses due to lack of attention, misleadings due to unsafe practices, and to lack of knowledge (91.2% vs 20%, 44.4%, and 44.4%). No differences in agreement/disagreement regarding team-, place of work-, and organization-latent factors. Composite index: AG was low (66% to 42%, $p = ns$).

By latent factors, only task related factors showed differences, communication factors showing the lower AG vs organization, infrastructure, equipment and clinical factors (16.7% vs 70%, 90%, 68.6% and 71.4%, $p < 0.05$).

AG was low when active errors were classified for severity by GTT (range 66% to 33%, $p = ns$). The proportion of errors producing temporal harm needing hospital admission (F) due to lapses because of slips was 7 times higher than active errors causing no harm.

Conclusion: There is low AG between communicators and analyzers. Perhaps lack of a safety culture environment is one of the main causes. There is no AG in the evaluation of errors causing harm.

16AP03-5

Seven years of critical incidents in critical care units: data from the national base

Palencia M., Galve A.L., Cabrerizo P., Portas M., Lema M., Fernandez Quero L.

Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Critical Care Units constitute areas especially vulnerable to the emergence of critical incidents (CI). In its genesis contribute multiple factors such as the patient pathology, communication barriers, the realization of a large number of activities per patient and day, the practice of diagnostic procedures and invasive treatments and the amount and complexity of information received. According to the various series described in the literature, the likelihood of an CI is increased between 8% and 26% per day of stay, and the vast majority of incidents are preventable. The objective of this study is to perform a review of all the CI occurred in units of resuscitation and declared in SENSAR Database.

Material and methods: Review of all CI reported in SENSAR January 2009 until November 2016.

Results: In this period were declared a total of 6205 CI, of which 155 incidents had occurred in a Critical Care Unit, which constitutes 2.4% of the total. 51 (32.9%) of them correspond to incidents of medication, 38 (24.5%) are clinicians, 19 (12.2%) to communication errors and 17 (10.9%) to equipment. With regard to morbidity we found that 91 (58.7%) no caused harm, 23 (14.8%) were less morbidity, 24 (15.4%) intermediate morbidity and 14 (9%) morbidity were greater. There were two (1%) cases of death with contribution of the incident. There was no death declared directly related to the incident.

Discussion: Emphasizes the low rate of declaration of CI in Critical Care Units. Due to the characteristics of the online SENSAR database it is not possible to find out how many of the hospitals have registered with these units among its facilities, the number of beds available, the type of patients that attend or the days of average stay, which undoubtedly affects the statistics. Despite its limitations, has proved to be a tool that works and that is in progressive expansion, it is imperative to implement measures to enhance its use and the expansion of the modern culture of security in this environment are especially vulnerable, such as protocols for handover, safety courses multidisciplinary, simulation, sessions of service, talks of learning (debriefing) or training in crisis resolution and non-technical skills.

16AP03-6

Spanish critical incidents in paediatric anaesthesia: seven year data from the national base

Romera A.¹, Chamorro E.¹, Gago S.¹, De Miguel Á.², Galve A.I.¹, López-Gil M.T.¹

¹Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Gregorio Marañón General Hospital, Dept of Anaesthesiology & Pain Medicine, Madrid, Spain

Background and Goal of Study: This study reports the Spanish experience in critical incidents (CI) observed in paediatric anaesthesia.

Materials and Methods: We reviewed all CI declared from January 2009 to October 2016.

Results and Discussion: 180 CI in children up to 16 years old were reported in our national online database (3% of the total amount). 33% (59) of these paediatric CI took place in children under the age of 2, and 21% (39) in ASA III or IV. We found that most CI (100; 53%) were equipment failure related, 17% (33) were clinical incidents and in third place (27 CI; 14%) we found medication errors. 42 (23%) resulted in consequences for the patient: 2% (4) accounted for major morbidity, 9% (16) for medium morbidity and 12% (21) for low morbidity. For the first time since the database was created, one preventable paediatric dead was reported. Corrective measures were adopted in 83 cases (46%).

The incidence of paediatric reporting in our database is similar to the one found in other international studies. In those, however, most of the CI are clinical and airway related. As our results also confirm, infants below one year of age have a higher risk of having a critical incident, reported to be 2.5 times that of older children.

Out of the 90 hospitals enrolled in the Anaesthesia and Intensive Care National Incident Reporting System (SENSAR), only 28 (<30%) declare paediatric CI.

Due to the database's characteristics and limitations, neither the age of the patients admitted in each center, nor the medical care provided (emergency, ambulatory or elective surgery) can be figured out. Therefore, important information is missing to take further conclusions. The growing major morbidity data make determining the key factors which influence this low paediatric declaration rate -compared to the adult one -, increasingly imperative, not only to enhance the capabilities of the national reporting system, but also to provide the corrective measures that this vulnerable patient population needs. Not all tertiary referral paediatric hospitals in Spain has joined SENSAR, which undoubtedly affects statistics.

Conclusion: Improving safety culture involves assessing and spreading it throughout the system. Although the online national database we currently use has proved to be a useful tool in expansion, further adjustments should be made in order to encourage paediatric anaesthetists to take part and to help safety professionals in their analytic process.

16AP03-7

Critical incident in the operating theater: what implication for anaesthesia? An analysis of 155 closed claims (SHAM insurance)

Thiessen A.¹, Fuz F.², Guerin J.-P.¹, Rouquette-Vincenti I.¹, Piriou V.³, de Saint Maurice G.⁴, CAMR (Risk Analysis and Control Committee) of the French Society of Anaesthesia and Intensive Care

¹Princess Grace Hospital, Dept of Anaesthesiology & Intensive Care, Monaco, Monaco, ²SHAM Insurance, International Risk Management, Lyon, France, ³Hospices Civils de Lyon, Centre Hospitalier Universitaire, Dept of Anaesthesiology & Intensive Care, Lyon, France, ⁴Val-de-Grâce Military Teaching Hospital, Dept of Anaesthesiology & Intensive Care, Paris, France

Background and Goal of Study: One in 10 hospital inpatients are likely to suffer from an error during their hospital stay. More than sixty percent of critical incidents (CI) relate to surgery. In two-thirds of cases, CI is directly due to a team communication failure. SHAM insurance is the biggest French provider of medical liability insurance (50 % of the market), insuring 80 % of public and 27% of private hospitals.

Materials and Methods: We performed a retrospective study of the closed claims regarding a CI which occurred in the operating theatre (or immediately after) before 2010 and settled in a court. Claims due to obstetrics or nosocomial infection were excluded. The primary aim of our study was to investigate for the CI if anaesthesia was involved. The secondary aim was to describe the contributing factors of the events (individual factors, communication failure, factors related to the patient ...).

Results and Discussion: The main specialities concerned were orthopaedic surgery (36%), visceral surgery (17%) and gynaecology (12%). Consequences were simple (n=36), severe (106) or death (13). Anaesthesia was involved in 13 cases : wrong intraoperative positioning (n=3), dental injuries (2), post-operative surveillance failure and non-admission to intensive care (2), absence of preoperative visit, wrong evaluation during preoperative consultation, lack of anaesthesia information, medication error, nerve damage after spinal anaesthesia, team medical error. Surgery remains involved mainly for technical errors (70), lack of information (21), post-operative care or retained foreign objects. The contributory factor of the event is mainly a cognitive factor (27%), a lack of vigilance (15%) or surveillance failure (11%). In 22% of the cases, there is a team communication failure.

Conclusion(s): Anaesthesia is rarely involved in the foreground of the CI. The closed claims analysis finds a team communication failure. The human factors (individual or related to the team) are almost always at the origin of these claims.

The understanding of the reported claims of this study should help strengthen the quality approach, the simulation program and Team Improvement Programs recently recommended by the HAS (French National Authority for Health).

16AP03-8

Multicenter audit of Perioperative and Anesthetic Adverse events in Thailand (PAAad Thai): mortality and critical incidents

Charuluxananan S.¹, Sriraj W.², Punjasawadwong Y.³, Pitimana-aree S.⁴, Lekprasert V.⁵, Werawatganon T.¹, PAAad Thai Study Group

¹Chulalongkorn University, Dept of Anaesthesiology, Bangkok, Thailand, ²Khon Kaen University, Dept of Anaesthesiology, Khon Kaen, Thailand, ³Chiang Mai University, Dept of Anaesthesiology, Chiang Mai, Thailand, ⁴Siriraj Hospital, Mahidol University, Dept of Anaesthesiology, Bangkok, Thailand, ⁵Ramathibodi Hospital, Mahidol University, Dept of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: The Royal College of Anesthesiologists of Thailand initiated a registry study of anesthesia and adverse outcomes in Thailand since 2005. In 2015, the Perianesthetic Anesthetic Adverse Events Study in Thailand (PAAad Thai) was conducted to investigate patients, surgical, anesthetic profiles and to determine suggested strategies for prevention of adverse events.

Materials and Methods: A prospective descriptive study was conducted in 22 hospitals across Thailand. Each hospital was invited to report, on an anonymous and voluntary basis, any perianesthetic adverse incident and monthly statistics of main anesthetics performed between January 1, and December 31, 2015. A standardized incident report form was required to be completed. Reports were analyzed by 3 senior anesthesiologists. Descriptive statistics was used.

Results and Discussion: Among 333,219 cases, 2,206 incident reports with 3,028 critical incidents were reported. The incidents commonly occurred in male (52.0%), age under 10 y (13.0%), age more than 70 y (18.2%). The incidence of common adverse events were cardiac arrest within 24 h (15.5:10000), death (13.0:10000), oxygen desaturation (13.9:10000), reintubation (11.1:10000), early and late esophageal intubation (8.5:10000), difficult intubation (8.0:10000), severe cardiac arrhythmia (14.0:10000), drug error (3.2:10000), etc. Surgical specialties that posed high risk of incident were general, cardiothoracic, neurological and otorhinolaryngological surgery. Common locations that incidents occurred were operating room, recovery room.

Conclusion(s): Cardiac arrest within 24 h decreased by half within a decade. Common factors related to incidents were inexperience, emergency, inadequate preanesthetic evaluation, inappropriate decision, lack of vigilance and experienced assistant. Suggested corrective strategies were guidelines, quality assurance activity, additional training, improvement of supervision and communication.

16AP03-9

Perioperative anesthesia related mortality: a retrospective cohort study with 11.562 anesthetics procedures

Stefani L.C.¹, Guollo F.², Backof A.², Borges R.M.J.¹, Felix E.A.¹

¹Universidade Federal do Rio Grande do Sul, Dept of Anaesthesiology, Porto Alegre, Brazil, ²Hospital de Clinicas de Porto Alegre, Dept of Anaesthesiology, Porto Alegre, Brazil

Background and Goal of Study: Anesthesia-related perioperative deaths are rare and have been declining over the past 50 years. However there are a small number of patients at high-risk for complications and death that would benefit with a new approach. We intend to evaluate the incidence, preoperative risks factors, and classify the cause of perioperative deaths up to 30 days of procedures requiring anesthesia.

Materials and Methods: A retrospective cohort study was performed at an university Hospital in south Brazil evaluating the data of surgical patients between January 2012 and December 2013. Details were ascertained from the Information Management System studying those inpatients that died post-surgery. Deaths were reviewed and classified by three Anesthesiologists (according to ANZCA Classification) into three major groups: Attributable to Anesthesia, Not Related to Anesthesia, and Unassessable Death.

Results and Discussion: A total of 11562 surgeries were performed resulting in 321 (2,77%) 30-day perioperative death. Most deaths occurred after 48 hours (76,6%), in patients ASA physical state 3 or higher (86,9%), submitted to major (59,2%), urgent (54,4%) surgeries, in which a small death percentage

was attributable to anesthesia (0,6%) or had apparent anesthesia contribution (3,8%). Most of the deaths were classified as inevitable and have occurred irrespective of anesthesia or surgical procedures (50%). Surgical contribution was pointed in 25,3% of the cases, and 16,3% were considered incidental death, not related to the indication for surgery neither to factors under the control of the anesthetist or surgeon. The only death attributable to anesthesia was due to pulmonary aspiration, and those with possible anesthesia contribution (n=12) were related to inappropriate adverse event management. Sepsis was the most common death case (45,3%) followed by advanced cancer (20,6%). The most frequent procedure was exploratory laparotomy (21,8%).

Conclusion(s): The qualitative analysis of perioperative deaths contributes to recognition of assistance failures and to prioritize the most problematic areas that should be improved. Our study confirmed that death attributable to anesthesia is a rare event, therefore it signalizes the urgency to advance in perioperative care of patients scheduled to exploratory laparotomies, specially those associated to sepsis.

Reference: www.anzca.edu.au/documents/soa-mortality-report_p4.pdf

16AP03-10

What do we know about postoperative delirium (POD)?

Preliminary results of a national survey

Susano M.J.¹, Vasconcelos L.¹, Lemos T.¹, Amorim P.¹, Abelha F.²

¹Centro Hospitalar do Porto, Dept of Anaesthesiology & Intensive Care, Porto, Portugal, ²Centro Hospitalar São João, Dept of Anaesthesiology, Porto, Portugal

Background and Goal of Study: POD is the most common postoperative morbidity in elderlies and carries substantial clinical and socio-economical consequences. It is highly under-diagnosed, mainly due to lack of awareness. The aim of the study was to assess anaesthesiologists' perspectives and management of POD.

Materials and Methods: After IRB approval, an online questionnaire based on a survey (1) was sent to anaesthesiologists working in Portugal and asked to anonymously participate. It was divided in 3 sections: demographics; questions regarding knowledge, subjective preferences and practices; and management of clinical cases. Answers were presented as a Likert scale from 1-5 (disagree completely to agree completely), or as yes/no/don't know. Descriptive statistical analysis was conducted to report results.

Results and Discussion: Response rate was around 15%(193); 66% female, 29% residents, 87% from teaching hospitals. If the anaesthesiologists were to be submitted to a general anaesthesia, most would be concerned about neurocognitive side effects (4- 29%, 5- 28%) and 75% would want the depth of anaesthesia (DA) to be monitored. Majority states the risk for neurocognitive side effects should be considered when choosing type of anaesthesia (4-34%, 5-53%) and pre-operative neurocognitive function should be routinely assessed (4-44%, 5-33%). Considered major risk factors were: age, major surgery, alcoholism and previous stroke. Almost 96% of respondents have processed-EEG monitors in their hospitals and 50% always uses them. In fact, about 70% of anaesthesiologists believe that DA should be monitored in all patients. Almost 60% recalled an episode of POD in the last year. When managing a case of an agitated and confused patient, 64% would first administer an analgesic and only 10% an anxiolytic (40% would choose a benzodiazepine). Most hospitals don't have protocols to evaluate POD in PACU (56%) or surgical wards (61%). Around 97% of respondents believe that POD is a neglected field in anaesthesiology. Limitations: low response rate, sampling and recall bias.

Conclusions: Overall, anaesthesiologists are aware of the importance, risk factors and management for POD. Intraoperative monitoring of DA is recommended to lower the incidence of POD; although it is widely used there is room for improvement. Protocols for preoperative cognition evaluation and POD diagnosis and treatment should be sought.

References: 1. Ann Med Surg 2014 (3):100-7

16AP03-11

OS-MRS for prediction of complications in patients submitted to laparoscopic gastric bypass in a Portuguese tertiary Centre - Is there a relationship?

Ramos P.¹, Pereira C.¹, Miguel D.¹, Aguiar J.¹, Oliveira J.², Ferreira C.³

¹Centro Hospitalar do Porto, EPE., Dept of Anaesthesiology & Intensive Care, Porto, Portugal, ²Centre for the Study of Education, Technologies and Health, Polytechnic Institute of Viseu, Portugal, ³Hospital Geral de Santo António - Centro Hospitalar do Porto, Dept of Anaesthesiology & Intensive Care, Porto, Portugal

Background and Goal of Study: Patient risk stratification plays a central role in daily practice of anaesthesiologists. Obesity Surgery Mortality Risk Score (OS-MRS) was developed and validated to predict mortality at 90 days for patients submitted to bariatric surgery. The aim of our study was to evaluate if OS-MRS is a good score to predict complications following bariatric surgery in a tertiary hospital.

Materials and Methods: After approval by the institutional review board, clinical records of 450 patients submitted to gastric bypass surgery were audited between January 2010 and August 2016. Clinical and demographic data, such as age, gender, comorbidities, ASA Classification, Body Mass Index (BMI), OS-MRS score, duration of surgery and hospital length of stay were collected. Patients were divided into the three classes of OS-MRS score according to the presence of five clinical characteristics (BMI>50, male, arterial hypertension, pulmonary embolism risk factors and age >45 years old).

Class A - OS-MRS=0-1;

Class B - OS-MRS=2-3;

Class C - OS-MRS=4-5.

Complications observed were divided into surgical, cardiovascular, respiratory, thromboembolic, hospital readmission, re-intervention, intensive care admission and death and classified according to Clavien-Dindo Classification. The relationship between OS-MRS classes and complications until 90 days after surgery was analysed using the Chi-Square test. Statistical analysis performed using SPSS® version 23. Statistical significance with p<0,05.

Results and Discussion: A total of 450 (81,1% female) patients were included. Average age was 44,4 years old (±10,7). ASA 2 - 23%; ASA 3 - 76%; ASA 4 - 1%. Average BMI was 43,7 Kg/m² (±5,7) and duration of surgery 123,7 minutes (±43,7). Hospital length of stay was 3,9 days (± 5,7).

A total of 190 (42%) patients were classified as OS-MRS Class A, 210 (46,7%) class B and 50 (11,1%) Class C.

A total of 9,9% of complications (n= 42), classified as I (0,9%), II (3,3%), IIIa (0,9%), IIIb (2,7%), IVa (0,2%), IVb (1,1%).

No relationship observed between classes of OS-MRS and the development of complications (p=0,942).

Conclusion(s): In patients submitted to laparoscopic gastric bypass surgery in a Portuguese tertiary hospital, the OS-MRS could not predict the occurrence of complications until 90 days after the procedure. Despite of the low number of patients in our study, these results are comparable to previous studies in the literature with larger samples.

16AP04-1

Satisfaction of the patients after the implementation of the ERAS protocol in the Guadalajara University Hospital (Spain)

Cabellos Olivares M.¹, Labalde Martínez M.², Martínez-Meco Ortiz L.M.¹, Atance Martínez J.C.³, Rodríguez Fraile J.R.^{1,4}, Ramia Ángel J.M.²

¹Guadalajara University Hospital, Dept of Anaesthesiology, Guadalajara, Spain, ²Guadalajara University Hospital, Dept of Surgery, Guadalajara, Spain, ³Guadalajara University Hospital, Research and Development Department, Guadalajara, Spain, ⁴Alcala de Henares, Dept of Anaesthesiology, Guadalajara, Spain

Background: Enhanced recovery after surgery (ERAS) program has been widely adopted in colorectal surgery bringing short-term patient benefit. It has proven to reduce complication rate and length of hospital stay. But few studies analyze the degree of satisfaction of these patients. The aim of this study

was to know the satisfaction of the patients after the implementation of the ERAS protocol in the Guadalajara University Hospital. It is based in the RICA (enhanced recovery for abdominal surgery) program published in 2014 by the Ministry of health, social services and equality of Spain.

Material and methods: This is an observational cohort study. The inclusion criteria are: elective colorectal surgery, over 18 years of age, appropriate cognitive state and ASA (American Society of Anaesthesiology) I-II-III. The exclusion criteria are: urgent surgery and existence of higher concomitant surgical processes.

From May to November of 2016 we have collected 86 patients. After the patients' discharge from the hospital, a telephone survey was carried out based on the model published in the RICA guide.

This survey is divided into several sections:

1. degree of patient information prior to surgery;
2. Treatment received by patients by health personnel;
3. Postoperative pain according to EVA (Analogue visual scale);
4. nausea or vomiting after surgery;
5. Assessment of the information given by the health staff when they leave the hospital;
6. Assesses the competence and coordination of health personnel;
7. Degree of satisfaction with the RICA guide;
8. Asked if they would return to operate with this protocol and if they would recommend it to a friend.

Results: The median age of our patients was 68 years (range 59-80 years). Of these, 52 (60.5 %) were men and 34 (39.5 %) were women. 90% of the patients defined as very good or good the treatment received by the hospital staff. 95% of our patients are considered very satisfied with the assistance provided, and would undergo surgery following the same protocol and recommend it to a family member. No patient is dissatisfied with the care provided. The satisfaction was significantly greater in absence of postoperative morbidity (56 vs 30 $p=0.04$).

Conclusion: Few studies have performed a patient satisfaction study after the implementation of the ERAS protocol and this is very necessary to evaluate how we work. Further studies with sufficient statistical power are required to examine this question.

16AP04-2

Screening future employees for emotional intelligence as a crucial step towards improved perioperative efficiency and patient safety

Luedi M.M., Stueber F.

Bern University Hospital Inselspital, University of Bern, Dept of Anaesthesiology, Bern, Switzerland

Background and Goal of Study: As Goleman established, "IQ and technical skills are important, but emotional intelligence (EI) is the sine qua non of leadership". Widely accepted in management sciences for over a decade, the value of employees' is only just about to be recognized in anaesthesiology. When aiming for both increasing patient safety and efficiency, selecting the right team members might be the most important task of leadership in anaesthesiology.^{1,2}

We aimed to develop a questionnaire for potential future nurses, residents and attending physicians in anaesthesiology to support leadership's decision making in job interviews.

Materials and Methods: Based on the five dimensions of EI self-awareness, self-regulation, motivation, empathy and social skills as established by Goleman³, we defined interview questions addressing respective hallmarks of these personality traits specifically respecting perioperative settings and team dimensions.

Results and Discussion: All five dimensions of EI can be specifically adapted to perioperative teams and settings. Self-confidence and realistic self-assessment tailored to clinical routine and emergencies can shed light on a candidate's self-awareness as openness to change and comfort with ambiguity with to clinical routine and emergencies can show a future perioperative specialist's potential in self-regulation. Specific questions considering hallmarks of motivation, empathy and social skills in both perioperative routine and emergencies complete the picture.

Conclusion: Irrespective whether emotional intelligence is a genetically inherited trait or learned behavior,² it might be the most essential dimension for perioperative efficiency and patient safety beyond any checklist and guideline. We provide a questionnaire for HR specialists in perioperative medicine to specifically screen potential employees for this crucial dimension.

References:

1. Luedi MM, Boggs SD, Doll D, Stueber F. On patient safety, teams and psychologically disturbed pilots. *European Journal of Anaesthesiology*. 2016 Mar;33:226-227.
2. Luedi MM, Doll D, Boggs SD, Stueber F. Successful Personalities in Anaesthesiology and Acute Care Medicine: Are We Selecting, Training, and Supporting the Best? *Anesthesia and Analgesia*. 2016 Nov 17. [Epub ahead of print]
3. Goleman D. What makes a leader? *Harvard Business Review*. 2004;82, 82-91.

16AP04-3

Surgical Apgar score - an underrated key-tool to enhance post-surgical care?

Fonseca R., Bento S., Gonçalves D., Valente E.

Centro Hospitalar de Leiria, Dept of Anaesthesiology, Leiria, Portugal

Background and Goal of Study: The SAS is wholly part of surgical safety monitoring programmes and is derived from calculating 3 intraoperative variables: estimated blood loss (EBL), low heart rate (L-HR) and low mean arterial pressure (L-MAP).

Evidence shows its superiority in stratifying surgical risk, as well as its possible use in predicting postoperative morbidity after major abdominal surgery. Gastric malignancies are highly prevalent. Although gastrectomy followed by lymphadenectomy imposes significant post-operative morbidity, it still the chosen treatment.

The aim of this study is to assess the post-operative morbidity and mortality predictive value of the SAS in total and subtotal gastrectomies.

Materials and Methods: Retrospective study based on the review of sociodemographical and clinical data relating to total or subtotal gastrectomies due to oncological pathology occurring between January 2014 and June 2016 in our hospital. 94 procedures were analysed.

The following groups of variables were considered:

- i) preoperative (gender; age; ASA classification, Body Mass Index (BMI); the TNM stage of neoplasia);
- ii) intraoperative (type of surgery, duration, SAS, L-HR; EBL; L-MAP);
- iii) postoperative (duration of hospitalisation; occurrence and characterisation of morbidity and mortality).

Patients were categorised according to their functional stage (ASA) and SAS. Statistical analysis was carried out using standardized significance and confidence levels.

Results and Discussion: 58 partial and 34 total gastrectomies were analysed, achieving a mean SAS of 7.8 (± 1.49) and a mean duration of 186 minutes (± 73.43). Low SAS were significantly associated with postoperative complications and longer hospitalisations ($p < 0.05$).

Among the 55.3 % of patients who developed complications, more precarious prior functional stages and lower mean SAS ($p < 0.05$) were observed ($p < 0.05$). There was no statistically significant association between SAS and early or late postoperative mortality ($p > 0.05$).

Monitoring of the SAS can be a valuable tool in predicting postoperative morbidity, providing an early indication of the need for further care.

Proper recording of morbidity indicators may lead to a continuous improvement of practices and optimisation of clinical decisions.

Conclusion(s): The present study stresses the potential role of SAS, complemented with rigorous stratification of patients, in preemptive planning of care in order to mitigate post-surgical morbidity.

16AP04-4

Theatre safety culture and perioperative staff feedback

Hill M.¹, Patmore C.², Olley L.²

¹Plymouth Hospitals NHS Trust, Dept of Anaesthesiology, Plymouth, United Kingdom, ²Peninsula University Plymouth School of Medicine and Dentistry, University, Plymouth, United Kingdom

Background: Feedback of team performance and patient outcomes are important drivers in the delivery of high quality care and for staff engagement. The ability to pause and reflect upon what a team does well, and the opportu-

nities are to improve, are crucial in understanding and facilitating good team work to drive habitual excellence¹.

Methods: We measured the safety culture in a theatre using the SCORE safety culture questionnaire². The Leadership domain questions identified that staff felt that they did not get adequate feedback. Questionnaires and facilitated discussions with the staff were used to understand which aspects of team performance, patient outcomes and patient experience they would like and how often and how frequently they would like to receive it.

Results: SCORE safety culture survey

426/926 (46%) theatre staff completed the SCORE survey in over 30 theatres. The Leadership domain results were:

In this work setting local leadership.....

1. Is available at predictable times 50%
2. Regularly makes time to feedback to me about how I am doing 32%
3. Regularly makes time to pause and reflect with me about my work 28%
4. Provides frequent feedback about me performance 30%
5. Provides useful feedback about my performance 34%
6. Provides meaningful feedback about my performance 32%
7. Communicates their expectations to me about my performance 38%

In our feedback pilot theatre we received 11/18 (61%) completed responses from the theatre staff (surgeons, scrub staff and anaesthetists). Initial results have shown:

- 100% of staff believe feedback would influence their practice,
- 60% of staff would like more feedback on patient outcomes of which all would like feedback about patient experience
- 70% on team performance

Conclusion: There is a complex interrelationship between improved safety culture and better staff and patient outcomes. Staff currently do not receive feedback but wish to have more feedback and believe that this would improve the safety culture in theatres. Further work is required to optimise the feedback and its delivery to theatre staff. After developing a feedback system we aim to spread it through the 30+ theatres.

References:

1. Doyle C, Lennox L, Bell D. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. *BMJ Open* 2013;3:e001570.
2. Safe and Reliable Healthcare. SCORE Survey.: www.safeandreliablecare.com

16AP04-5

Who's who in the operating theatre team: identification and patient safety

Wainwright K.¹, Chatham-Zvelebil N.², Daubeny T.¹

¹Royal Hampshire County Hospital, Dept of Anaesthesiology, Winchester, United Kingdom, ²Portsmouth Hospitals NHS Trust, Dept of Anaesthesiology, Cosham, United Kingdom

Background and Goal of Study: Approximately 8 million surgical procedures take place each year in England. The World Health Organisation (WHO) introduced the Surgical Safety Checklist (SSC) to change practice in surgical theatres, foster better team communication and to encourage a culture of safety. Despite the SSC including a point where team members introduce themselves by name and role subsequent recollection of this information may be difficult especially in an emergency situation. This project looked at the ability of theatre team members to identify the name and role of their colleagues during routine day case surgery.

Materials and Methods: During the period September to October 2011 staff in operating theatres at Queen Alexandra Hospital, Portsmouth were asked to identify the names and roles of other members of the operating team. Theatre staff were surveyed before and after a whiteboard was installed for recording team members' names and roles. Team members were asked to identify their colleagues without referring to the white board.

Results and Discussion: During the two month period 160 members of operating theatre teams were asked to identify their colleagues. In theatres where no white board was present to record team members names 64/80 respondents correctly identify their colleagues (80%, 0.95 confidence interval (CI): 70-87%) see figure 1. In theatres where team names and roles were recorded on a white board this rose to 80/80 team members being correctly identified (100%, 0.95 CI: 96-100%).

The addition of a white board on the wall of the operating theatre led to a marked improvement in name and role identification. This improvement may reflect increased recollection of the original team briefing process.

Conclusion(s): In both routine and emergency situations the ability to communicate effectively within the team is integral to the safety of the patient. Knowing the names and roles of other members of the team is fundamental to the WHO SSC and to building successful, safe operating theatre teams. Future work could focus on whether improved identification of team members in a routine operating theatre environment results in improved patient outcomes.

16AP04-6

An operating room fire on a patient - prevention and management

Saura C.¹, Oliveira C.¹, Susano M.J.², Antunes P.³, Xambre F.³

¹Hospital Garcia de Orta, Dept of Anaesthesiology, Almada, Portugal, ²Hospital de Santo António, Dept of Anaesthesiology, Porto, Portugal, ³Hospital Santa Maria, Dept of Anaesthesiology, Lisboa, Portugal

Background: Operating Room Fires (OF) consist of every surgical fires (SF) that occur in or on a patient under anesthetic care. Its incidence has remained unchanged in spite of the existence of guidelines and a broad improvement in operating rooms safety. Its genesis is well understood and preventable. Given that they can cause serious injury to patients, all professionals are expected to know how to stratify the risk, prevent and manage OF through an action protocol. We present a effective way to achieve that goal and precisely describe how to proceed.

Case report: We present the case of a 90-year-old male who underwent sedation plus local analgesia for the surgical excision of a basal cell carcinoma in the lower eyelid. There was the need for Oxygen (O₂) administration (made through nasal cannula) and monopolar electrocautery use. This dangerous combination resulted in a SF and a right hemifacial second degree burn.

Discussion: It is essential that the whole operating room (OR) staff knows the fire triad as well as the oxidizers, fuel and ignition sources most commonly used. OF prevention includes: education about fire safety and the risks of a oxidizer-enriched atmosphere (e.g. O₂); formal periodic fire drills; preparation, (this consists of risk stratification, action protocol creation and proper equipment availability); and prevention, minimizing the oxidizer-enriched atmosphere and ensuring safety when using fuel and ignition sources. When facing a fire, each OR staff member must perform a specific task according to the predetermined action protocol (AP). Major principles are: early recognition, immediately halt the procedure; initiate the fire extinguishing attempt and evacuation protocol (if needed); and post-fire plan for ongoing care of the patient.

Learning points: To lessen OF is a whole OR staff responsibility (anesthesiologist, surgeon, nurses, technicians) and this mission success rests in clear and timely communication. The existence, visible placement, awareness and compliance with a prevention and action protocol is essential.

References:

- Practice Advisory for the Prevention and Management of Operating Room Fires, An Updated Report by the American Society of Anesthesiologists Task Force on Operating Room Fires, Anesthesiology* 2013; 118:00–00
- E. Jan. *A Fire in the Operating Room: It could Happen to You!*, American Society of Anesthesiologists 2009; Vol 40: 26-31

16AP04-7

High performance teams building: development of a new tool in patient safety

Lema Tome M., Ginel Feito M.D., de Miguel Guijarro Á.,

Chamorro García E., Galve Marqués A.I., Garrido Sanchez A.

Gregorio Marañón University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: The principal contributing factor up to 70% of the critical incidents (CI) in anaesthesia is the human factor. We designed a multidisciplinary course in Safety in Surgery and Anaesthesia focused in training high performance teams (intended to surgeons, anaesthesiologist, nurses and other no-surgical professionals). The goal of our study is to compare the results of a survey made before and after the workshop to the participants at Gregorio Marañón University hospital and the other Spanish hospitals.

Materials and Methods: The course design included 2 phases: a face-to-face seminar and one online. In the first one, an introduction about patient safety was made: CI, underlying factors, human factor, CRM (crisis resource management), debriefing method and non-technical skills. We recreated different scenarios by video simulation.

Before the workshop a survey was made with the following items: Pre-session: general data, general knowledge about patient safety, human factor, teamwork, CRM, learning discussions and communication skills.

Post-session survey emphasised in: relevance of what they learnt for daily work, the impact in safety patient, communication skills, and the necessity for repeated training.

Results and Discussion: 9 sessions with a 159 participants have been held in Spain from January to November of 2016. 6 of them took place at our hospital. We included 90 participants grouped in 15 per session (anaesthesiologist, surgeon and nurse), and other non-surgical professionals. Although most participants had training in safety, a lack of formation in non-technical skills figures prominently in our hospital (73%) and the others (62%); and also an absence of adequate coordination of the surgical team. Similarly in all the hospitals, (77% HGUGM - others 72.7%) the participants have never received a workshop like this, neither know how to implement a debriefing (61.4% and 50%) or CRM methodology. All the surveys show, when we compare our hospital to the rest of the Spanish hospitals, a $p > 0.05$ so we can conclude that this workshop can be transposed between all hospitals, with similar results.

Conclusion: Training workshops for multidisciplinary high performance teams is a tool capable of improve Safety Culture in surgical environment. This workshop is a new tool capable to enhance no-technical skills. Data suggest that periodic training is necessary to maintain the formation level.

16AP04-8

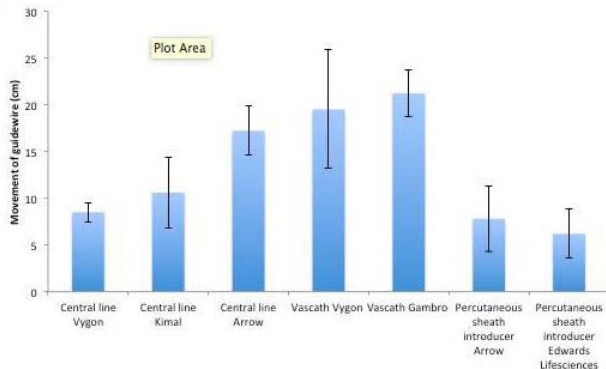
Central venous catheter guidewire salvage technique to prevent a never event

Mariyaselvam M.¹, Richardson J.², Sawyer A.², Young P.²

¹Cambridge University, Dept of Anaesthesiology & Intensive Care, Cambridge, United Kingdom, ²Queen Elizabeth Hospital, Kings Lynn, Dept of Intensive Care, Kings Lynn, United Kingdom

Background and Goal of Study: Accidental guidewire retention following central venous catheter (CVC) insertion is the 2nd commonest reported retained foreign object in the UK and is a never event. The NHS England National Reporting and Learning System (NRLS) database 2004-2015 reported 239 guidewire retentions of which on only one occasion was suction reportedly applied to the distal lumen prior to removal. If recognised early, the guidewire is more likely to be still in the catheter lumen. A common technique for guidewire removal is to clamp the catheter at the skin and pull the assembly back. However, if the wire has passed beyond the skin level, this is likely to be ineffective. We tested a rapid suctioning prior to clamping to improve the chances of success.

Materials and Methods: Following IRB approval, we used a bench model with a guidewire placed 2 cm into the distal tip of a CVC catheter simulating a wire about to embolise. The CVC was positioned in a quarter circle conformation and the tip and guidewire was submerged in a water bath simulating the circulation. A 20ml syringe was attached to the distal lumen and strong suction was continuously applied for 5s by vigorously retracting the plunger and guidewire retraction measured.



[Guidewire Retraction during Suctioning]

We tested 3 CVCs, 2 vascaths and 2 wide-bore introducers 10 times each. Success was determined by the wire moving back into the catheter thereby improving the chances of clamping and removal.

Results and Discussion: The rapid suck technique successfully retracted the wire in all scenarios and for all catheters (figure 1 shows means and 95% CI). Only the Vascaths, the wide bore catheters and the Arrow CVC reliably retracted the wire beyond the estimated skin level.

Conclusion(s): The intraluminal position of a retained guidewire may be unknown, may be difficult to see on x-ray, and delays or patient manipulation may cause further migration. If there has been a decision to remove the catheter then suction should be applied first to retract the wire. Further simulation studies should examine whether following rapid suction, additional clamping or continuous suctioning on catheter removal is more effective for guidewire retrieval.

16AP04-9

Surgeons' efficiency and surgical resource utilization in the operating rooms

Nakata Y.¹, Watanabe Y.², Narimatsu H.³, Yoshimura T.⁴, Otake H.⁵, Sawa T.⁶

¹Teikyo University Hospital, Dept of Anaesthesiology, Tokyo, Japan, ²Waseda University, Graduate School of Economics, Tokyo, Japan, ³Kanagawa Cancer Center, Research Institute, Yokohama, Japan, ⁴Shin-Yurigaoka General Hospital, Dept of Anaesthesiology, Kawasaki, Japan, ⁵Showa University Hospital, Dept of Anaesthesiology, Tokyo, Japan, ⁶Teikyo University, Medical Information and System Research Center, Tokyo, Japan

Background and Goal of Study: We reported two studies that evaluated the Japanese surgical reimbursement system in terms of resource utilization using surgeons' efficiency scores measured by data envelopment analysis (DEA).^{1,2} We found that the surgical reimbursement system is unequal among surgical specialties in 2013 and 2014. This observation was based on the previous fee schedules before the revision in 2016. The purpose of this study is to examine whether the current surgical reimbursement system in Japan reflects resource utilization after the revision in 2016.

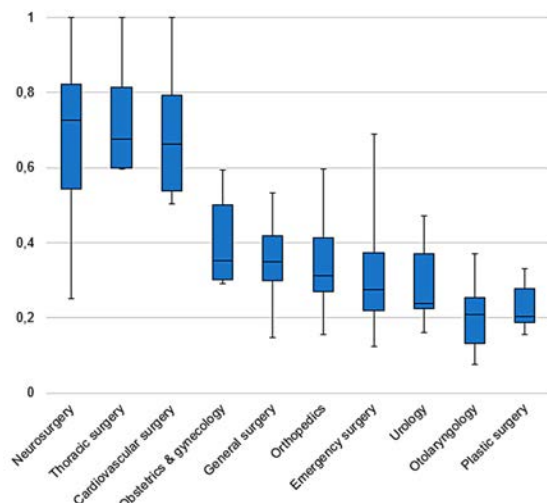
Materials and Methods: IRB approved our study. We collected data from surgical records in the Teikyo University electronic medical record system from April 1 till September 30, 2016.

We defined the decision making unit as a surgeon with the highest academic rank that scrubbed in the surgery. We focused on the surgeons' activity and their clinical decision. The inputs were defined as

1. the number of medical doctors who assisted surgery, and
2. the time of operation from skin incision to skin closure.

The output was defined as the charged surgical fee.

We added all the inputs and outputs for each surgeon during the study period, and calculated his/her efficiency score using DEA. We compared the efficiency scores of each surgical specialty using Kruskal-Wallis and Steel methods.



[Figure 1: Box-plot of distribution of efficiency scores by surgical speciality. Medians, 25-75 percentiles and ranges shown]

Results and Discussion: We analyzed 2,558 surgical procedures performed by 109 surgeons. The efficiency scores were shown in Figure 1. The difference in efficiency scores was statistically significant ($p = 0.0001$). The efficiency score of neurosurgery was significantly greater than obstetrics & gynecology, general surgery, orthopedics, emergency surgery, urology, otolaryngology and plastic surgery ($p < 0.05$).

Conclusion: We demonstrated that surgeons' efficiency in the operating rooms was significantly different among surgical specialties. This suggests that the Japanese surgical reimbursement scales continue to fail to reflect resource utilization despite the revision in 2016.

References:

1. Nakata Y, et al. *Int J Health Serv* 2015;45: 801-809
2. Nakata Y, et al. *Int J Health Care Qual Assur* 2015;28: 635-643

16AP04-10

Comparison between forced air and intravenous fluid Warmer in gynecologic laparoscopic surgery: an interim analysis

Boayam W., Vichitvejpaisal P., Suton P., Tapala S.

Mahidol University, Dept of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: Patients undergo gynecologic laparoscopic surgery normally experience with hypothermia. This can cause myocardial ischemia, etc. This study aimed to compare the difference of core and room temperature by using forced air and intravenous fluid warmer.

Materials and Methods: After IRB approval COA. Si201/2016 (18/03/2016), the study has been registered by ClinicalTrials.gov (NCT02990429). A prospective study was conducted with 90 elective surgery. Inclusion criteria were patients aged 18-65, ASA I-III, BMI 25-30 kg/sq.m, surgical time > 90 min. Participants were randomized into two groups;

A: patients were warmed by forced air (Bair Hugger, USA) at 43 °C,

B: patients received warmed intravenous fluid (Ranger Warmer, USA) at 41 °C.

The core and ambient temperature were recorded every 15 min after the induction until the end of surgery, and then at 15 min interval in the recovery room. Data were expressed as mean and standard deviation. Categorical and numeric data were analyzed by Chi-square, non and dependent t test respectively. A difference between tympanic membrane and room temperature of 0.5 °C was considered significance when $p < 0.05$ at 95% Confidence Interval.

Results and Discussion: The demographic data of both groups were similar. Group A showed a steady temperature throughout the procedure. However, group B showed significantly drop of temperature at 30 min and recover after the operation.

	Forced-air warmer	Fluid warmer	P
Operating room(min)			
0	35.3±0.5	35.3±1.0	0.167
15	35.3±0.7	35.0±0.9	0.147
30	35.2±0.6	34.8±0.8	0.035
45	35.2±0.8	34.9±0.7	0.043
60	35.2±0.9	34.9±0.8	0.041
75	35.1±0.7	34.8±0.8	0.031
90	35.1±0.8	34.8±0.9	0.032

[Temperature diff. Forced-air and Fluid warmer]

This might due to the forced air warmer yielded a circulating, temperate flow; while, warmed intravenous fluid lost heat en route to the patients. Therefore, the distance between administered fluid and site of intravenous cannulation should be short as much as possible. Nevertheless, the core temperature of both groups showed insignificant difference in the recovery room, as all participants were covered by blanket in a warmed atmosphere.

Conclusion(s): The forced air warmer was more efficient than intravenous fluids warmer in a cool operating theatre.

16AP05-1

Medication critical incidents reported by SENSAR (Spanish critical incident reporting system) from 2009 to 2016

Galve A.I., Hernández I., Ginel M.D., Portas M., Garrido A., Cabrerizo P.

HGU Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: Medication related critical incidents are frequent. Most of them can be prevented. The impact of a medication incident can cause no harm or can be potentially dangerous and even lead to the patient's death.

The frequency and potential harm of the reported incidents lead us to remember the importance of enhancing efforts to protect patient's safety by reading the labels of our medications.

The goal of this study was to review the critical incidents reported by SENSAR related to medication errors. Critical incidents reporting systems have shown to play an important role in patients safety. SENSAR is a Spanish national critical incident reporting system in Anesthesia. Incidents are notified and analyzed by local teams, and local improvement measures are implemented.

Materials and Methods: We designed a prospective observational study in which we analyzed the medication related critical incidents reported by SENSAR during the period of time between January 2009 and October 2016. We used "medical errors" as key Word. We studied the contributing factors analyzed found to be related to the incidents, and the measurements locally proposed.

Results and Discussion: Our review has a total amount of 6205 critical incidents reported, 1311 of them of medication.

In terms of morbidity and mortality, the impact of these errors was variable, 61% did not cause any damage in the patient, 3% caused no harm but ended up with surgery suspension, 20% caused minor morbidity, 10% intermediate morbidity, 1% higher morbidity, and it is important to highlight that 0.3% of incidents led to the death of the patient.

Most of the incidents are related with drug administration (16%), followed by prescription incidents (13%), storage of medication incidents (10%) and drug dose incidents (9%).

Conclusion(s): Our review found 21% medication related incidents among all the analyzed ones. Most of them took place during the administration. To avoid these incidents we have different measurements: the acquisition of a system of labelling, alerts to remember the need of double checking the medication before the preparation and administration, and the electronic prescription. Also, it is important to have the medication properly placed in the operating room, as well as the communication, presentation in session and the update and use of protocols.

In line with other publications locally applicable measures are the most frequent proposals.

16AP05-2

Preoperative benzodiazepine premedication critical incidents in a tertiary university hospital

Portas González M.¹, de Miguel Guijarro Á.¹, Romera Rabasa A.², Ginel Feito M.D.², Palencia Jorge M.², Gago Quiroga S.²

¹Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Gregorio Marañón General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain

Background and Goal of Study: In 2009 the Department of Anaesthesiology and Intensive Care from Gregorio Marañón General Hospital (Madrid, Spain) joined SENSAR (Spanish Anaesthesia and Intensive Care National Incident Reporting System). Since then, several critical incidents (CI) related to preoperative benzodiazepine premedication (PBP) administered in the wards have been communicated in spite of e-mail alerts. So we decided to conduct a study. Its goal: to review all CI related to PBP and standardize our PBP practice.

Materials and Methods: We conducted a retrospective observational study. We searched on Anestic (SENSAR database) among the CI that our department had reported to SENSAR from January 1, 2009 till July 15, 2016. For that purpose we introduced the following keywords: benzodiazepines, flumazenil, midazolam, diazepam, lorazepam, bromazepam and its respective

brand names (Dormicum, Valium, Orfidal and Lexatín). Afterwards each CI was reviewed to select those related to PBP side effects or contraindications. CI related to intravenous PBP in the surgery room were excluded. We implemented PBP protocol with recommended benzodiazepines, doses and contraindications.

Results and Discussion: With these keywords we found 38 CI among the 757 CI our Department had reported during the study period. Only 12 of them were considered valid. Four CI (33,3%) were related to Obstructive Sleep Apnea Syndrome with nasal continuous positive airway pressure treatment and morbid obesity or difficult airway scheduled for short surgical procedures; 5 CI (41,6%) to elderly patients, 3 of them unable to perform the surgical check list and 3 CI (25%) were related to administration of flumazenil for prolonged extubation time. There were no CI related to anxious patients because of lack of premedication. We observed that in many cases the pharmacokinetic characteristics of the chosen benzodiazepine were not optimal for their intended use. Another CI was reported during the development of the PBP protocol: an elderly patient with a cervical tumor who experienced respiratory depression in the ward (SpO₂ 76%).

Conclusion(s): PBP CI at our institution are rare but could be dangerous. Critical Incident Reporting Systems can be a useful tool to identify anesthetic security breaches and implement barriers that protect our patients.

16AP05-4

Accidental administration of ketamine in the gastrointestinal mucosa

*Kollmann Camaïora A., Tapia B., Alsina E., Gilsanz F.
La Paz University Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*

Background: Ketamine acts predominantly by antagonizing the N-methyl-D-aspartate receptor, has a chiral structure and is metabolized by the cytochrome P450 (CYP) 3A and CYP2B6 enzymes. The most common administration routes are intravenous and intramuscular, although it can be administered subcutaneously and oral; but due to extensive first-pass metabolism it has a low bioavailability.

Case report: We present a 73 y.o. male ASA II patient scheduled for colonoscopy due to mild hematochezia. The patient had hypertension and benign prostate hypertrophy. Sedation with spontaneous ventilation was performed with standard monitoring, EKG, pulse-oxymetry and blood pressure. The patient first received an intravenous bolus of Ketamine 15mg and Propofol 50mg, followed by an infusion at 150mg/h.

During the procedure a 12mm polyp was identified in the ascending colon and for its extraction it was first elevated with diluted methylene blue injected in the mucosa. The procedure went without incidents and the patient would have been ready for discharge with a Modified Aldrete Score of 10/10 20 min after the procedure. However, when performing the next procedure on the list, we discovered that the methylene blue had been diluted in a labelled bag containing ketamine diluted in saline, and thus the patient received 100mg of it in the colonic mucosa. We explained him the incident and he was kept under observation at the post-anaesthesia recovery unit for 12h. During this period the patient was asymptomatic and was later discharged home.

Discussion: Safety is a team effort and commitment, however, even with correctly labelled medication errors can occur; and it is important to come forward to the patients about it. This is the first case report of ketamine administration in the gastrointestinal mucosa; and through this administration error we can learn about it. The patient didn't develop any symptoms of ketamine administration which could indicate that it was not absorbed, or at least not fully, by the gastrointestinal mucosa.

References: Peltoniemi MA et al. Clin Pharmacokinet 2016.

Learning points: Ketamine appears not to be absorbed by the gastrointestinal mucosa. More studies are necessary to fully understand the pharmacokinetics and pharmacodynamics of this drug. It's vital to label all the medication, and also check all the empty syringes and ampules at the end of every procedure.

16AP05-6

Dexmedetomidine and post operative narcotic requirements in bariatric surgery

*Ranganathan P., Ellison M., Ritchie M., Sizemore D., Attaallaah A.
West Virginia University, Dept of Anaesthesiology, Morgantown, United States*

Background and Goal of Study: Dexmedetomidine is an α_2 -adrenergic receptor agonist used by intensive care units and anesthesiologists. It is unique in its ability to provide sedation without causing respiratory depression. Recently, it has received attention for its potential for additive analgesia. Patients undergoing gastric bypass surgery have a high prevalence of sleep apnea and Pickwickian component that can be worsened by opioid analgesia in the postoperative period.

The primary objective: To assess if the use of a single bolus dose dexmedetomidine in addition to standard pain regimen given intra operatively decreases postoperative narcotic requirements.

Materials and Methods: Patients undergoing gastric by-pass procedures for weight loss were enrolled in the study and block randomized. The anesthesia provider and PACU nurse were blinded to drug versus placebo. The control group received 1-2 mcg/kg fentanyl IV plus 1000 mg IV acetaminophen as well 60mL saline delivered over 15 minutes in OR upon notification of surgical closure. The experimental group received 1-2 mcg/kg fentanyl IV plus 1000mg IV acetaminophen and 1mcg/kg IV dexmedetomidine deliver over 10 minutes from 60 mL syringe upon notification of surgical closure. Upon arrival to PACU, patients immediately received hydromorphone patient controlled analgesia (PCA). PCA was interrogated at 30 minute, 1 hour, 90 minute, 2 hour and 4 hour mark and usage in milligrams was recorded.

Statistical Analysis: The data was summarized using the mean, median, standard deviation, min, and max for continuous data; for categorical data, we used the count and percentage. The difference between the two groups (dexmedetomidine and placebo), was assessed using a two-sided two-sample unequal-variance t-test with Welch's modification to the degrees of freedom.

Results and Discussion: There was moderate evidence of a mean difference between the two treatment groups. The study group had a total amount of 2.66 mg with the placebo group had a total of 3.77 mg. The trend of total medication used over time is neither increasing nor decreasing for study group, but increasing over time for placebo group. The number of PCA attempts for made by patients in study group decreased over time where as increased over time for placebo (p= 0.04)

Conclusion: Addition of Dexmedetomidine may decrease post op opioid requirements in Bariatric Surgery and improve early PACU discharge and recovery.

16AP05-7

Introduction of a nationwide standardised drug label for high-risk anaesthetic drugs

*Koers L.¹, Kooij F.¹, Over L.², Wolff A.³, Preckel B.¹
¹Academic Medical Center, University of Amsterdam, Dept of Anaesthesiology, Amsterdam, Netherlands, ²Gele Ziekenhuizen, Dept of Anaesthesiology, Apeldoorn, Netherlands, ³University Medical Centre Groningen, Dept of Anaesthesiology & Pain Medicine, Groningen, Netherlands*

Background and Goal of Study: Anaesthetic drug error is a recognised source of patient harm. Misidentification of drugs due to similar packaging or labelling is an important cause of drug error.¹ Currently, there are no standardised labels for anaesthetic drugs in the Netherlands and many hospitals have their own colour-coding of anaesthetic drug labels.¹

However, many anaesthesia providers are working in multiple hospitals. This increases the likelihood of drug error through misidentification of drugs by relying on the wrong colour scheme.

We designed and implemented a standardised label for high-risk anaesthetic drugs in the Netherlands.

Materials and Methods: We designed the labels using the colours from the ISO standard, and the ISMP Tall Man Lettering system in order to reduce medication errors within the same group. A QR code for electronic registration and double check was added. The implementation process followed the implementation steps as described in the NICE guidance.² We send email

notifications through the Dutch society of Anaesthesia and several national conferences were organised. A Prospective Risk Analysis was done. An e-learning was created to familiarise staff with the new labels.

Results and Discussion: The Academic Medical Centre Amsterdam was one of the pilot hospitals that started using the labels. The introductory e-learning was completed by 88% of staff. Ninety-four percent felt that the e-learning was helpful to explain the system behind the labels. A voluntary survey after using the labels was completed by 68 members of staff, and most common criticism was the likeness of certain colours, especially during scopic surgery as ambient light is switched to green. This problem was addressed and the colours were intensified. During the 3-month introduction period of the new labels, 7 minor drug errors were reported in 4715 anaesthetic actions. The Dutch Society for Anaesthesia now recommends the use of these labels nationwide.

Conclusion(s): To reduce patient harm it is imperative to reduce anaesthetic drug error. We describe the successful design and implementation of standardised labels resulting in a nationwide recommendation to use these labels. The impact of standardised labels on patient outcomes has to be determined in future.

References:

1. Preckel B et al. Labelverschillen leiden tot medicatiefouten. *Med Contact* 2014; 2345-7.
2. How to put NICE guidance into practice. <http://www.lumsa.it/sites/default/files/UTENTI/u492/nice.pdf>

16AP05-8

The long-term efficacy and safety of rocuronium and sugammadex in patients undergoing renal transplantation

Ono Y, Fujita Y, Akahori T, Hashimoto A., Sato Y, Fujiwara Y.
Aichi Medical University, Dept of Anaesthesiology & Intensive Care, Nagakute, Japan

Background and Goal of Study: Sugammadex reverses rocuronium by encapsulating it, creating a stable complex that is mainly excreted by the kidneys. Although sugammadex clearance is reportedly reduced in renal impairment,¹ there have been case reports describing the safe use of rocuronium and sugammadex in renal transplantation.² Nonetheless, in view of the prolonged exposure to sugammadex during renal transplantation, current safety data are insufficient. We investigated the safety and efficacy of rocuronium and sugammadex in the immediate perioperative period, and over a long-term follow-up period.

Materials and Methods: We studied 57 consecutive patients diagnosed with severe renal failure who underwent renal transplantation under general anaesthesia at our institution between March 2014 and June 2016. We investigated the efficacy of sugammadex, and recorded perioperative complications in the first 72 hours in the surgical intensive care unit, and followed up all patients for more than 5 months.

Results and Discussion: The median age, height and weight of the cohort were 50.5 years (interquartile range 43.0 -61.0 yr), 1.63 m (1.58-1.79 m) and 59.0 kg (49.0 -69.0 kg), respectively. Twenty-one were men (36.9%). Thirty-one patients had required dialysis for <1 month (54.4%), 12 for <1 year (21.1%) and 15 for >1 year (26.3%). Median serum creatinine concentration before transplantation was 5.9 mg/dL (4.7-7.7 mg/dL), blood urea nitrogen (BUN) was 30 mg/dL (25-35 mg/dL) and the estimated glomerular filtration rate (eGFR) was 8 ml/min/1.73m² (6-10 ml/min/1.73m²).

The duration of anaesthesia and surgery was 427 min (397-462 min) and 332 min (300-377 min), respectively. The median rocuronium dose was 160 mg (130-205 mg).

One patient was administered sugammadex 160 mg, two were given 300 mg, two were given 400 mg and 52 were given 200 mg. Patients were extubated once the train-of-four ratio had recovered to 0.9. Median serum creatinine concentration after transplantation was 1.4 mg/dL (1.0-1.6 mg/dL), BUN was 16 mg/dL (13-19 mg/dL) and eGFR was 47 ml/min/1.73m² (39-57 ml/min/1.73m²). No adverse events were recorded during the observation period.

Conclusion(s): Rocuronium and sugammadex appear to be safe and efficacious in patients undergoing renal transplantation.

References:

1. *Br J Anaesth* 2015; 114: 777-784
2. *Eur J Anaesthesiol* 2016; 33:383-385

16AP06-1

A cost-effective way to monitor for ophthalmic complications during prone surgery

Roberts T, Burckett St Laurent D.

Royal Gwent Hospital, Dept of Anaesthesiology, Newport, United Kingdom

Background: Vision loss following spinal surgery is a rare but life-changing complication. There are several associated mechanisms of post-operative vision loss (POVL). The incidence ranges from 0.028 to 0.2% (1), however the potential for long-term harm means that care should be taken in at-risk patient groups. Products such as Proneview® allow visualisation of the eyes during surgery. Often the patient is positioned with their head away from the anaesthetic machine, covered in drapes, hindering access to the eyes. It was suggested that a better way to allow clear, regular monitoring of the eyes could be developed.

Materials and Methods: We identified a commercially available (non-medical) camera and video monitor which could operate in very low light and could be easily attached to the Proneview® mask. The total cost was £24. It was exempt from formal testing as it was battery-powered and CE marked. Two positions for the camera were identified. It can either be placed directly underneath the eyes, facing upwards, or can be taped to the side of the Proneview® face mask, pointing at the mirror below. The equipment was tested in simulated conditions prior to use on patients. Users were provided with comprehensive instructions for use of the device, choosing to use the screen either constantly or intermittently.

Results and Discussion: Feedback was sought from colleagues locally:

- In situations where the patient's head is positioned away from the machine, particularly for cervical spine surgery, the camera makes it easier to monitor for ophthalmic complications.
- Anaesthetists were likely to check the eyes more regularly when using the camera than without it.
- Diathermy can cause interference when using the monitor, which is reduced by shielding the video cable within a plastic tube.

Conclusion: For surgical cases where the patient is prone, our equipment provides effective and cost-minimizing method of monitoring for ophthalmic complications. Whilst rare, ophthalmic complications can have a devastating impact on a patient's quality of life and we believe further development would be a valuable patient safety contribution.

References: 1. Chang SH, Miller NR. The Incidence of vision loss due to peri-operative ischemic optic neuropathy associated with spine surgery: The John Hopkins Hospital Experience. *Spine* 2005; 30: 1299-302

16AP06-2

Capnography improves 'respiratory' safety of obese patients after abdominal surgery

Vorotyntsev S.¹, Latyshev P.²

¹Zaporizhzhia State Medical University, Dept of Anaesthesiology & Intensive Care, Zaporizhzhia, Ukraine, ²Sverdlovsk Regional Clinical Hospital-1, Dept of Anaesthesiology & Intensive Care, Ekaterinburg, Russian Federation

Background and Goal of Study: Obese patients worth special attention after abdominal surgery because the risk of postoperative hypoventilation and hypoxia. It is considered that monitoring of EtCO₂ can reduce the risk of respiratory complications. In prospective study we have evaluated the efficacy of capnography for prevention of postoperative dyspnea in 60 obese surgical patients.

Materials and Methods: Two groups of patients (total intravenous anesthesia (TIVA, n=30) and combined epidural-general anesthesia (CEGA, n=30)) were extubated in operating theatre and transferred to the surgical ward, where they were getting oxygen through nasal cannula (4 l/min) and it was provided to them monitoring of SpO₂, pulse rate, blood pressure, EtCO₂ and respiratory rate (RR) during 2 hours. The end points were: time of tracheal extubation after the end of surgery (T); dyspnea episodes in first 10 minutes after extubation (N₁); opioid use during 1st postoperative hour; cases of respiratory deviations from triggers (SpO₂<92%, RR<8/min, EtCO₂>50 mm Hg, EtCO₂<30 mm Hg, apnea time >20 sec) for each patient during 2 hours (N₂); postoperative lungs complications; length of hospital stay (LOS). Statistical analysis of the results was organized using the Student t-test and Mann-Whitney U-test.

Results and Discussion: There were no significant differences in gender, age, body mass index between groups. T was within 15 min in both groups ($p > 0.05$). N_2 TIVA-group was significantly higher than N_2 CEGA-group: 10 (7-12) cases to 3 (1-4) cases accordingly ($p < 0.05$). During first hour after surgery 17 (57%) patients from TIVA-group needed additional use of Trimeperidin 20 mg IM while in CEGA-group opioids were used only for one (3%) patient ($p < 0.05$). Dyspnea was found in 100% of patients, herewith in 90% of patients trigger RR < 8/min or apnea time > 20 sec worked out. N_2 TIVA-group was 10 (8-13) in comparison with N_2 CEGA-group 5 (2-7), $p < 0.05$. Pneumonia didn't appear in patients of TIVA-group while in CEGA-group it appeared in 3 patients ($p > 0.05$). The LOS was not much different between the groups ($p > 0.05$).

Conclusion(s): Obese patients after abdominal surgery need non-stop capnography monitoring to avoid the development of hypoventilation as a result of unnoticed in time respiratory depression. Special attention should be paid to the patients for that opioids are used because the higher dyspnea cases than in patients for that regional techniques of analgesia are used.

16AP06-3

Does geography matter: meta-analysis of patient safety during procedural sedation with and without capnography

Saunders R.¹, Lightdale J.R.², Pollock R.F.³, Mestek M.L.⁴, Struys M.M.R.F.⁵

¹Coreva Scientific, Health Economics and Outcomes Research, Freiburg im Breisgau, Germany, ²UMass Memorial Children's Medical Center, Pediatric Gastroenterology, Worcester, United States, ³Ossian Health Economics, Health Economics and Outcomes Research, Basel, Switzerland, ⁴Medtronic Inc, Medical Affairs, Boulder, United States, ⁵University Medical Center Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: There have been questions about comparability of randomized, controlled trial (RCT) data from disparate geographies, where clinical practice and event rates may vary. This systematic review and meta-analysis was performed to assess the impact of capnography on patient safety outcomes during procedural sedation (PS) and considers whether there is consistency of data across geographies.

Materials and Methods: Systematic, independent review of PubMed, the Cochrane Library and EMBASE was performed in March 2016 for RCTs published in or after 1995 and enrolling patients undergoing PS. Title and abstract screening of 928 unique results was performed independently by 2 reviewers using *Sourcecerer*. Full-text review of 22 studies resulted in 12 being included for analysis. Extracted data were assessed for clinical utility by 2 physicians. The primary endpoint was oxygen desaturation, and the protocol allowed for the analysis of other endpoints reported by ≥ 3 studies.

Meta-analysis with *OpenMEE* used a random effects model. Results are presented as the odds ratio (OR) of events with capnography versus control across all eligible studies, whereby values < 1 indicate improved safety with capnography.

Results and Discussion: All studies reported mild desaturation, which was significantly reduced with capnography: the mean (95% confidence interval) OR was 0.65 (0.52, 0.81). The reduction was significant in the USA (OR 0.53: 0.31, 0.89) and Europe (OR 0.69: 0.51, 0.92). Six studies defined mild desaturation as < 90%, the OR with capnography was 0.60 (0.47, 0.78).

Severe desaturation occurred in 102 of 1,440 capnography patients and 186 of 1,460 control patients, giving an OR of 0.52 (0.40, 0.67). Removal of any one study did not influence the outcome (Fig 1A). Of the 6 studies reporting severe desaturation, 3 were German, 2 USA, and 1 Chinese. In all geographies, capnography significantly reduced severe desaturation (Fig 1B). Meta-regression confirmed no difference between geographies for both mild and severe desaturation.

There were no differences between capnography and control in other endpoints. All studies that reported bag-mask ventilation found it to be lower with capnography, OR 0.60 (0.30, 1.22).

Conclusions: Capnography helps to reduce oxygen desaturation during PS. Our results are generalizable over different geographies, suggesting that early detection of respiratory compromise may universally improve patient safety.

16AP06-4

EEG monitoring during anesthesia of a patient under the influence of cocaine

Lopes C.G.¹, Nunes R.R.², Cavalcante S.L.F.², Fernandes M.B.C.², Nascimento J.C.R.², Ribeiro K.G.²

¹Hospital Sao Carlos, Dept of Anaesthesiology, Fortaleza, Brazil,

²Hospital Geral de Fortaleza, Dept of Anaesthesiology, Fortaleza, Brazil

Background: Cocaine is a common recreational drug. Anesthesiologists at times have to manage patients under the influence of cocaine. This drug increases cerebral concentrations of norepinephrine, serotonin and especially dopamine by blocking presynaptic uptake. Complications associated with central vascular changes and direct excitatory effects on the CNS may interfere in anesthetic titration.

Case report: A 27 year-old male with open fracture of the right leg from a motorcycle accident reported using cocaine 3 hours earlier. The patient was submitted to external bone fixation under subarachnoid blockade with isobaric levobupivacaine (12.5 mg). The patient was awake, without agitation, and monitored with CNAP, cardioscopy, SpO₂ and bilateral BIS with spectrographic analysis. Midazolam

(10 mg) was administered, but the effect was short-lived. BIS remained high, with zero burst suppression. The spectrogram revealed power enhancement, especially in the alpha and beta bands (well-defined red patterns) unlike the EEG pattern observed in the wake state without CNS stimulants (Pic 1). The amplitude was momentarily attenuated during the effect of midazolam. No hemodynamic changes occurred and the patient remained cooperative throughout the procedure.

Discussion: EEG monitoring during anesthesia makes it possible to evaluate the depth of anesthesia and detect electrical changes induced by compounds acting on the CNS. Each drug affects the EEG in a specific manner, as observed for cocaine, which enhanced power in all bands.



[Pic. 1]

References:

1. Nunes RR, Chaves IMM, Alencar JCG, et al. Bispectral index and other processed parameters of electroencephalogram: an update. *Rev Bras Anestesiologia* 2012; 62: 1: 105-117
2. Bauer G, Bauer R. EEG, Drug Effects, and Central Nervous System Poisoning. In: Schomer DL, Silva FHL. *Niedermeyer's Electroencephalography: Basic Principles, Clinical Applications, and Related Fields*. 6th Ed. Lippincott Williams & Wilkins. 2011:901-922

Learning points: Cerebral monitoring during anesthesia is a valuable tool for assessing anesthetic depth and the effect of CNS-acting drugs.

16AP06-5

Monitor sedline: is it effective to monitor intraoperative awareness?

Garcia Fernandez E.¹, Davila Arango N.A.², Rubio Babiano P.², Ruiz Chiroso M.C.², Rios Llorente A.², Vaquero Roncero L.M.²
¹Salamanca Hospital, Dept of Anaesthesiology, Salamanca, Spain, ²Complejo Asistencial Universitario de Salamanca, Dept of Anaesthesiology, Salamanca, Spain

Background and Goal of Study: To assess if there is a relationship between intraoperative awareness and the use of Sedline® monitor in patients under general intravenous anesthesia.

Materials and Methods: Observational, descriptive and cross-sectional study performed between 2014 and 2015 in 93 patients. We excluded: patients premedicated with benzodiazepines or opioids, not extubated in the operating room, under 18 years or with a history of neurological or psychiatric alterations. Sedline® obtains the Patient State Index (PSI), which is a value for classifying anesthetic depth. The reference values are: 100-70: Aware patient.70-50: Sedation.25-50: Ideal Anesthetic Depth .0-25: Deep Anesthetic Plane. We use Brice questionnaire to evaluate intraoperative awareness. The variables are age, sex, weight, ASA, BMI, type and duration of surgery, PSI values at baseline, induction, 5 minutes postinduction, surgical incision and extubation. Quantitative variables are expressed as averages and standard deviations. Qualitative variables in percentages. For the relation of variables, we used chi-square statisticians, Student's t-test for paired samples, and Pearson's correlation. Statistical significance level $p < 0.05$. Program SPSS 20.0.

Results and Discussion: The incidence of intraoperative awareness was zero. Seven patients reported intraoperative dreams. With a PSI >39 in induction, 10.2% had dreams, whereas those with a value of less than 39 had only 3.3% dreamed ($p > 0.05$). Of the total sample, at induction, the average PSI value was 49.83 (DS18.70) with values greater than 50 at 37.6%. During extubation, 44.1% of the patients had PSI <70, of which 6.5% woke up with values below 50.

Conclusion(s): There were no cases of intraoperative awareness. Seven cases had dreams, 6 of them had a PSI value at induction greater than 39. It could suggest that values above 39 at induction are related to the possibility of dream recall. In the total sample the average PSI value during induction was very close to 50, which corresponds to the upper limit to be in the optimum state of hypnosis. The PSI value in extubation is below 70 in 44.1%. This value does not assure the reliable awakening state for the patient. Further studies are needed to determine these conclusions.

References: D.Drover. Patient State Index. Best practice & Research Clinical Anaesthesiology. Vol.20, No. 1, pp. 121-128,2006.

16AP06-6

Sonographic gastric volume and risk factors for full stomach in emergency surgery: an observational study

Delamarre L., Brunel E., Conil J.-M., Fourcade O., Minville V.
 CHU de Toulouse, Dept of Anaesthesiology & Intensive Care, Toulouse, France

Background and Goal of Study: Perioperative pulmonary aspiration remains a life-threatening complication of emergency anesthesia. Clinical judgment based on risk factors for full stomach drives the choice of rapid sequence induction (RSI). Gastric ultrasounds (US) look promising. The primary goal was to investigate the relationship between clinical risk factors and US gastric volume. Secondary goals were concordance of clinical and US judgments and characterization of patients with undetected full stomach.

Materials and Methods: A prospective observational study was conducted at our University Hospital. Clinical judgment regarding the state of full stomach and 15 risk factors were collected, followed by US measurements of antral cross section area (CSA). A CSA $\geq 3.5\text{cm}^2$ defined a full stomach. Concordance between judgments was tested by Cohen's Kappa.

Results and Discussion: 210 patients were included. No relationship between clinical risk factors and US full stomach was found, except for clinical ileus ($p = 0.03$). Concordance between clinical and US judgments was mediocre (Cohen's Kappa: 0.19). Patients with clinically undetected full stomach represented 37% of our cohort, but exhibited no specific risk factor but chronic kidney disease. They benefited from an adequate anesthesia (RSI or regional anesthesia) in only 70% of the cases.

Conclusion(s): Studying the largest cohort described to date concerning gastric US in emergency anesthesia, clinical risk factors seem to fail at predicting full stomach and may lead to inadequate anesthetic strategies. Patients with clinically undetected full stomach do not present a specific risk factors pattern. Those data question clinical judgment regarding full stomach and plead for larger implementation of gastric US in research and practice.

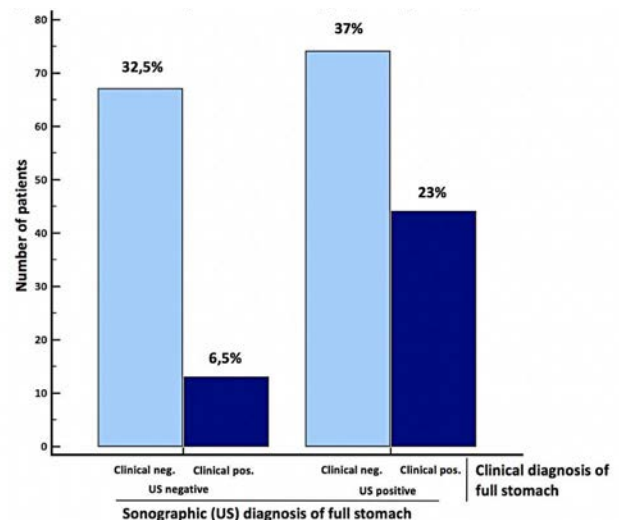
References:

1. Bouvet L. et al. Anaesthesiology. 2011
2. Perlas A. et al. Anesth Analg. 2013

	Sonographic full stomach (n=119) n (%) or Median [CI 95]	Sonographic empty stomach (n=81) n (%) or Median [CI 95]	p
Demographic data			
Age	50 [39.3 - 54.7]	47 [34 - 55]	0.36
BMI (kg/m ²)	23.7 [22.9 - 24.6]	23.2 [22.5 - 24]	0.56
Gender			0.89
Male	63 (59.2%)	44 (54.3%)	
Female	56 (47.1%)	37 (45.7%)	
ASA score (1/2/3/4)			0.11
1	65 (52.1%)	50 (61.7%)	
2	42 (35.3%)	25 (30.9%)	
3	14 (11.8%)	6 (7.4%)	
4	1 (0.8%)	0 (0%)	
Tabagism	40 (33.6%)	27 (33.3%)	0.99
Type of surgery			
Orthopedics-Trauma	78 (66.7%)	63 (77.8%)	
Visceral (Digestive & Gynecologic)	29 (24.8%)	8 (10%)	
Head and Neck (incl. Neurosurgery)	7 (6%)	5 (6.2%)	
Soft tissues	3 (2.6%)	5 (6.2%)	
Aspiration & Full Stomach Risk Factors			
GERD	22 (18.5%)	7 (8.6%)	0.07
Ileus	13 (10.9%)	2 (2.5%)	0.03*
Morphine <4h before induction	27 (22.7%)	25 (30.9%)	0.25
Chronic Kidney Disease	7 (5.9%)	2 (2.5%)	0.32
Diabetes Mellitus	8 (6.7%)	6 (7.4%)	0.99
Nausea	21 (19.6%)	15 (18.8%)	0.99
Vomiting	13 (12.1%)	10 (12.5%)	0.99
Maximal Pain (Visual Analogic Scale)	6 [5.4 - 7]	7 [5 - 7]	0.98
Maximal Stress (Visual Analogic Scale)	5 [4.9 - 6]	5 [3 - 5]	0.17
Fasting Durations			
From last liquid intake to induction	13 [10.2 - 12.4]	12 [10 - 14.3]	0.49
From last solid intake to induction	15 [12.9 - 16.5]	15.9 [12.7 - 17.4]	0.83
Liquid intake <6h before induction	13 (19.6%)	8 (10%)	0.99
Solid intake <6h before induction	4 (3.5%)	2 (2.5%)	0.99
Sonography - Characteristics			
Antral Cross Section Area (cm ²)	5.77 [5.04 - 6.3]	2.39 [2.1 - 2.6]	< 0.0001*
Ease of sonography (Visual Analogic Scale)	6 [5.5 - 7]	5 [4 - 6]	0.047*
Duration (min)	5 [4 - 5]	5 [5 - 5.9]	0.03*

CI 95 : confidence interval 95%. BMI : Body Mass Index. GERD : Gastro-Esophageal Reflux Disease. * : $p < 0.05$

[Figure 1]



[Figure 2: Concordance of clinical and sonographic diagnosis of full stomach]

16AP06-7**Tachypnea detected by an acoustic respiratory rate monitor is a predictor of the occurrence of oxygen desaturation**

Saad M., Bourgain J.-L., Billard V.

Institut Gustave Roussy, Dept of Anaesthesiology, Villejuif, France

Background and Goal of Study: Patients undergoing neck surgery (NS) are at a higher risk of respiratory complications. The first sign of respiratory compromise detected by postoperative (PO) continuous monitoring is blood oxygen desaturation. The non-invasive monitoring of respiratory rate (RR) by an acoustic monitor in the PO period has been shown to be as effective and better tolerated than capnometry. The purpose of this study is to evaluate the incidence of PO desaturation episodes in NS patients and the correlation between a change in RR detected by the acoustic monitor and the occurrence of desaturation.

Materials and Methods: Fifteen patients who underwent neck surgery (laser surgery of the vocal cords, thyroidectomy, neck dissection) without tracheostomy underwent, during the first postoperative night, continuous monitoring of pulse oxygen saturation (SpO₂) and RR with an adhesive bioacoustic sensor applied to the neck and connected to a monitor (Radical 7 Masimo, Irvine, CA). RR and SpO₂ were recorded every 2 seconds. Retrospectively, the occurrence and duration of desaturation (SpO₂<92%) episodes were calculated for each patient. Respiratory rate was recorded at the time of desaturation, 5 minutes earlier and 10 minutes earlier. The statistical analysis was performed using SPSS software, version 21.

Results and Discussion: A total of 416.137 data entries were analyzed with a monitoring median time of 15 hours. Desaturation occurred during 5% of the total monitoring period. SpO₂ was significantly correlated to RR at the time of the measurement, 5 minutes earlier and 10 minutes earlier ($r = -0.123$, $P < 0.001$; $r = -0.137$, $P < 0.001$ and $r = -0.151$, $P < 0.001$, respectively).

Respiratory rate cutoff value for predicting the occurrence of desaturation 10 minutes later was determined by establishing a ROC curve and corresponds to 18 bpm with a sensitivity of 0.447 (95% CI 0.445, 0.449), a specificity of 0.869 (95% 0.868, 0.870) and an area under the curve of 0.677 (95% CI 0.673, 0.682), $P < 0.001$. With a definition of tachypnea as a RR > 18 bpm, 45% of desaturation entries were preceded by tachypnea vs 13% of normal saturation, $P < 0.001$. The occurrence of tachypnea was associated with a 5.3 fold increase in the risk of oxygen 10 minutes later (95%CI 5, 1-5,4).

Conclusion(s): In patients who underwent neck surgery, an increase in respiratory rate detected by an acoustic monitor during the postoperative period is a predictor of the occurrence of desaturation ten minutes later.

16AP06-9**Ultrasonographic optic nerve sheath diameter for predicting elevated intracranial pressure during laparoscopic surgeries: a systematic review and meta-analysis**

Seo J.H., Kim E.J., Choi S.H.

Yonsei University College of Medicine, Dept of Anaesthesiology & Pain Medicine, Seoul, Korea, Republic of

Background and Goal of Study: Laparoscopic surgery includes carbon dioxide (CO₂) pneumoperitoneum and changes in patient position to facilitate clear surgical view, which may result in elevated intracranial pressure (ICP). The objective of this study was to assess the effects of laparoscopic surgery on changes in ICP, aided by ultrasonographic measurement of optic nerve sheath diameter (ONSD), the generally accepted simple, reliable ICP measurement technique.

Materials and Methods: A computerised literature search was performed in August 2016 to identify prospective trials that measured ONSD to assess ICP changes during laparoscopic surgery. The primary outcomes were the changes in ONSD determined by calculating mean difference (MD) in the early (0-30 min) and the late (30-120 min) periods after initiating pneumoperitoneum.

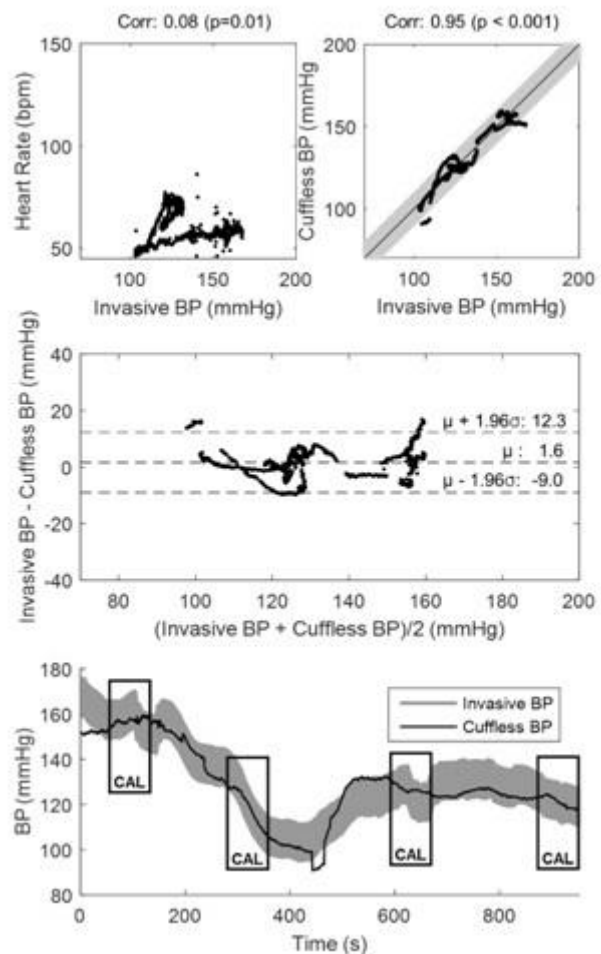
Results and Discussion: A total of nine observational studies and one randomized controlled study with 460 subjects were analysed. Compared to the baseline value after anesthesia induction, significant increase of ONSD was observed in early (MD 0.46, 95% CI 0.31 to 0.61, $P < 0.001$, $I_2 = 97.3\%$) and late periods (MD 0.67, 95% 0.20 to 1.14, $P = 0.005$, $I_2 = 99.2\%$). Comparison of changes in ONSD between early and late periods revealed no significant differences through observational time.

Conclusion(s): It is concluded that enlarged ONSD as a predictor for elevated ICP was observed during early and late periods with CO₂ pneumoperitoneum for laparoscopic surgery.

16AP06-10**Wireless and cuffless monitoring of blood pressure in the operating room: the role of optical beat-to-beat technology**Degiorgis Y.¹, Solà J.², Braun F.², Pierrel N.¹, Verjus C.², Schoettker P.¹¹CHUV (Centre Hospitalier Universitaire Vaudois), Dept of Anaesthesiology, Lausanne, Switzerland, ²CSEM (Centre Suisse d'Electronique et Microtechnique), Engineering, Neuchâtel, Switzerland

Background and Goal of Study: Brachial cuff blood pressure measurement is the standard method for non-invasive hemodynamic measurement in the operating room, providing intermittent values with the risk of occulting hemodynamic instability. In case of necessity for beat-to-beat blood pressure readings, invasive intra-arterial monitoring is available. Photo-plethysmographic signals are routinely recorded for pulse oximetry. The aim of this study is to demonstrate feasibility and efficacy of tracking beat-by-beat changes of blood pressure during induction of general anesthesia by simple optical means in comparison with an invasive arterial signal.

Materials and Methods: The study included 40 patients necessitating invasive arterial blood pressure monitoring for general anesthesia. Anesthesia was induced after arterial catheter had been inserted under local anesthesia, while photo-plethysmographic signals were acquired at the fingertip. A dedicated Pulse Wave Analysis (PWA) algorithm continuously generated blood pressure estimates that were further compared with reference readings provided by the arterial catheter.



[Figures 1]

Results and Discussion: Figures 1 illustrates the results of cuffless systolic blood pressure estimations compared to invasive arterial blood pressure references. While comprehensive statistical analysis of the performances of the novel approach will be presented at finalization of the ongoing clinical study, preliminary results acquired on the first 30 patients support the hypothesis that blood pressure changes during general anesthesia can be reliably measured by dedicated PWA algorithms applied to fingertip photoplethysmographic signals.

Conclusion(s): Estimating patients' blood pressure changes in relation to induction of general anesthesia by means of a simple optical probe at the fingertip associated to a specific pulse-wave analysis is feasible and reliable. Experimental conditions were limited to induction of general anesthesia without major hemodynamic variations nor continuous vasopressive therapy. Further comparisons must be established to consider this device as an alternative to non invasive brachial cuff or arterial catheter.

16AP07-1

A novel algorithm to predict desaturation in sedated patients with obstructive sleep apnea

Hou S.-Y.¹, Wu S.-C.², Chiang M.-H.²

¹Kaohsiung Chang Gung Medical Center, Dept of Anaesthesiology, Kaohsiung, Taiwan, Republic of China, ²Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Dept of Anaesthesiology, Kaohsiung, Taiwan, Republic of China

Background and Goal of Study: Obstructive sleep apnea (OSA) is a clinical condition characterized by frequent upper airway collapses during sleep. Propofol-induced sedation was widely used in many medical procedures, such as endoscopic retrograde cholangiopancreatography, colonoscopy, nasopharyngoscopy, bronchoscopy. However, hypoxia/hypoxemia was reported as common sedation-related complications. Patients with OSA were prompt to desaturation and need carefully preparation in maintain upper airway patency. This study was to investigate predictive factors of desaturation, develop a algorithm and validate its accuracy.

Materials and Methods: After obtained approval of the Institutional Review Board of Chang Gung Memorial Hospital (approval number: 101-4101B), patients received surgical intervention for sleep apnea and proceeded with drug-induced sleep endoscopy (DISE) were enrolled between Jan 2010 and Feb 2012. The overnight PSG was in our hospital. Propofol titrated to desired effect was settled by Ce steering of Schnider model. Patient was maintained with BIS=40-70. If SaO₂ was below 90%, the mandible angle was tilt forward. If the SaO₂ continuously dropped to 85%, mask ventilation was applied. First 35 cases of PSG parameters (predictive factors) and desaturation (lowest saturation <95% during DISE) were used to develop the algorithm. The remaining 31 cases were used to validate it.

Results and Discussion: Among first 35 patients, 20 patients had desaturation during DISE. We compared age, gender, BMI and PSG parameters (Lowest SpO₂, Sleep efficiency, AHI-total, AHI-REM, AHI-NonREM, Apnea-longest, Hypopnea-longest, mO₂<90%, Average SpO₂, De-saturation index, Arousal-total, Snoring index). In ROC analysis, six predictors were found, including AHI-total, AHI-REM, mO₂<90%, Average SpO₂, Lowest SpO₂, De-saturation index. In multiple logistic regression models, Average SpO₂ and AHI-REM were independent predictors. Collectively, the simple algorithm to predict desaturation under sedation is the following: Average SpO₂<95.05 or Average SpO₂≥95.05 with AHI-REM≥16.5. Otherwise, desaturation is nil. The following 31 patients were used to validate it. There were 24 patients had desaturation during DISE. The predictive accuracy, sensitivity, PPV, and NPV is 84%, 100%, 83% and 100%.

Conclusion(s): This is the first study to predict desaturation under propofol-induced sedation based from PSG parameters. Using Average SpO₂ and AHI-REM is a simple method in prediction.

16AP07-2

A novel nasal PAP mask assembly maintained spontaneous ventilation and oxygenation in a high-risk patient during ERCP in swimmer position

Tse J., Milask T., Barsoum S., Sison R.

Rutgers Robert Wood Johnson Medical School, Dept of Anaesthesiology, New Brunswick, United States

Background: Patients undergoing upper GI endoscopy often receive sedation and O₂ via nasal cannula. Over-sedation/airway obstruction may cause severe desaturation, especially in obese patients with obstructive sleep apnoea (OSA) or patients in prone position (swimmer) during endoscopic retrograde cholangiopancreatography (ERCP). A novel nasal PAP mask assembly using a paediatric mask and existing anesthesia equipment/machine was shown to maintain spontaneous respiration and improve oxygenation in sedated obese patients with OSA.¹⁻³ We report its use in a high-risk patient during ERCP in swimmer position.

Case report: A 51 y/o male (BMI 27 kg/m²) with HTN, anxiety and s/p multiple injuries sustained from a motor cycle accident 2 years prior presented for ERCP with removal of biliary stent. The patient underwent multiple surgeries including splenectomy, cholecystectomy, partial pancreatectomy, appendectomy, and recent complex abdominal wall reconstruction for his post-traumatic ventral hernia. He had a tracheostomy and was in coma for two months. He had a Class I airway and a deep retracted tracheostomy scar, and room air SpO₂ of 97%. After discussing with him and the endoscopist, the procedure was to proceed under MAC with video-laryngoscopy standby. He gave consent for photography and case report. After he assumed a swimmer position, an infant mask with fully inflated air cushion was placed over his nose and secured with a hook ring and rubber head straps and connected to a breathing circuit and the anaesthesia machine. The APL valve was adjusted to deliver 6 cm H₂O CPAP with 4 L/min O₂. His SpO₂ increased to 99%. He then received midazolam (2x2 mg), lignocaine (100 mg) and propofol bolus (50 mg) and infusion (175 mcg/kg/min). He maintained spontaneous ventilation and 99-100% SpO₂ throughout. He tolerated the procedure well without any complication. He was elated that intubation was avoided. He was discharged home without any problem.

Discussion: This simple nasal PAP assembly maintained spontaneous ventilation and oxygenation in a high-risk patient in a swimmer position under deep sedation during ERCP. It utilizes existing anaesthesia equipment and machine and may improve patient safety at a low cost.

References:

1. www.TSEMask.com;
2. SAMBA 28th AM, 2013;
3. IARS AM: MCC1080, 2015

Learning points: How to prepare a nasal mask assembly using existing anaesthesia equipment and to maintain spontaneous ventilation by providing nasal CPAP in prone position.

16AP07-3

Airway management complications by trainees in a tertiary university hospital ICU

Maichle S., Fariña González T.F., García González I.,

Velasco Lopez E., Ortuño Andérez F., Sanchez García M.

Hospital Clínico San Carlos, Dept of Intensive Care, Madrid, Spain

Background and Goal of Study: Although it is recommended that personnel with the greatest skill and experience perform airway management techniques, it is an essential skill in Intensive Care that need to be acquired by trainee as soon as possible. Some studies showed a 28% rate of complications in tracheal intubation. The aim of our study was to asses the rate and characteristics of complications concerning airway management among Intensive Care trainees in our Unit.

Materials and Methods: Prospective, observational study conducted in a 40-bed ICU during a 3-month period. 15 residents (3 per year/5 years) and the staff were asked to prospectively fill a survey every tracheal intubation (TI), tracheostomy (TO) and chest tube (CT) they had performed. The items collected were: year of residency, time (day or night), urgency and hemodynamic situation. Also type of procedure, who made it, supervision, number of attempts, Cormack-Lehane grade if appropriate and the complications that might have occurred. We classified operators in groups (R1-R3, R4-R5, and staff) and number of attempts (≤2 and >3).

Results and Discussion: 54 airway procedures were done: 36 (66,7%) T1, 13 (24,1%) T0 and 5 (9,3%) CT. 6 (11,1%) were done during night time (0-9 hs) and 34 (63%) during an emergency situation. R1-R3 made 36 (66,7%), R4-R5 15 (27,8%) and staff 3 (5,6%). 17 (31,5%) patients were hemodynamically unstable. 11 (20,4) had any kind of anatomical difficulty. Complication occurred in 6 (11,1%) situation. In general, there was no association between complication and anatomical difficulty ($p=0,91$), who performed the technique ($p=0,5$), supervision ($p=1$), emergency and hemodynamic situation ($p=0,66$ and $p=1$). Concerning T1, complications did not associated with Cormack grade ($p=0,57$) but to >3 attempts ($p=0,005$).

Conclusions: Younger trainees should be encouraged to performed airway management techniques regarding the time of the day, hemodynamic situation, anatomic difficulty and emergency situations. Although supervision had no statistic significance in this study, probably due to a small sample size, it is fundamental for education and patient safety. A limit of 2 attempts per operator is recommended to avoid complications.

References:

1. Jaber S et al. *Crit Care Med* 2006; 34:2355-2361
2. Roux D et al. *Crit Care Med* 2014; 42:886-895

16AP07-4

Audit of using El-Ganzouri prognosis scale for difficult airway assessment in obese patients

Malakhova A., Klimov A., Kamnev S., Subbotin V.

MCSC, Dept of Anaesthesiology & Intensive Care, Moscow, Russian Federation

Background and Goal of Study: Difficult laryngoscopy and intubation in obesity patients is more frequent than in patients with normal BMI [1,2,3,4]. Adequate assessment of difficult airway before surgery with general anaesthesia is topical. The aim of our study was to audit predictive value of El-Ganzouri scale for patients with BMI more than 30 kg/m².

Materials and Methods: Our department has accepted special protocol for patients with BMI more than 30 Kg/m² since 2016. This protocol includes assessment of airway by El-Ganzouri scale and intubation by videolaryngoscope in all cases. El-Ganzouri scale included 7 measures (mouth open, third-molar distance, Mallampati class, neck mobility, the possibility of mandible extension, body weight, anamnesis of difficult intubation). If a patient gains from 0 till 3 points, intubation could be performed with standard laryngoscopy. If a patient gains from 4 till 7 points, intubation is recommended with video laryngoscopy. If a patient gains 8 points or more, awake intubation is recommended with bronchoscope. On the first step anaesthesiologists try to intubate the patients was using videolaryngoscope as standard laryngoscope. If it not possible anaesthesiologist used this device as videolaryngoscope. We used STATISTICA 10.0 for data analysis.

Results and Discussion: During our audit were assessed 50 patients (29 women and 21 men, aged from 26 to 74) which were scheduled general anaesthesia with tracheal intubation. Median of BMI - 37 Kg/m² (30,5-71). 28 patients had from 0 till 3 points, 22 patients had from 4 till 7 points by El-Ganzouri scale. Nobody had 8 points or more. Laryngoscopy and intubation with standard laryngoscopy technique was performed in 39 cases. Laryngoscopy and intubation with videolaryngoscopy was performed in 11 cases. accordance with Griner FF at al. formula. Sensivity was 81 %, specific - 66%, positive predictability - 40%, negative predictability - 93% (Griner FF at al. formula).

Conclusion(s): We recommend El-Ganzouri scale for airway assessment in obese patients. This scale has high prognosis value for standard laryngoscopy. If El-Ganzouri scale recommends using video laryngoscope, it is better to use it even if intubation may be successful with a standard laryngoscope.

References:

1. A. De Jong at al. 2015,
2. Lundstrom LH at al. 2009,
3. Rose DK at al. 1994,
4. Uribe AA at al. 2015.

16AP07-5

Management of the difficult airway: an updated closed claims analysis

Domino K.B.¹, Joffe A.M.¹, Aziz M.F.², Posner K.L.¹

¹University of Washington, Department of Anesthesiology and Pain Medicine, Seattle, United States, ²Oregon Health Sciences University, Anesthesiology & Perioperative Medicine, Portland, United States

Background and Goal of Study: Death/brain damage (death/BD) in difficult intubation claims arising from induction decreased in the 1990s, but remained high if the difficult intubation was encountered during other phases of anaesthesia.¹ Management of the difficult airway in the 2000s may have changed due to improvements of technology and guidance for managing extubation of a difficult airway.² We therefore reviewed recent difficult airway claims in the Anesthesia Closed Claims database (N=10,546) for claims collected through 2014.

Materials and Methods: Inclusion criteria were events in year 2000 or later, surgical/procedural/obstetric claims (no chronic or acute pain), with the primary damaging event of difficult intubation (n=83). There were no exclusions. A supplemental data form was completed by 3 authors to determine the circumstances, location, and phase of care of the difficult intubation and to judge specific management errors (if any). Judgements were assessed by kappa and proportions by Fisher's exact test.

Results: Death/BD occurred more often in difficult airway claims (84%) vs. claims with other damaging events (43%, $p<0.001$). Most difficult airway claims involved emergency (42%) or urgent (22%) intubation, with 36% encountered during purely elective intubation. Most intubations took place in the operating room (72%). Most occurred during induction (57%), with 27% during maintenance, emergence, or recovery from anaesthesia. The proportion of death/BD was not different on induction (77%) vs. other phases of care (91%, $p=0.2$). Concerns with airway management were inadequate preoperative airway evaluation (17%), failure to plan for difficult airway management on induction (24%), lack of back-up plan for difficult reintubation on extubation (12%), preservation (28%), failure to try awake intubation (12%), failure to use a laryngeal mask airway as a bridge (23%), and delay or no call for a surgical airway (19%). Kappas ranged from 0.44 to 0.66. Three or more judgment problems were observed in 22%.

Conclusion: Difficult intubation persists as a mechanism of severe injury. Judgment problems occurred frequently in claims related to difficult intubation suggesting need to improve airway decision-making through simulation and training.

References:

1. Peterson GN, et al. *Anesthesiology* 2005; 103:33-9
2. ASA Practice Guidelines for Management of the Difficult Airway. *Anesthesiology* 2013; 118:1-20.

Acknowledgments: Funded by AQI/ASA

16AP07-6

Usefulness of thyromental height - TMH as an isolated predictor of difficult intubation

Borrero-Cortés C., Bolívar-Trujillo M.

Universidad Nacional de Colombia, Dept of Anaesthesiology, Bogota D.C., Colombia

Complications arising from drawbacks in attempting to achieve or maintain a patent and safe airway may become emergencies requiring advanced measures to maintain patient life. Having validated parameters in observational studies with a significant population sample, allows prior to anesthetic induction and the administration of neuromuscular blocking drugs, it is possible to have a better approximation to the possibility of facing a difficult airway and thus to prepare all the necessary elements for safe intubation.

Objective: To calculate the prediction validity and reproducibility of the parameter "Thyromental Height (TMH)", as isolated predictor of difficult intubation.

Methods and Design: Observational study. First measurement of the thyromental height in the conventional preoperative assessment and a second measurement at the moment the patient was in surgery rooms. Once the anesthetic induction was performed, direct laryngoscopy was performed and according to the findings, the Intubation Difficulty Scale (IDS) score was es-

timated. A correlation was made between the results of the measurements obtained and the results of the IDS to calculate the validity and reproducibility of the parameter thyromental height.

Results: We studied 384 patients (52.6%) women and (47.4%) men. The mean age was 48 ± 19.2 years. The incidence of difficult intubation (score on the IDS >5) was 4.95%. There were no failed intubations or complications associated with airway management. In anesthetic induction, 45 (11.7%) patients received sedation with midazolam; all were given propofol as hypnotic; 209 (54.4%) received fentanyl and 175 (45.6%) remifentanyl and 55 (14.3%) patients received cisatracurium, 315 (82.0%), rocuronium and 14 (3.65%), succinylcholine. No statistically significant differences were found on the IDS according to the drug regimen used. In the concordance analysis between the 2 measurements (conventional preoperative assessment and surgery rooms) an intraclass correlation coefficient of 0.92 was found. For the TMH parameter, a sensitivity of 73.68% was estimated, a specificity of 98.90%; a PPV of 77.78% and a NPV of 98.63%.

Discussion and Conclusion(s): Measurement of TMH is easy, reproducible and shows better statistical performance for predicting difficult intubation compared to the Mallampati test, TMD and oral opening. The results of sensitivity, specificity, PPV and NPV of these other parameters were similar to those described in previous articles.

16AP07-7

Frequency of low minute ventilation events as indication of post-operative respiratory depression

Alparslan T.¹, Wael S.¹, Harvey B.², Chang C.¹, Hovsepian K.¹

¹Cleveland Clinic, Outcomes Research, Cleveland, United States,

²Respiratory Motion, Inc., Research, Waltham, United States

Background and Goal of Study: Opioids are a vital part of postoperative pain management but can cause opioid-induced respiratory depression (OIRD). Early identification of patients at-risk for OIRD in the PACU could improve patient safety and allow for changes in opioid dosing and extra monitoring on the general hospital floor (GHF). We evaluated the ability of a non-invasive respiratory volume monitor (RVM, ExSpirom, Respiratory Motion, Inc.) to ID patients at-risk for OIRD on the GHF by monitoring them in the early post-op period.

Materials and Methods: In an observational study, we used a non-invasive RVM to measure tidal volume, respiratory rate & minute ventilation (MV) for up to 48hr following abdominal surgery. Predicted (MV_{PRED}) was calculated based on body surface area. A Low MV event (LMVe) was defined as $MV < 40\%$ MV_{PRED} sustained ≥ 2 min. LMVe Rate was calculated as LMVe per hour. Patients were grouped by LMVe Rate (A: LMVe Rate $< 1/hr$, B: $1-3/hr$, C: $\geq 3/hr$).

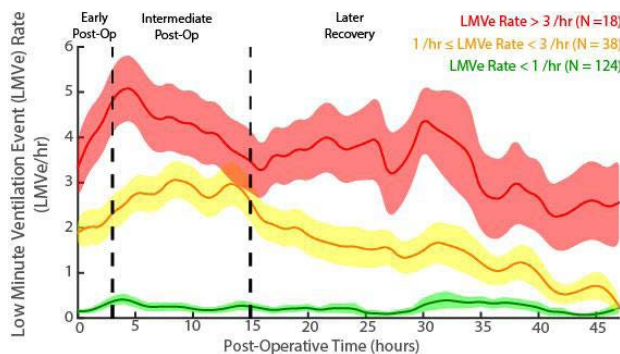


Figure 1. Mean (Solid lines) \pm SEM (shaded regions) LMVe Rate as a function of time following PACU admission. Patients were grouped based on LMVe Rate (A: LMVe Rate $< 1/hr$, B: LMVe Rate between 1 & 3/hr (yellow), C: LMVe Rate $\geq 3/hr$ (red)). In all groups, Early Post-Op LMVe Rate was highly correlated with the rate of LMVe in Later Recovery. For Groups B & C, the LMVe Rate was higher in the Intermediate Post-Op (B: 2.7/hr, C: 4.4/hr) compared to the Early Post-Op (B: 2.0/hr, C: 3.7/hr) & Later Recovery (B: 1.4/hr, C: 3.2/hr).

[Low MV Event Rate as a Function of Time]

Results and Discussion: 180 patients (90 males, 48.0 (18-80) yrs, BMI: 26.5 (15.0-41.1) kg/m^2) were monitored for 3.1 ± 0.1 hr in the PACU & 38.7 ± 0.9 in the GHF 49 patients (27%) experienced no LMVe during the monitoring period & 90% of the monitored time were LMVe free. The majority of patients ("A", 69%, low risk) maintained adequate MV ($107 \pm 4\%$ MV_{PRED}) & had few LMVe (1 LMVe/4.5hr lasting 5.4min). A smaller group ("B", 21%, moderate risk) main-

tained lower MV ($59 \pm 2\%$ MV_{PRED}) & had more frequent LMVe (1 LMVe/32min lasting 6.0min). The smallest group ("C", 10%, high risk) had repetitive LMVe (1 LMVe/16min lasting 7.8min) indicating potentially unsafe MV. Fig 1 shows changes in LMVe Rate over time for the 3 groups. Early Post-Op (0-3hr) LMVe Rate was highly correlated with LMVe Rate in Later Recovery (15-48hr).

Conclusions: Most patients maintained adequate MV with few LMVe in the PACU & GHF, suggesting that the RVM can provide useful data without unnecessary alarms. A small fraction (10%) of patients had repetitive LMVe indicative of OIRD. In clinical practice, these patients could have been identified early on & recurring LMVe could have been prevented with changes in opioid dosing or additional monitoring.

16AP07-8

Tailored optimisation of airway management strategies improves patient safety

Pedersen T.H.¹, Theiler L.¹, Kleine-Bruegggeny M.², Riggenbach C.¹, Greif R.¹

¹Bern University Hospital Inselspital, University of Bern, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland, ²Barts Health NHS Trust, Department of Perioperative Medicine, Barts Heart Centre, London, United Kingdom

Background and Goal of Study: Severe airway-management-related complications were estimated as 1 in 5500 anaesthesia cases. The incidence of minor complications remains unclear. The study goal was to improve patient safety through tailoring strategies to optimise airway management.

Material and methods: First, a baseline was obtained to estimate incidence and nature of airway-related events by closely monitoring all general anaesthesia cases at Bern University Hospital for a 2-month period. Based on analysis of this baseline, 5 tailored interventions were implemented in the 10 months until the next evaluation phase. The interventions were: 1. To not check facemask ventilation before inducing neuromuscular blockade, 2. To preoxygenate optimally, 3. To introduce a standardised pre-anaesthesia checklist, 4. To change operator to most experienced after 2 unsuccessful attempts, 5. To use video laryngoscopy whenever possible. This phase was followed by a re-analysis, where again all general anaesthesia cases were monitored over a 2-month period. Primary outcome was the number of patients with airway-management-related events.

Results and Discussion: Number of patients with events decreased from phase 1 to phase 2 (Table 1). The events "Difficult mask ventilation", "Cormack/Lehane ≥ 3 ", "Desaturation" and "Oesophageal intubation" decreased (Table 2). There were also fewer airway management attempts (Table 3).

Table 1	Phase 1	Phase 2	p-value
Cases monitored	3669	3786	
Total number of patients with events (%)	572 (15.6)	439 (12.0)	< 0.001
Total number of events (%)	805 (22.0)	551 (14.6)	< 0.001

[Total cases with airway events]

Table 2	Phase 1	Phase 2	p-value
	Events (%) (n=3669)	Events (%) (n=3786)	
Difficult bag mask ventilation	140 (3.8)	101 (2.7)	0.005
Cormack/Lehane grade ≥ 3	131 (3.6)	75 (2.0)	< 0.001
SpO ₂ $< 95\%$ or 5% decrease from starting value	106 (2.9)	73 (1.9)	0.007
Oesophageal intubation	51 (1.4)	31 (0.8)	0.025
Bloody secretions noticeable in airway or on device	30 (0.8)	10 (0.3)	0.001

[Examples of airway events]

Table 3	Phase 1	Phase 2	p-value
	Cases (%) (n=3669)	Cases (%) (n=3786)	
1. attempt	3363 (91.7)	3531 (93.3)	0.009
2. attempt	247 (6.7)	228 (6.0)	0.210
≥ 3 attempts	59 (1.6)	27 (0.7)	< 0.001

[Successful airway management]

Conclusion: The number of patients with airway-management-related events decreased significantly with 23%. This was achieved by analyzing the prospectively obtained baseline and hereby implementing a bundle of tailored interventions for airway management.

16AP07-9

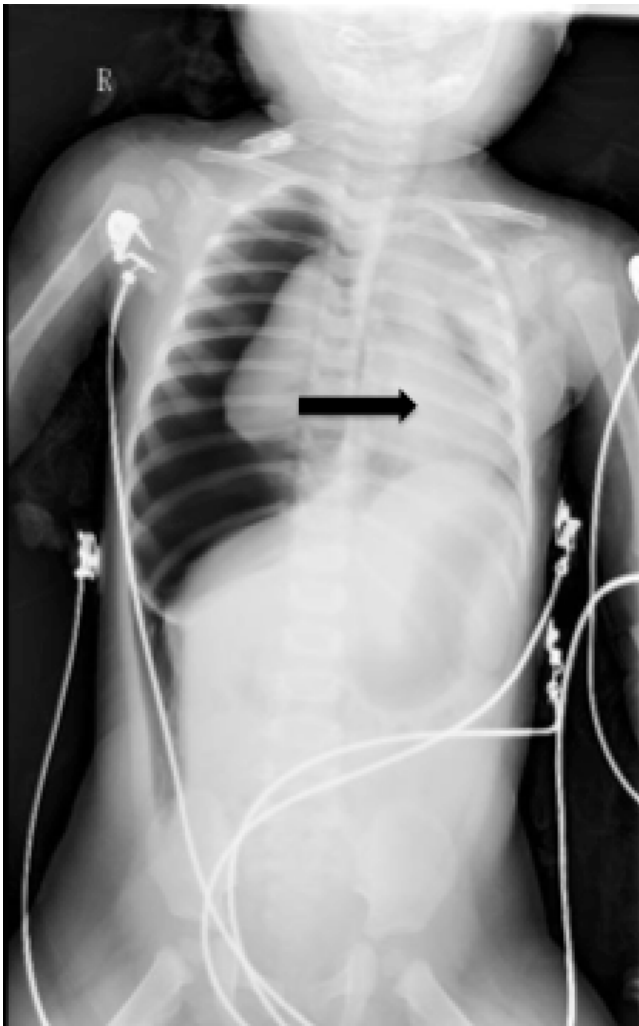
Tension pneumothorax during foreign body retrieval: experiences with 2 cases

Xu Z., Jinhong W., Yuexin Z., Weixing L.
Eye & ENT Hospital of Fudan University, Dept of Anaesthesiology, Shanghai, China

Background: Tension pneumothorax during surgery will lead to a fatal emergence unless treated by decompression treatment. We reported two cases, both of them developed a rapid onset of tension pneumothorax during rigid bronchoscope procedure.

Case report:

Case 1: An 8-month old girl with suspected aspiration of peanut for 1 day. Manual jet ventilation was used. After extraction, the SPO₂ decreased. X ray showed: Right pneumothorax (Fig 1). A right pleural cavity drainage was done, and the test tube was extracted 5 days later.



[Fig. 1: Right pneumothorax, with lung collapse]

Case 2: A 2-year-old boy, with a suspected peanut inhalation for 10 days. Manual jet ventilation was used. The chest cavities overexpanded, followed by circulation compromise. A thoracentesis was done by the anesthetist, with a "hiss" of rapid exit of air. X-ray afterwards showed (Fig 2): Bilateral Tension pneumothorax. The patient discharged 3 weeks later without cerebral hypoxia complications.



[Fig. 2: Bilateral Tension pneumothorax]

Discussion: Tension pneumothorax usually caused by a collapsed lung, seldom occurred in both sides [1], may arise from an underlying lung disorder. Some specific issues:

1. The anesthetic plan: The flowchart of anesthetic protocol in our department (Fig 4) Focus on: misplacement of the jet tube, anesthesia plan, ventilation mode, patient's chest wall motion.
2. Communication with surgeon: anesthetic plan and possible complications, et al...
3. Decrease the pneumothorax related mortality and morbidity: A prompt decompression should be considered [4], even before a radiological confirmation, and should be in skilled hand.

References: Barton ED, Rhee P, Hutton KC, et al. The pathophysiology of tension pneumothorax in ventilated swine. *J Emerg Med* 1997;15:147-53.

Learning points: A prudent preoperative assessment, effective communication with surgeon and prompt crisis management strategy are crucial in preventing iatrogenic damage and decrease adverse complication perioperatively.

16AP07-10

Boerhaave's syndrome - early diagnosis is the key

Tumkur Nagendra G.¹, Ghosh S.²

¹Prince Philip Hospital, Hywel Dda Health Board, Dept of Anaesthesiology & Intensive Care, Llanelli, United Kingdom, ²Hywel Dda Health Board, Dept of Anaesthesiology & Pain Medicine, Carmarthen, United Kingdom

Background: Boerhaave's syndrome is a rare condition in which misdiagnosis, as is often the case usually have grave consequences for the patient. We describe a patient with Boerhaave's syndrome who presented to a district general hospital, and the prompt management preventing a fatal outcome.

Case report: A young female presented with dull chest pain and breathlessness to a District General Hospital without on call surgical cover. Following investigations, she was treated for possible pneumonia/pulmonary embolism. The patient's condition started to deteriorate with increased oxygen demand and was admitted to intensive care, where mechanical ventilation had to be initiated with inotropes. The inotrope requirements increased considerably within the next few hours. The X-ray report showed left lower lobe consolidation with effusion. Based on physical examination and FAST scan,

the pleural effusion was drained to reveal a brown foul smelling fluid.

The surgical team at the tertiary centre was contacted and by the time the CT report of the oesophageal rupture was issued, the transfer to the tertiary centre was completed.

The patient recovered well over the next few weeks and was discharged home at 6 weeks.

Discussion: Spontaneous oesophageal rupture (Boerhaave syndrome) is caused by a sudden rise in intraoesophageal pressure and makes up about 15% of all oesophageal ruptures. Classically, patients present with Meckler's triad of chest pain, vomiting and subcutaneous emphysema. This triad occur in only 14% of patients with Boerhaave's syndrome [1]. Early clinical diagnosis and CT enables more detailed assessment to exclude many of the differentials (e.g. pulmonary embolism), while giving strong evidence of oesophageal rupture [2].

References:

1. Griffin SM, Lamb RJ, Shenfine J, Richardson DL, Karat D, Hayes N. Spontaneous rupture of the oesophagus. *Br. J. Surg.* (2008), 95(9):pp 1115-20.
2. Fadoo F, Ruiz DE, Dawn SK, Webb WR, and Gotway MB. Helical CT esophagography for the evaluation of suspected esophageal rupture or rupture. *The American Journal of Roentgenology*, (2004), 182(5), pp 1177-1179.

Learning points: Our case on Boerhaave's syndrome focuses on the importance of fast and accurate diagnosis particularly by imaging and critical thinking, which leads to vastly improved outcomes and highlights the limitations for doing so at a secondary care centre.

16AP07-11

Respiratory failure caused by postoperative hypothermia in elderly patient with pituitary dwarfism after urgent surgery

Djurdjevic Svraka A.¹, Svraka D.², Gasevic Kasagic M.¹

¹General Hospital Gradiska, Dept of Anaesthesiology & Intensive Care, Gradiska, Bosnia and Herzegovina, ²University Clinical Center Republic of Srpska, Dept of Anaesthesiology & Intensive Care, Banjaluka, Bosnia and Herzegovina

Background: A rare entity, hypoplastic pituitary, when presented to us for elective surgery requires a detailed evaluation and postoperative follow up. Many anaesthetic problems can occur if patient with pituitary dwarfism requires urgent surgery.

Case report: A 73 year old lady with primordial dwarfism, 23kg bodyweight, short statured, puppet facies, highpitched voice, limited elbow extensibility, with secondary hypothyroidism, cardiomyopathy and arterial hypertension, was short prepared for urgent surgery because incarcerated femoral hernia. General anaesthesia was conducted with doses of medication Fentanyl, Propofol, Atracurium on the basis of bodyweight and elderly.

After the induction and preoxygenation intubated without difficulties with 6.5 endotracheal tube which was a optimal proper-size. Peroperatively we have hemodynamical stable state.

After surgery on awakening from anesthesia when patient was awake but the resulting respiratory failure despite the reversion neuromuscular block. There was not satisfied criteria for extubation and oxygenation of blood began to fall to immeasurable value on the pulse oximetry. After measuring body temperature which was low then 35 degrees Celsius, despite optimal ambient temperature, we started with warming the patient and administering a warmer parenteral infusion. How the body temperature rose to 36.5 degrees Celsius respiratory function recovered. After safe extubation patient was observed at ICU for one day.

Discussion: The responsibility of the hypothalamic-pituitary system to stress is depressed because there is no detectable or very low ACTH in the peripheral blood. Low thyroid hormones can not control the basale metabolic rate (body temperature) and play an important role in growth and maturation. As compared to the size body, the relatively increased body surface area, there is a good chance of significant drop in body temperature. Anesthetic induced vasodilatation and more suppressed adrenal, increased heat loss and reduced heat production is insufficient to decrease in core temperature.

References: Sessler, D.I. Temperature monitoring. *Millers Anesthesia* 6th Edition. Elsevier Churchill Livingstone, Philadelphia, PA, 2005, Vol.1:Chap 40, pgs 1571-1597.

Learning: Because of more reasons for intraoperatively hypothermia in patient with pituitary dwarfism early thermal management has to be remembered.

16AP07-12

Increased incidences of post-anesthesia care unit (PACU) overstay and postoperative subcutaneous emphysema (SE) in transoral vestibular endoscopic thyroidectomy (TVET): an audit report

Lan K.M., Wang K.F., Lin Y.T., Wang L.K., Wu S.Z., Chen J.Y.

Chi Mei Medical Center, Dept of Anaesthesiology, Tainan, Taiwan, Republic of China

Background and Goal of Study: Transoral vestibular endoscopic thyroidectomy has been developed for a better cosmetic result. In our hospital, the new surgical technique has been introduced since 2015. Routine quality control report revealed increased PACU overstay incidence. Gas insufflations into neck region also raised concern. Herein we present a retrospective audit.

Materials and Methods: A total of 80 patients received TVET from Oct. 2015 to Sep. 2016. General anesthesia was induced and maintained with sevoflurane/desflurane in oxygen/air mixture (FIO₂ 0.4-0.5; 1-2 L/min). Under nasotracheal intubation and neuromonitoring, all operations were performed by one experienced laparoscopic surgeon. He used laparoscopic instruments to establish 3 subcutaneous tunnels from oral vestibule to front neck and create an air pocket with 6 mmHg CO₂ insufflation. During PACU care after surgery, nurses checked patient's neck, shoulder and chest at 15 minutes if subcutaneous emphysema (SE) develops. PACU staying time and adverse events were recorded.

Results: The incidence (7/80 = 8.8%) of PACU overstay (longer than 2 hours) was higher than average monthly incidence (3.4%) ranging from 2.8% to 3.9%. SE was found in 31 patients (31/80 = 38.8%). Three of them had stridor (3/31 = 9.7%) and ten exhibited temporary difficulties of breath or swallow (10/31 = 32.3%). After oxygen therapy, none experienced desaturation (SPO₂ < 90%). Nonetheless, none stayed in PACU longer than 3 hours.

Discussion: PACU overstay may result in operating room congestion, reduced patient satisfaction and increased financial burden. In our audit, SE occurred in more than one third patients and the incidence of PACU overstay was increased. PACU overstay was related to SE and its associated sequelae which was caused by CO₂ insufflation near airway during TVET procedures. SE occurs as a benign course and resolves spontaneously in most cases. SE is easily overlooked when this minor complication goes without other complications. It may go unrecognized because of rapid absorption of CO₂. However, it may progress to pneumothorax or mediastinal emphysema in rare conditions. Hence, SE is a concern for anesthesiologists because of potential risks of subsequent major sequelae.

Conclusion: TVET is a new technique, however, it is not completely proven to be safe and without potential morbidity. Increased incidences of PACU overstay and SE after TVET were noted. Further investigation is warranted.

16AP08-1

Feelings of pressure among operating room professionals when using the WHO safe surgery checklist

Swinnen W.¹, De Meirsmans S.¹, Bogaert S.¹, Pannier E.¹,

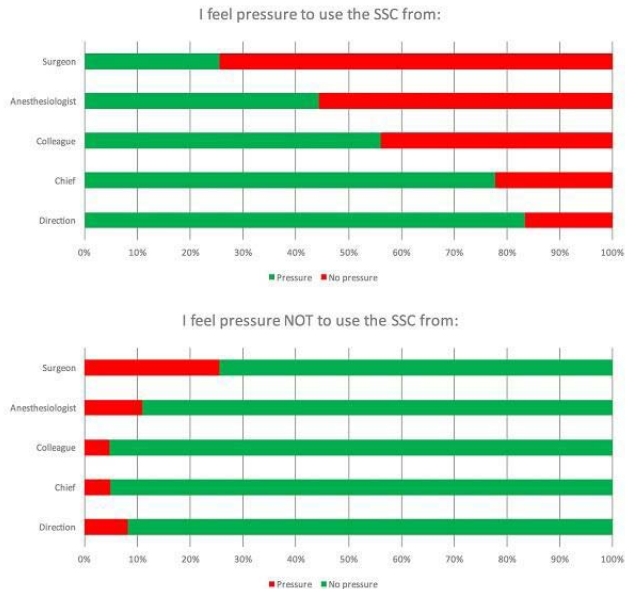
Bergs J.², Blot S.³

¹az Sint-Blasius, Dept of Anaesthesiology & Intensive Care, Dendermonde, Belgium, ²Hasselt University, Medicine & Life Sciences, Hasselt, Belgium, ³Ghent University Hospital, Dept of Internal Medicine, Ghent, Belgium

Background and Goal of Study: The WHO promotes the use of the Safe Surgery Checklist (SSC) in OR's. The use of the SSC is part of the International Patient Safety Goals, adopted both by accreditation organisms and the Flemish authorities. Implementing the SSC is a laborious process with lots of obstacles. Feelings of pressure, exerted or experienced by different OR professionals (ORP) are important for the acceptance and the actual use of the SSC.

Materials and Methods: An online Survey Monkey survey was open for all surgeons, anesthesiologists, and OR nurses in 55 hospitals in Flanders (Belgium), between February 15th and March 29th 2016. The survey explored the presence of feelings of pressure when using the SSC. Subgroup analysis was done for professional groups and OR experience. Statistical analysis: Chi-square and Fisher's exact tests. Results with p<0.05 are statistically significant.

Results and Discussion: After exclusion of 41 answers (incompleteness, no (known) use of SSC), 649 answers were analyzed. Professional groups: surgeons (28%); anesthesiologists (33%); nurses (39%). Experience in OR: <1y (5%); >1y (15%); >5y (18%); >10y (26%); >20y (36%). Hospital size (n beds): <200 (2%); >200 (40%); >500 (33%); >1000 (25%). Surgeons exert pressure not to use the SSC (stated by anesthesiologists and nurses (no intergroup difference)). Surgeons are less committed to enforce the effective use. Anesthesiologists exert less pressure to use or not to use the SSC. The highest pressure to use the SSC comes from the department chief and the hospital direction. Feelings of pressure are significantly present among less experienced (<10y) nurses ($p=0.01$), and more exerted by their colleagues ($p=0.007$).



[Feelings of pressure]

Conclusion(s): Existing feelings of pressure are confirmed, however, remain limited. They follow traditional dividing lines between different ORP Physicians seem less committed to enforce the use of the SSC.

Reference: O'Connor P, Reddin C, O'Sullivan M, et al. Surgical checklists: the human factor. *Patient Safety in Surgery* 2013;7:14

16AP08-2

Handover checklist: improving surgical patient safety

Chamorro García E., Portas González M., Cabrerizo Torrente P., Tisner Madrid M., Romera Rabasa A., González García C. *Hospital General Universitario Gregorio Marañón, Dept of Anaesthesiology & Intensive Care, Madrid, Spain*

Background and Goal of Study: Patient handover (the transfer of information between individuals and teams) is a critical moment for patient safety. The main barriers to a proper handover include inaccuracy, incomplete or overload of information, lack of standardization and distractions.

Our aim is to develop a handover checklist to standardize information and improve communication. We hypothesized that the development of a written protocol containing relevant data may reduce anaesthesia care transition errors, improving patient safety.

Materials and Methods: It is the first part of an observational prospective single blind study in a tertiary hospital.

We surveyed, by intradepartmental e-mail, viewpoints of department members involved in patient transfers before implementation of the protocol. Answers were ranged 1-5 (very dissatisfied- very satisfied). Starting on May 2016 and during 4 weeks, an observer evaluated 50 non-obstetric adult patient handovers to the PACU and analysed anaesthetics items. Thirty minutes later, another survey was delivered to the receiver to assess the satisfaction level with information provided and the ability to remember handover relevant data. Handover length and professional status were also recorded.

We developed a written protocol with concise patient information to standardize patient transfer.

Results and Discussion: We had a rate of response of 14%. The 4% of respondents stated being very satisfied with the reported information and the 11% recognized that the handover was usually very hurried.

Spontaneously, 96% of anesthesiologists reported general information (allergies, type of anaesthesia...). They only reported adverse events if they had taken place. Other aspects (neuromuscular block reversion, antibiotics or analgesia), were reported in 40% of cases. Postanaesthetic care was frequently forgotten (80%). In contrast, nursing care was completely reported in the 48% of the times. Relevant reported information was remembered 30 minutes after the handover in 93% of cases.

Despite 36% of respondents recognized being very satisfied with reported information, 68% stated the handover was very rushed.

Conclusions: The surgical handover remains one of the main causes of critical incidents in our environment nowadays. During the verbal report, the hurry or the lack of standardization could drive to errors and omissions. Implementation of a written checklist could improve the quality of communication and reduce the possibility of harm to the patient.

16AP08-3

The original WHO safe surgery checklist: are all items appropriate?

Bogaert S.¹, De Meirman S.², Pannier E.³, Blot S.⁴, Bergs J.⁵, Swinnen W.⁶

¹Ghent University Hospital, Dept of Anaesthesiology, Gent, Belgium, ²Koninklijke Universiteit Leuven, Dept of Anaesthesiology, Leuven, Belgium, ³az Sint-Blasius, Dept of Anaesthesiology, Dendermonde, Belgium, ⁴Ghent University Hospital, Research and Development Department, Gent, Belgium, ⁵Hasselt University, Dept of Anaesthesiology, Hasselt, Belgium, ⁶az Sint-Blasius, Dept of Anaesthesiology & Intensive Care, Dendermonde, Belgium

Introduction: The WHO promotes the use of the Safe Surgery Checklist (SSC) in OR's, to reduce the number of incidents and to save lives. The use of the SSC is part of the International Patient Safety Goals, and adopted by accreditation organisms and the Flemish authorities. The WHO stimulates individual organizations to modify the SSC to account for differences among facilities, meanwhile warning not to remove safety steps simply because they cannot be accomplished.

Methods: A SurveyMonkey survey was open for surgeons, anesthesiologists, and OR nurses in 55 hospitals in Flanders (Belgium), between Feb 15th and Mar 29th 2016. The study was approved by the Committee for Medical Ethics of the az Sint-Blasius, Dendermonde. The survey explored opinions about appropriateness of the items in the original WHO SSC. Subgroup analysis was done for professional groups, OR experience, hospital size, and hospital accreditation status. Statistical analysis: Chi-square tests and Fisher's exact tests. Results with $p < 0.05$ are statistically significant.

Results: After exclusion of 41 answers (incompleteness, no (known) use of SSC), 649 answers were analyzed. The majority (61%) uses an adapted SSC, only 6% use the original WHO SSC. 33% ignores the format of the SSC. Professional groups: surgeons (28%); anesthesiologists (33%); nurses (39%). Experience in OR: <1y (5%); >1y (15%); >5y (18%); >10y (26%); >20y (36%). Hospital size (n beds): <200 (2%); >200 (40%); >500 (33%); >1000 (25%).

Surgeons were less convinced of appropriateness of Site marking ($p < 0.0001$), Team members introduction ($p = 0.001$), Confirm id/site/procedure ($p = 0.003$), Sterility confirmed ($p = 0.003$), Instrument, sponge & needle counts ($p = 0.0001$). Anesthesiologist found Allergy ($p < 0.005$), Anesthesia Medication ($p < 0.00001$), Pulse oxymeter ($p = 0.002$), Imaging displayed ($p = 0.03$) and Concerns for recovery ($p = 0.0004$) less appropriate. Nurses were not convinced about appropriateness of Anticipated duration ($p = 0.03$). There was no influence of hospital size, neither of hospital accreditation status.

Conclusion: Flemish OR professionals do not support all items of the WHO SSC to the same extent. Particularly, estimated blood loss, team member introduction and anticipated duration are less supported. Judgment is clearly linked to direct professional interest.

References: WHO, Implementation Manual WHO Surgical Safety (1st edition), www.who.int/patientsafety/safesurgery/ss_checklist/en/, assessed online on 2016/05/17.

16AP08-4**Utilizing checklists to improve handoff in the Post Anesthesia Care Unit (PACU)**Tollinche L.*Memorial Sloan Kettering Cancer Center, Dept of Anaesthesiology & Intensive Care, New York, United States*

Background and Goal of Study: Perioperative miscommunication is closely linked to adverse events. Use of checklists to standardize the handoff in the post anesthesia care unit (PACU) has been shown to effectively reduce medical errors. Our study investigates the use of a checklist to improve the handoff in the PACU.

Materials and Methods: A total of 120 handoffs were observed in real time in the post anesthesia care unit (PACU). Sixty (60) handoffs were observed for each pre- and post-implementation period. Using a 12-item checklist, each observer quantified items reported during every observed handoff. Additional data points, such as: duration of the report, training of the anesthesia staff giving report, and total number of questions asked by PACU staff were collected for further analysis.

Results and Discussion: Composite value from both surgical and anesthesia reports showed an increase in the median report of 9 items from pre-implementation period to 11 post-implementation. Surgical staff reported consistently a median of 6 items, whereas anesthesia staff improved from 5 reported items to 9. Median duration of handoff increased from three to four minutes per handoff. Pre-implementation, more items were reported with increasing duration, but post-implementation, median of 11 items were reported consistently in all durations. Improvement was seen in all types of anesthesia providers, reporting a median of 11 items post-implementation.

Conclusion(s): Implementation of a checklist for PACU handoff increased overall data transfer. The observed improvement was independent of duration of the report and level of the training of anesthesia staff.

16AP08-5**Creating cognitive aids for crisis situations in smartphone platforms: 'anestcritic' and our experience**Ferrero-Coloma C.¹, Cuesta-Montero P.², Carrió-Font M.³,Navarro-Martínez J.A.¹, Puertas-González L.A.⁴

¹Hospital General Universitario de Alicante, Dept of Anaesthesiology & Intensive Care, Alicante, Spain, ²Hospital General Universitario de Albacete, Dept of Anaesthesiology, Albacete, Spain, ³Hospital de Denia, Dept of Anaesthesiology & Intensive Care, Denia, Spain, ⁴Mediacomunicacion, Commercial Department, Albacete, Spain

Background and Goal of Study: Medical crisis, during surgery or in a critical care environment, has two characteristics: they are at the same time potentially severe and are not usually seen. This combination of factors makes the rate of human mistakes higher. Learning and management of crisis situations has not a globally accepted rule, and teaching methods such as the one used by pilots have been imported to the crisis management's field. We wanted to import from aviation industry the use of cognitive aids in a more technological and accessible way using our smartphones.

Materials and Methods: During 2015 an in-depth we conducted a review of procedures, protocols, algorithms and guides published by national and international journals and societies about management and treatment of crisis situations that could happen in an anesthesia or critical care environment. Once reviewed, we started writing algorithms that could help in those situations as a cognitive aid. At the same time, developing a suitable platform for those algorithms was necessary. Our roadmap was:

1. Contacting an app programming team
2. Meetings and brainstorming about features in the app were held: hyperlinks, dose calculator...
3. Topic distribution, classification and priority
4. Tests in simulation units
5. Publication
6. Review and updates
7. Download numbers analysis

Results and Discussion: Our tests with our app 'Anestcritic' in simulated scenarios allowed us to improve the results in comparison to those without any cognitive help, showing a more structured differential diagnosis, with less initial mistakes to diagnose and treat, even in those less frequent pathologies.

After 6 months of its publication, 'Anestcritic' has reached 849 downloads in both Android (213) and iOS (636) platforms. It has been in the top ranking of medical apps for several weeks. Only 11 of the 213 downloads in Android platforms were deleted after being downloaded, showing a high level of acceptance among users.

Conclusion(s): The unquestionable utility of protocols in crisis situations does not necessary means these cannot be improved. New technologies, and especially the widespread use of smartphones, provide us with a unique opportunity. The successful numbers of download after launching 'Anestcritic' 6 months ago, show us the high demand of cognitive helps and the awareness of its utility among anesthesiologists and critical care providers.

16AP08-6**Improving safety of emergency out-of-theatre intubations in an acute NHS Trust using stakeholder engagement in the development of an intubation checklist**Ralhan V.¹, Sadeghi P.¹, Shanmugasundaram P.¹, Choudhury M.²

¹Buckinghamshire Healthcare NHS Trust, Dept of Anaesthesiology & Intensive Care, High Wycombe, United Kingdom, ²Buckinghamshire Healthcare NHS Trust, Dept of Emergency Medicine, Aylesbury, United Kingdom

Background and Goal of Study: Critically ill patients in the intensive care unit (ICU) and emergency department (ED) may require tracheal intubation. Limited physiological reserve of these patients, lack of staff familiarity with, and the logistical challenges of out-of-theatre intubations (OOTI) make this procedure especially hazardous. The fourth National Audit Project¹ (NAP4) reported that failure and complications during OOTI were more frequent than those in theatre. It recommended the development of an intubation checklist for all ED and ICU intubations¹. Stakeholder engagement is well recognised in underpinning the success of implementing change from Quality Improvement Projects (QIP)^{2,3} and therefore was used in the development and implementation of a checklist to improve the safety of OOTIs at Bucks Healthcare NHS Trust (BHNT).

Materials and Methods: 84 staff members from the multi-disciplinary team (MDT) involved in emergency OOTI (including doctors, nurses and operating department practitioners from Anaesthetics, ICU and ED) at Stoke Mandeville Hospital were given a five-question survey over six weeks. The survey asked respondents their views on the use of an OOTI checklist, and their preferred option of two checklists: Checklist 1 was a modified prehospital intubation checklist, and Checklist 2 was an example provided in NAP4.

Results and Discussion: 83 staff members returned completed questionnaires. 90% believed an OOTI checklist would be useful, of which 92% preferred Checklist 2. 45% of respondents recommended adjustments to Checklist 2.

Conclusion: Stakeholder engagement was instrumental in the development of this OOTI checklist. By engaging the MDT their experience and knowledge was shared and influenced the outcome. Checklist 2 will be modified, based upon the recommendations from this study, and implemented BHNT, in line with the NAP4 recommendations.

References:

1. Cook TM, et al. Major complications of airway management in the UK: results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. *Br J Anaesth* 2011; 106: 632-42
2. NHS England/Nursing/LTC. MDT Development - Working toward an effective multidisciplinary/multiagency team. NHS England. 2014
3. Rowling E. Leadership and Engagement for Improvement in the NHS: together we can. Report from The King's Fund Leadership Review. 2012

16AP08-7**Patient discomfort caused by pre-induction checklists?**

Nabecker S., Pedersen T., Theiler L., Riggenbach C.,
Plazikowski E., Greif R.

University Hospital of Bern, Inselspital, Dept of Anaesthesiology &
Pain Medicine, Bern, Switzerland

Background and Goal of Study: Since WHO released the Safe Surgery Saves Lives Program perioperative checklists were introduced worldwide to minimize errors and to improve patient safety. Implementation of checklists is not easy and anaesthesia personnel often remain reluctant. The argument against checklists is the presence of patients and possible discomfort for them. We investigated how patients and anaesthesia personnel perceived discomfort when a pre-induction checklist was used.

Materials and Methods: Anaesthesia health care professionals were asked

1. If they should go through checklists while the patient is present;
2. If checklists before anaesthesia induction cause patient discomfort; and
3. If checklists before induction of anaesthesia reduce the risk of errors.

In-hospital patients were asked the same questions prior to the use of the Surgical Safety Checklist before entering the OR, and on the 1st postoperative day. Primary outcome was the level of patient discomfort. We rated all questions on a 100 mm Visual Analogue Scale (VAS), where 100 was total

agreement. Wilcoxon rank sum test and Mann-Whitney U test were applied as appropriate.

Results and Discussion: 148 anaesthesia health care professionals and 123 patients were included. The results show a significant difference in the perception of discomfort by the use of a checklist when comparing patients and anaesthesia personnel (Table). Patients strongly agree that health care professionals should go through checklists while the patient is present. Interestingly, anaesthesia personnel rated the potential discomfort much higher than actually perceived by patients. In contrast, both groups rated the possibility of reducing risks of errors high.

VAS, median 25th; 75th percentile	Patients before induction n= 123	Patients 1st postoperative day n=118	Anaesthesia personnel n=148	p-value patient before/after	p-value personnel vs patient after
Question 1	100 (70; 100)	100 (97; 100)	84 (57; 95)	< 0.01	< 0.01
Question 2	7 (0; 45)	0.5 (0; 19)	30 (13; 59)	< 0.01	< 0.01
Question 3	97 (60; 100)	100 (82; 100)	93 (74; 99)	< 0.01	< 0.01

[Table]

Conclusion: Patients experience far less discomfort observing the use of pre-induction checklists than anaesthesia personnel expect. Patients value the potential safety benefit significantly higher than anaesthesia personnel.

Education**17AP01-1****Impact of stress on the efficacy of management of life-threatening conditions provided by anesthesiology residents and medical students**

Wroblewski L., Janiszewska A.

Medical University of Warsaw, Dept of Anaesthesiology & Intensive Care, Warsaw, Poland

Background and Goal of Study: This is an innovative simulation-based study focused on stress level evaluation in medical providers. The aim of the study was to measure the relation between stress and effectiveness of management in life-threatening conditions. The study group comprises young anesthesiology residents (AR) and medical students (MS) - medical providers particularly prone to elevated stress levels. We expected that increased stress level may cause increased error frequency in delivering appropriate treatment and decision making time.

Materials and Methods: 26 subjects were examined: 10 AR and 16 MS. The subjects were involved in two independent simulation stations - airway obstruction in unconscious patient and in-hospital cardiac arrest. All subjects who had taken part in the study were qualified in advance life support. We measured time needed to solve the problem and errors made in algorithms. The stress level was measured by galvanic skin response and blinking rate using eye-tracking technology. The gaze duration of fixation was evaluated (eye-tracking technology). T-student test was used for statistical analysis.

Results and Discussion: Group with higher level of stress (higher galvanic response, higher blinking rate) had higher error frequency in both simulation. AR presented higher levels of stress in both simulations than MS. The time needed to establish airway patency was shorter in MS group (mean: 20,05 s in MS vs 35,06 s in AR, $p=0.01$), probably because AR needed more time for checking for safety, general assessment and breathing evaluation. There was no significant difference between groups in the time needed to recognize and defibrillate ventricular fibrillation, although the interruptions in cardiopulmonary resuscitation were longer in MS group (mean: 19,3 s in MS vs 10,7 s in AR $p=0,04$). AR had focused their eyesight on the most important information, whereas MS had more often but shorter gazes.

Conclusion(s): Higher stress levels could lead to higher errors rate in simulated life-threatening situations. Unexpectedly medical students were less stressed during simulation of than young anesthesiology residents.

This is a pilot study, further surveys on bigger group of subjects are planned to establish the association of stress level and error frequency.

Acknowledgements: The authors would like to thank Institute of Sensory Analysis for making galvanic skin response method and eye-tracking available.

17AP01-2**Improving transfusion safety through social networking sites**

Nakhli M.S.¹, Kahloul M.¹, Kacem I.², Boughatas W.², Mhamdi S.¹, Mrizak N.²

¹Sahloul Hospital, Dept of Anaesthesiology & Intensive Care, Sousse, Tunisia, ²Farhat Hached Hospital, Department of Occupational Medicine, Sousse, Tunisia

Background and Goal of Study: Transfusion safety requires the adherence of clinicians to the best transfusion practices. Several studies evaluating the level of transfusion safety knowledge and practices found disappointing results despite the efforts of faculty staff. Social networking sites (SNS) such as Facebook®, while not originally intended to be used as learning environments, may be adapted for the distance-learning part of training programs. The purpose of the study is to evaluate the impact of a training program through the facebook social network, on young physicians' knowledge of blood transfusion safety.

Materials and Methods: This is an interventional study carried out at the Teaching Sahloul Hospital of Sousse over a 3 month period. The first stage of the study was an initial assessment of knowledge through a questionnaire. Subsequently, a group was created on 'facebook' including the study population. Key messages were broadcast on this group in the form of a caricature over a period of 1 month. Finally, the survey was repeated after completion of the training program for 1 month.

Results and Discussion: The overall response rate to the survey was 77%. The mean age of the study population was $27,5 \pm 2,9$ years with a sex ratio of 0.7. Our population was divided into 39 internal and 38 residents. They were affected mainly in anesthesia-reanimation services in 44.2% of cases. The transfusion rate was more than twice a week in 63.6% of cases. The correct response rate by question before the training program was $52.33 \pm 15\%$. 67% of our participants correctly answered more than half of the questions. The correct response rate by question after the intervention was $66.12 \pm 13.7\%$ ($p < 10^{-3}$). Almost the majority (92.2%) of participants had correctly answered more than half of the questions. Our participants rated this evaluation program as beneficial in 70% of the cases.

Conclusion(s): We report a positive impact of this program in improving knowledge. Further studies are needed to evaluate the effectiveness of SNS in blended learning environments.

17AP01-3

Teaching low-flow anesthesia methods: does it worth it?

Czobor N.R.¹, Lukacs F.², Holndonner-Kirst E.¹, Gál J.¹, Merkely B.³, Székely A.¹

¹Semmelweis University, Dept of Anaesthesiology & Intensive Care, Budapest, Hungary, ²Semmelweis Medical University, Dept of Anaesthesiology & Intensive Care, Budapest, Hungary, ³Semmelweis University, Department of Cardiology, Budapest, Hungary

Background: The adequate use of low-flow anesthesia is an effective method to reduce institutional charges of clinical centers, while patient safety is continuously maintained. The primary aim of this study was to show out, how efficient is a fast track training focusing on a new anesthesia management strategy.

Materials: To manage the anesthesia, Asys CS² anesthesia machine by Datex-Ohmeda was used, allowing the measurement of the exact consumption of different anesthetic gas components (inhalational agents, fresh gas flow). The prospectively collected data included patients who underwent cardiovascular surgery in the Department of Cardiovascular Center of Semmelweis University. We defined a period before the training organised on 15-09-2016 (pre-course period) and another after it (post-course period). The examination focused on the consumption of isoflurane and sevoflurane, and on the analysis of the training's effectiveness. For statistical analysis Student T-test and one-way ANOVA were applied.

Results: The data of 435 patients, anesthetized by 29 anesthesiologists, were analyzed. During the pre-course period, the hourly used quantities were 5.1±9.1 ml of sevoflurane (median 6.5 ml; IQR 4.2-9.6) and 3.0±5.1 ml of isoflurane (median 4.3; IQR 3.3-7.0) while in the post-course period the same consumptions were 2.7±4.4 ml and 2.2±3.0 ml respectively. The difference was significant ($p < 0.001$). The charges of hourly used fresh gases were 796±1047 Ft (median 784; IQR 512-1162) for the pre-, and 469±480 Ft (median 524; IQR 395-884) for the post-course period ($p=0.002$). Considering the two periods, the medians and standard deviations of all three data are showing a decrease. During the second period, those who did not attend to the training, consumed hourly 3.7±6.2 ml of sevoflurane (median 7.6, IQR 4.4-11.1) and 1.9±2.6 ml of isoflurane (median 6.8; IQR 3.0-11.7; $p=0.68$). The total fresh gas flow charges for the same group showed no significant difference (median 817; IQR: 443-1418 for the first and median 924; IQR 443-1418 for the second period; $p=0.68$).

Conclusions: It is desirable to optimize the cost-effectiveness and environmental aspects of the use of anesthetic agents. According to our findings, the amount of fresh gas consumption, thus the expenditures on anesthetic agents, decreased after a fast-track low-flow anesthesia management training. The difference is given mostly by the usage of sevoflurane.

17AP01-5

A Quest for Optimal Compliance with Joint Commission International Standards for Anesthesia: There and back again

Ringoir J.¹, Fakir N.¹, Van Biesen S.², Kennis M.³, Swinnen W.¹

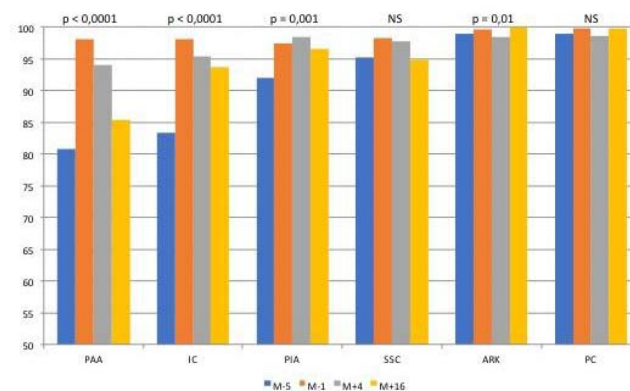
¹az Sint-Blasius, Dept of Anaesthesiology & Intensive Care, Dendermonde, Belgium, ²KU Leuven, Dept of Anaesthesiology, Leuven, Belgium, ³Ghent University, Dept of Anaesthesiology, Ghent, Belgium

Background and Goal of Study: Many hospitals worldwide are currently preparing an accreditation process with JCI, requiring anesthesia teams to strive for optimal conformity with JCI standards. Particular requirements involve Pre-Anesthesia Assessment (PAA)(ASC 3.2 & ASC 4 ME 1), Informed Consent (IC)(ASC 3.3 & ASC5.1), Pre-Induction Assessment (PIA)(ASC 4 ME 2), use of a Safe Surgery Checklist (SSC)(IPSG 4 & IPSG 4.1), Anesthesia Record Keeping (ARK)(ASC 5 & ASC 6) and correct Postoperative Care (PC) (ASC 6.1). Our goal was to observe the process of improving compliance around an accreditation audit and 1 year later.

Materials and Methods: Postoperatively, records of all patients undergoing general or regional anesthesia were reviewed on completeness by a blinded researcher. Compliance was measured at baseline (M-5, n = 187), one month before (M-1, n = 354), 4 months (M+4, n = 305) and 16 months (M+16, n = 582) after the JCI audit. Interventions to maximize compliance were conduct-

ed before (standardization of anesthesia procedures, preoperative flow, IC, implementing a SSC), as well as during (identification of major improvement opportunities, communication towards staff) from M-4 till M+4. No interventions were done between M+4 and M+16. Statistical analysis was performed using Chi Square tests. Results with $p < 0.05$ were statistically significant.

Results and Discussion: Significant improvement was observed in PAA, IC, PIA and ARK standards. ARK and PC show very high scores throughout the whole study. Improvement, however, was not sustained for PAA, IC and SSC, due to stopping interventions.



[Compliance with JCI Standards]

Conclusion(s): The streamlining of procedures, communication to the professionals involved in the perioperative process and close follow-up demonstrate the strong potential of improvement in hospitals preparing for accreditation. Releasing pressure, however, to soon after an audit, caused lower compliance.

17AP01-6

Assessment and certification processes in postgraduate anaesthesiology training in Europe

Manders L.A.¹, Jonker G.², Marty A.P.³, Gessel van E.F.⁴, Kalkman C.J.², Hoff R.G.²

¹University Medical Center Utrecht, Dept of Anaesthesiology & Intensive Care, Utrecht, Netherlands, ²University Medical Center Utrecht, Dept of Anaesthesiology, Utrecht, Netherlands, ³University Hospital Zurich, Dept of Anaesthesiology, Zurich, Switzerland, ⁴University of Geneva - Faculty of Medicine, Dept of Anaesthesiology, Geneva, Switzerland

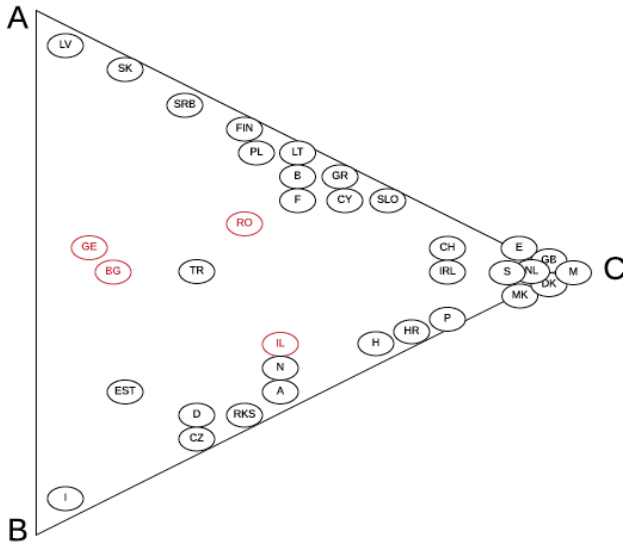
Background and Goal of Study: Postgraduate specialty training has been based on a time- and rotation-based model.¹ Nowadays, competency-based education is emerging¹ and anaesthesiology training evolves in many ways in Europe. Therefore, differences in criteria and processes for certification are expected, but the extent to which these exist is unknown. Comparable certification criteria could lead to comparable outcomes of training, as envisioned by the European Board of Anaesthesiology (EBA UEMS).² Aim of this study was to compare assessment and certification processes in anaesthesiology training in Europe.

Methods: An online survey on assessment and certification decisions was performed among 35 national representatives at the EBA UEMS. From preliminary qualitative analysis, an initial classification of countries in four groups emerged (table). Two groups are apprenticeship models with a knowledge (A) or procedural (B) focus. Group D countries have features from A and B, but are evolving to varying extents toward group C: a competency-based orientation.

	Group A (n=3)	Group B (n=5)	Group C (n=6)	Group D (n=7)
Curriculum and assessment	Knowledge-based curriculum, main assessment method is a final exam of knowledge	Procedural-based curriculum, assessment by completion of number of procedures	Competency-based curriculum with multiple workplace-based assessments	Share features from at least two categories (A-C)

[Initial classification of countries]

Results: All 35 countries were included in the analysis. For 14 countries classification was not univocal and for 13 of those group D was considered. Many countries appeared to have evolved from groups A or B toward C, although in different ways and degrees, resulting in a divergent group D. A rigid four-category classification did not do justice to the diversity in evolution of training programmes and a more fluid classification was devised (figure).



[Classification by certification process]

Conclusion: Assessment and certification processes in European anaesthesiology training are diverse. Many countries are evolving from a knowledge- or procedural focus within a time-based apprenticeship model toward a competency-based certification process. It demands ongoing effort to establish comparable certification criteria, allowing a common certification process to guarantee a required level of competence of all European anaesthesiologists.

References:

1. Iobst et al. Med Teach 2010;32:651-6
2. van Gessel et al. Best Pract Res Clin Anaesthesiol 2012;26:55-67

17AP01-7

Assessment of physicians' workload in an academic health care setting with the Physicians Workload Measuring Tool (PWMT)

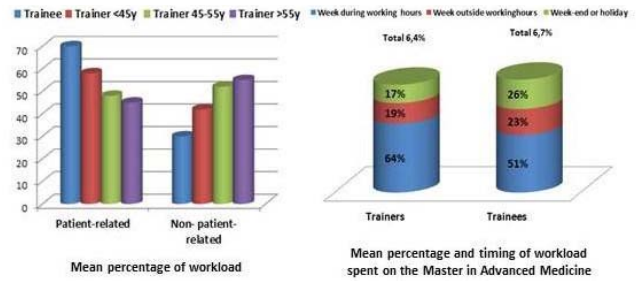
Degrève W.¹, Velghe A.², Monten C.³, Van Herzelee I.⁴, Moerman A.¹
¹Ghent University Hospital, Dept of Anaesthesiology, Ghent, Belgium, ²Ghent University Hospital, Geriatrics, Ghent, Belgium, ³Ghent University Hospital, Radiotherapy, Ghent, Belgium, ⁴Ghent University Hospital, Thoracic and Vascular Surgery, Ghent, Belgium

Background and Goal of Study: In 2009, a new academic degree of Master of Medicine in Advanced Medicine was introduced at Ghent University (Belgium). This implementation has raised concerns about time investment for both trainers and trainees. The aim of this research project was to quantify the existing workload in an academic training centre and to assess the extra time invested in the new training program.

Materials and Methods: A newly developed workload measurement tool, the PWMT, was used to measure workload among 775 physicians from the Ghent University Hospital, anonymized and randomized per discipline. The PWMT allows registration of all physicians' activities every 15 minutes, 24/7. The completed forms were processed manually. A Linear Mixed Model with random effects was used to perform analysis of the workload. Percentages of time spent on each activity were evaluated by linear regression analysis.

Results and Discussion: 32% of trainers and 15% of trainees registered their workload three times one week, with ten weeks in between. The mean weekly workload was 63.7h (95%CI 59.5-67.9). A trainer between 45-55y worked about 5.7h longer, resulting in a mean 70h workweek. Having children, gender, discipline or function (trainer vs trainee) did not change the workload significantly. About 16% of work was performed outside working hours. Trainees spent most of their time on patient related activities, mainly

direct patient contact (49%-59%), whereas trainers spent more time on non-patient related activities (increasing with age) (Fig). Master program-related activities accounted for 6.4 and 6.7% of the total workload for trainers and trainees, respectively. For trainees, half of the master-related activities were performed outside working hours (Fig).



[Mean percentage and timing of workload]

Conclusion: The PWMT provided objective information on total working time in an academic hospital environment. It indicated the possibility that implementation of the new Master program slightly increased total workload.

17AP01-8

Development and pilot testing of a new measurement tool to assess workload of physicians in an academic health care setting: Physicians Workload Measuring Tool

Legrand M.¹, Degrève W.¹, Velghe A.², Monten C.³, Van Herzelee I.⁴, Moerman A.¹

¹UZ Gent, Dept of Anaesthesiology, Ghent, Belgium, ²UZ Gent, Geriatrics, Ghent, Belgium, ³UZ Gent, Radiotherapy, Ghent, Belgium, ⁴UZ Gent, Thoracic and Vascular Surgery, Ghent, Belgium

Background and Goal of Study: To accommodate for the increasing need of a structured training for specialists in Medicine, a new academic degree of Master of Medicine in Advanced Medicine was introduced at Ghent University (Belgium) in 2009, with implementation of a supplementary training program. This evolution has raised concerns about time investment for both trainers and trainees. We aimed to develop a workload measurement tool and to assess its feasibility to correctly estimate the workload of physicians in an academic hospital as well as the extra time invested in the new training program.

Materials and Methods: The Physicians Workload Measuring Tool (PWMT) was developed to register all clinical and non-clinical activities, 24/7. Activities were classified into well-defined categories. Every 15 minutes, each participant scored his current activity by ticking one box, corresponding to a specific category (Figure). Paper registration with optical mark recognition was chosen. Prior to wide implementation, a pilot study was performed. Members of the Medical Board and the Education Committee were invited to participate.

[Figure]

Results and Discussion: Only 33 out of 86 physicians participated (38% response rate). Because of low accuracy, optical mark recognition was substituted by manual validation. Mean total workload of participating physicians was 62.3 hours a week, with 26.3 hours (42.2%) dedicated to 'patient related' and 36 hours (57.8%) to 'non-patient related' activities (13.3h education, 8.5h administration, 8.1h research and 6h conferences). Master program-related activities accounted for 8.3 hours (13.3%). Although the time investment in the new training program was substantial, it must be acknowledged that this pilot group consisted mainly of physicians involved in the Educational program. A limitation of PWMT is its dependency on real time data entry. An advantage is registration of time investment independent of presence in the hospital, thus valorizing work performed at home.

Conclusion: PWMT adequately assesses total physicians' workload 24/7, including the additional time investment in the new program.

17AP01-9

Transfusional practice survey in a tertiary hospital. Are we really trained in transfusional practice?

Guirao Monreal M.Á., Guasch Arévalo E., Gilsanz Rodríguez F. Hospital Universitario La Paz, Dept of Anaesthesiology, Madrid, Spain

Background and Goal of Study: Continuous medical education (CME) in transfusional practice (TP) is mandatory at a university hospital in order to keep updated with the current use of blood products. Among doctors, TP varies based on which medical specialty one practices. The goal of this study is to describe the percentage of physicians trained in transfusional practice and the differences observed between specialties.

Materials and Methods: After local ethics committee approval (HULP: PI-230) an anonymous survey was conducted among six departments of a tertiary university referral hospital; Anesthesia (AR), Emergency (ED), Internal medicine (IM), orthopedics (OT), Intensive Care Unit (ICU) and General Surgery (GS). Data was collected throughout a three-month period (Dec 15'-Feb 16'). Survey included: presence of training in TP, length of it, and periodicity of hemoderivates prescription. Data base was created. Pearson's chi-square test, Fisher exact test and Likelihood ratio was used for qualitative variables. Statistical analysis was performed by SPSS 21.0®.

Results and Discussion: 125 out of 302 surveys were sent back which leads to a 41.3% (N=125) of participation rate. 76% (N=96) were staff doctors and 23.2% (N=29) were residents. 67.2% (N=84) of physicians had received training or CME along their career in TP.

The duration of formation had a median established in 10 hours, interquartile range 26 hours. Residency was the period when more physicians had been trained (44.8%, N=56), followed by CME (36%, N=45). The varying percentages in each department are shown in table 1.

Residents	Staff	AR	ED	ICU	IM	OT	GS
69%	66.6%	88.1%	80%	66.7%	20%	0%	75%

[Table 1: % of physicians trained in TP]

Differences observed among departments were statistically relevant ($p < 0.001$). Not statistically significant differences observed between residents-staff ($p = 0.243$).

The blood prescription rate didn't show any statistically significant difference among trained doctors in TP and non-trained doctors. ($p = 0.591$).

Conclusions: There is a lack of training in TP in many physicians at our hospital. One out of three have never received TP related education. CME could be more focused to a better TP as regardless of these data, however, prescription rate does not vary.

17AP01-10

The knowledge of the doctor just formed on the approach to the airway and the importance of practical theoretical courses on this field

Abraão M.A., Peclat T., Lopes F., Leite S. Hospital Universitário Clementino Fraga Filho - UFRJ, Dept of Anaesthesiology, Rio de Janeiro, Brazil

Background: Cardiovascular events and external causes are important indicators of death among Brazilian population. In this context, under mask ventilation and orotracheal intubation are considered life-saving procedures. However, the level of such knowledge is not satisfactory, even among the most qualified professionals, and in hospitals with medical residency programs, it is often the case that physicians in training are responsible for this first service. As for medical teaching, learning techniques with simulations of real situations are now used. The objective of this study was to apply simulation practice in airway management to residents' level one and to evaluate their outcome.

Materials and Methods: Newly graduated from medical school and current first year of medical practice and general surgery residents were invited to the study. A theoretical pre-test was applied to all participants, followed by a theoretical lecture and theoretical post-test. After one month, the participants were distributed in groups and then submitted to a validated practical assessment, followed by a practical class with manikins. Then a reassessment of the practical and theoretical test was applied. The participant who scored a grade equal to or greater than 15 was defined as competent. In the theoretical test, a grade greater than or equal to 7 was considered satisfactory. For the analysis of the non-parametric data, the Wilcoxon flagged test and the Friedman ANOVA were used. The qualitative variables were analyzed using the McNemar test. The value of $p < 0.05$ was considered significant.

Results and Discussion: Of the 31 invited residents, 25 were accepted. Of these, 1 was excluded, 24 had the practical data analyzed and 22 the theoretical data. The number of professionals in the practical assessment increased from 20.8% to 87.5% at the end of the course ($p < 0.0001$), demonstrating the acquisition of knowledge and a significant and important improvement in the residents' performance. In the theoretical evaluation, the number of students with satisfactory results jumped from 13.6% to 63.8% between the pre- and post-test, in addition to the 68.1% in the test after the practice ($p < 0.0001$), suggesting not only the improvement of knowledge, but also its maintenance.

Conclusion: Our study demonstrated that the application of a theoretical and practical course of approach to airway for newly graduated medical school students improved their performance in this field.

17AP02-1

3D screen-based simulation: a journey in transforming continuing education in anesthesiology

Lepkowski E.¹, Michelotti M.¹, Fried H.², Levine B.³

¹American Society of Anesthesiologists, Education Department, Schaumburg, United States, ²CAE Healthcare, Research and Development Department, Saint-Laurent, Canada, ³CAE Healthcare, Research and Development Department, Sarasota, United States

Background: American Society of Anesthesiologists (ASA) has partnered with CAE Healthcare to develop a 3D virtual learning environment to create an immersive and meaningful educational experience. Guided by ASA's clinical expertise and CAE's simulation expertise, a series of modules have been developed to assist members with improved performance in the management of anesthesia emergencies.

Case report: The scenarios include realistic diagnostic and monitoring equipment and medical instruments. The modules include OR, OB, and PACU scenarios. Each virtual patient will include CAE's modeled physiology engine that responds automatically to treatments, interventions and the administration of medication based on underlying medical conditions. The 3D environment includes:

- Virtual patients with unique realistic diseases based on models that respond appropriately to clinical interactions.
- A full complement of interactive anesthesia-related equipment, and monitors with live physiologic data and waveform tracings.
- Pharmacokinetic and pharmacodynamic modeling of medications and intravenous fluid administration.

Discussion: Our needs assessment shows that one of the most beneficial uses for implementing this type of methodology is physicians are finding it most challenging to find enough time to travel frequently to a simulation center. There is a general lack of unfamiliarity with the simulation equipment, nervousness and lack of confidence in being judged in having to perform in front of their peers in the simulation environment. Initial feedback on the screen-based simulation program is that the format allows the clinicians to practice or attempt multiple types of scenarios on their own time and in the privacy of their own environment.

References:

1. Gaba DM, Howard SK, Flanagan B, Smith BE, Fish KJ, Botney R: Assessment of clinical performance during simulated crises using both technical and behavioral ratings. *Anesthesiology* 1998; 89:8-18
2. McGaghie WC, Issenberg SB, Cohen ER, et al. Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. *Academic Medicine* 2011;86(6):706-11.

Learning points: Discuss preparation of an educational needs assessment to identify the early adopters of new technologies.

Identify training gaps that could be satisfied through the integration of immersive 3D environments with a comprehensive physiology/pharmacology model.

17AP02-2

Challenges of regional anaesthesia training: a prospective audit in a teaching orthopaedic hospital

Ayub K., Mann T., Mould M., Marfin A., Popat M., Galitzine S.
Oxford University Hospitals, Nuffield Department of Anaesthesia, Oxford, United Kingdom

Background and Goal of Study: Advantages of regional anaesthesia (RA) for sole anaesthesia or supplemental analgesia are well known [1]. Achieving proficiency in its delivery requires time and training opportunities. It is estimated that a caseload of around 50 is required before procedural competence is achieved [2]. Whilst this can be attained via RA training modules, the need to match trainees with adequate exposure to RA techniques is essential for skill acquisition.

Materials and Methods: Data on elective orthopaedic operations have been prospectively collected at our teaching hospital, recording the cases with planned RA and the type of blocks. The presence of trainees, and whether they were working solo or doubled up with a Consultant or the senior organizing anaesthetist (SOA) was also identified.

Results and Discussion: We present the results of the first 6 months of this ongoing prospective audit. 2761 operations were scheduled across 823 theatre lists. This involved 1544 nerve blocks for 1313 patients: 643 (41.6%) neuraxial, 713 (46.1%) lower limb, 194 (12.6%) upper limb and 3 (0.2%) other blocks. Despite 1.9 nerve blocks performed per list, trainees were present at 160 (19.4%) and doubled up with a non-SOA Consultant at only 69 (8.4%) of the total lists. A clear discrepancy exists between training opportunities availability and trainee allocation. A greater number of trainees need to be allocated to elective lists and paired with a non-SOA Consultant more frequently. There remains an onus on trainees to rotate between theatres to increase exposure.

Conclusions: This prospective audit has quantitatively confirmed our anecdotal impression that training opportunities are not fully utilised. We will highlight this shortfall to our department and re-evaluate training experience over the next six months.

References:

1. Mingus M. Recovery advantages of regional anaesthesia compared with general anaesthesia. *JCA* 1995; 7(7):628-633.
2. Kopacz D. The regional anaesthesia "learning curve". What is the minimum number of epidural and spinal blocks to reach consistency? *Regional Anaesthesia* 1996; 21(3):182-90.

Acknowledgements: We acknowledge the help of Emma Walduck and all theatre staff for data collection.

17AP02-3

Comparison of learning process between simulation and problem-based method in difficult airway management workshop

Apidechakul P., Vichitvejpaisal P.
Mahidol University, Dept of Anaesthesiology, Bangkok, Thailand

Background and Goal of Study: Though simulation-based and problem-based learning are sophisticated learning tool, neither of them manifests the superior benefit. We would like to compare the teachers' and students' attitudes on these two methods.

Materials and Methods: After IRB approval No. 369/2558(EC3), it has been registered by ClinicalTrials.gov : NCT02993393. A questionnaire was performed amongst volunteered: 10 anaesthesiologists and 40 nurse anaesthetist students. By stratified randomization, ten students simultaneously attended either SBL or PBL course one at a time. Six weeks later, a crossover technique was applied for both groups. Teachers' questionnaires were based on table of specification of the learning contents; while, students' matters comprised learning content, process and evaluation.

Results and Discussion: There were no statistical differences in term of content and evaluation techniques of the two methods amongst students. However, the learning process of SBL showed significant difference as compared to PBL. The SBL might be an easy way for students to reach a psychomotor domain of core knowledge.

Participants' point of view	PBL	SBL	P
Teachers			
1. Evaluation of the airway	2.8±0.4	1.9±0.9	0.029*
2. Basic preparation	2.6±0.5	1.7±0.8	0.010*
3. Strategy of intubation	2.6±0.5	2.2±0.9	0.269
4. Follow up care	2.1±0.6	2.0±0.9	0.780
Students			
1. Content	2.6±0.4	2.6±0.3	0.270
2. Process	2.6±0.4	2.8±0.3	0.017*
3. Evaluation	2.5±0.5	2.5±0.4	0.864

[Participants' point of view]

On the other hand, the staff showed statistical significance on the basic management and evaluation of the difficult airway by means of PBL. This might due to these two topics were not easy to be set up in a low fidelity manikin. The PBL should enhance educational activity in class by improved application of theory and increased learning motivation. Thus PBL promoted deep learning through self-directed learning processes.

Conclusions: The SBL seemed to be good for novice to gain experience and knowledge particularly the practical skill, while the PBL was suitable for anyone who could have reflective thinking in critical situation1.

References: 1. Couto TB, Farhat SC, Geis GL, et al. High-fidelity simulation versus case-based discussion for teaching medical students in Brazil about pediatric emergencies. *Clinics (Sao Paulo)*. 2015; 70(6): 393-9.

17AP02-4

DIY model for cricothyroidotomy

Marimuthu M., Stevens J., Hodzovic I., Subash F.
Royal Gwent Hospital, Dept of Anaesthesiology, Newport, United Kingdom

Background: Can't intubate and can't oxygenate (CICO) situation is a major complication of failed airway management. We have devised a way of providing airway management training in CICO situations, using equipment readily available in any Anaesthetic department. This would serve as a cost effective, repetitive and an efficient airway training tool.

Materials and Methods: The model consists of a manikin with head, an iGel size 5 LMA, a reservoir bag, an intravenous giving set, a disposable glove and sticky tape. The cricothyroidotomy training model can be easily assembled in three simple steps;

Step 1 - Wrap the giving set over LMA to emulate the tracheal cartilages, trimming of the excess and place it over the manikin neck.

Step 2 - Place the disposable glove over the LMA and stick it to all four sides using the sticky tape.

Step 3 - Connect the reservoir bag to the LMA. Simply adding an edible jelly into the disposable glove, provides the appearance of a large obese neck.

Discussion: Major complications such as “CICO” situation occurs in 1 in 5000 routine general anaesthetics but accounts for 25% of anaesthesia-related deaths. The UK fourth national audit project of the Royal college of Anaesthetists and Difficult airway society, identified that airway problems regularly deteriorated to ‘CICO’ situations. These were poorly managed with high failure rate of emergency cannula cricothyroidotomy in approximately 60%. Several studies support that repetitive training improves skills competency, technical knowledge and confidence levels. This model would certainly help achieve that.

Conclusion: This model is cheap and can be used repeatedly anywhere as a mobile training tool. It also avoids the complexity of using animal tissue, their need for special location for handling and disposal. It provides the opportunity for novice as well as senior practitioners to hone their skills by practicing regularly.

References:

1. Varaday, S. S., Yentis, S. M., & Clarke, S. (2004). A homemade model for training in cricothyrotomy*. *Anaesthesia*, 59(10), 1012-1015.
2. Cook, T. M., & MacDougall-Davis, S. R. (2012). Complications and failure of airway management. *British journal of anaesthesia*, 109(suppl 1), i68-i85.
3. <http://www.nationalauditprojects.org.uk/NAP4-Reports#pt>.

Acknowledgements: Intersurgical (i-gel), Trucorp airsims (Manikin)

17AP02-5

Effect of audit and feedback on physicians' intraoperative temperature management and patient outcomes: a three-arm cluster randomized controlled trial comparing benchmarked and ranked feedback

Boet S.¹, Bryson G.¹, Monica T.², Mclsaac D.¹, Mohammed K.¹, Grimshaw J.³, Canadian Perioperative Anesthesia Clinical Trials Group

¹Ottawa Hospital, Dept of Anaesthesiology & Pain Medicine, Ottawa, Canada, ²Ottawa Hospital, Clinical Epidemiology, Ottawa, Canada, ³Ottawa Hospital, Medicine, Ottawa, Canada

Background and Goal of Study: Audit and feedback can improve physicians practice(1); however, the most effective type of feedback is unknown. Inadvertent perioperative hypothermia (IPH) remains common despite effective and safe warming devices. IPH is associated with postoperative complications(2). This study aimed to measure the impact of targeted audit and feedback on anesthesiologists' intraoperative temperature management and subsequent patient outcomes.

Materials and Methods: This study was a three-arm cluster randomized controlled trial (NCT02414191). After Ethics approval and informed consent, anesthesiologists' intraoperative temperature management performance was audited with no feedback (eight months). Participants then received interventions according to their randomized group allocation (7 months): no feedback (control), benchmarked feedback, or ranked feedback. Anesthesiologists' percentage of hypothermic patients and use of warming device were analyzed. A mixed-effects logistic regression analysis was used, adjusted for clustering by provider and adjusting for pre-specified covariates.

Results and Discussion: Forty-five staff anesthesiologists who took care of 7846 patients over 15 months were included. Odds (OR) of hypothermia (temperature lower than 36.0 degrees Centigrade at the end of surgery) increased from pre to post-intervention in the control and ranked groups (OR[95%CI] Benchmark 1.06[0.87;1.29], p=.56; Ranked 1.26[1.02;1.57], p=.04; Control 1.27[1.04;1.57], p=.02). Differences in hypothermia between arms were not statistically significant (Benchmark vs. Control 0.83[0.62;1.10], p=.19; Ranked vs. Control 0.99[0.73;1.34], p=0.95). No significant change in intraoperative warmer use was detected either.

Conclusion(s): There is no evidence to suggest that audit and feedback, using benchmarked or ranked feedback, is more effective than no feedback to change anesthesiologists' intraoperative temperature management performance and patients' outcome. Feedback may need to be included in a bundle to produce its effect.

References:

1. Ivers N, et al. Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev*, 2012
2. Harper C, Aet al. NICE and warm. *BJA*, 2008

Additional Co-authors: Ashlee Pigford, Jamie Brehaut, Alan Forster, Natalie Clavel, Christopher Pysyk

Acknowledgements: Funding agencies: DIME, MCC, TOHAMO, CARF

17AP02-6

Follow-up survey of anesthesiologists attending a trauma course in Spain

Duque P.¹, Varela J.A.¹, Terradillos E.¹, Piñeiro P.¹, Turegano F.², Perez Diaz D.²

¹Gregorio Marañon General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, ²Gregorio Marañon General Hospital, Dept of Surgery, Madrid, Spain

Background and Goal of Study: The first three editions (2014-2016) of the DATC (Definitive Anesthetic Trauma Care) course were offered along with the surgical version, the Definitive Surgical Trauma Care (DSTC) course, in a combined program on trauma care adapted for surgeons and anesthesiologists. The course has been highly evaluated each year, making it a good option in trauma training, following initial management principles based on European Society of Anesthesiology ETC course (European Trauma Course). This trauma management course is intended to provide all target groups with an acceptable method of safe management, knowledge and skills, necessary to take care of the critical injured trauma patient. Little is known about the effects of such course on anesthesiologists professional development. The aim of the study was to study the impact of the course on self-efficacy and daily clinical practice by using a self-reported follow-up questionnaire.

Materials and Methods: In these three editions (2014-2016) in Spain, 100% of the DATC participants (n=36) were senior anesthesiologists coming from all over Spain. Participants were asked to fill in anonymously a follow-up questionnaire sent by email. We obtain 15 responders (41%).

Results and Discussion: The survey intend to assess two different issues:

A) Self-efficacy in trauma care: 90% of the responders still considered the course quite or very beneficial for their clinical practice. 70% of participants reported an improvement on their ability to deal with major trauma in a high or very high degree after the course. 80% think the course can help anesthesiologist to improve knowledge in trauma care and would recommend it to a colleague.

B) From a list items of DATC course contents:

- Technical content: massive transfusion and trauma induced coagulopathy is pointed out by the 80% of participants against 50% of trauma airway management.

- Non technical skills: team approach and decision making is highlighted in 90% of the replies against 40% of safety and security topics. Subjective opinion about the role of the surgeons in trauma care has improved in the 90% of the responders.

Conclusions: Follow-up data from DATC participants suggests a long term effect on self-efficacy in trauma care. Technical knowledge and non-technical skills practiced together with general surgeons may be beneficial in daily clinical practice and personal relationships.

17AP02-7

How realistic are low cost, low fidelity bronchoscopy simulators?

Gysin J., Pedersen T.H., Osswald M., Wegmann A., Theiler L., Greif R.

Bern University Hospital Inselspital, University of Bern, Dept of Anaesthesiology & Pain Medicine, Bern, Switzerland

Background and Goal of Study: Anesthesiologists and pulmonologists need to train bronchoscopy before performing this procedure. We developed a cost-effective bronchial tree simulator based on human thorax CT-scans, using rapid prototyping (3D-Print) technology. This randomized, single-blinded study evaluated how realistic our 3D-printed simulator would mimic human anatomy compared to two commercially available bronchial tree simulators.

Materials and Methods: 30 experienced anesthetists and pulmonologists (Bern University Hospital) used a fiberoptic bronchoscope and rated on a visual analog scale (VAS) (0mm = completely unrealistic anatomy and 100mm = indistinguishable from real patient) the following for each of the three simulators:

1. Localization of the right upper lobe
2. Placement of a bronchial blocker in the left main bronchus
3. Aspiration of fluid from the right lower lobe
4. Overall realism

The commercial simulators were: Laerdal Airway Management Trainer with Bronchial Tree (Laerdal Stavanger, Norway) and the AirSim Advance Bronchi (TruCorp® Ltd, Belfast, Northern Ireland).

Results and Discussion: The 3D-printed simulator was rated most realistic for the localization of the right upper lobe. There was no difference between the simulators in placement of a bronchial blocker into the left main Bronchus or for aspiration of fluid (Table). Finally the overall realism rating of the 3D-printed simulator was superior.

Outcomes	Laerdal	TruCorp	3D-Print	p-value
Localization of right upper lobe	65 (43-80)	68 (32-76)	77 (65-88)	0.002
Placement of bronchial blocker	70 (56-82)	73 (63-81)	69 (51-81)	0.792
Aspiration of fluid	53 (39-70)	62 (48-71)	64 (52-81)	0.057
Overall realism	63 (51-77)	66 (53-78)	75 (68-83)	0.021

[VAS scores (median, interquartile range); Friedman]

The 3D-printed simulator performs equally well or even better compared to the two other simulators. Given the costs of approximately €1.000 for Laerdal, €3.500 for TruCorp versus only €90 for the 3D-printed simulator, superiority of the 3D-printed simulator was reached with less than 10% of the costs.

Conclusion: The 3D-printed bronchial tree is superior to the substantially more expensive commercially available simulators. This means that a CT-based printed simulator is an inexpensive alternative for training basic bronchoscopy skills.

17AP02-9

The myths and realities of a trauma resuscitation education: the voices of active European Trauma Course (ETC) instructors

Hüpfil M.¹, Trummer F.², Lulic D.³, Deixler A.², Kalan Ustar K.², Lulic I.²
¹University Hospital Vienna, Dept of Anaesthesiology & Intensive Care, Vienna, Austria, ²Society of European Trauma Course Austria, Society of European Trauma Course Austria, Vienna, Austria, ³University Hospital Center Zagreb, Department of Emergency Medicine, Zagreb, Croatia

Introduction: The main principle of ETC - "The Team Approach" training and education is delivering more than simply content. Course design focuses on flexibility to meet individual trainee needs. Present trauma scenarios are built on predetermined learning objectives, addressing clinical and non-technical skills, frequently encountered during trauma resuscitation. ETC instructors represent core elements in providing sterling trauma resuscitation education. Therefore, in our study we aimed to investigate the motivation and challenges instructors meet while teaching on ETC.

Materials and Methods: A total of 47 (73%) of 64 instructors, actively teaching on at least one ETC course in Austria, completed an online survey, consisted of demographic data, and 29 Likert-type statements regarding motivation and challenges they meet whilst teaching on ETC.

Results: There were 65% male and 35% female instructors, aged from 29 to 70 years (median 41). The majority of instructors were specialists in anaesthesiology (43%), alongside with trauma surgeons, emergency physicians and intensive care specialists. They expressed the strongest agreement with the statement that simulation based learning, compared to traditional methods, improves management of acute trauma cases (64%) and that ETC guides them in developing non-technical skills (53%). Furthermore, majority of instructors (91%) are confident with ETC modified four-stage approach in skills teaching. Nevertheless, nearly a third of them (28%) have impeding fear of not being proficient in debriefing technique, and of failing to meet the scenarios learning objectives (31%). Although almost one third of instructors (34%) reported difficulties in attaining educational leave from working institutions in order to participate on the ETC, they disclosed the least agreement with the statement that they are instructing on ETC in order to preserve active instructor status (15%).

Conclusion: Our results suggest instructors actively teaching on the ETC feel confident with the course structure and educational principles. Nevertheless, they still face some difficulties, one of them being less confidence in successfully meeting the learning objectives during ever-growing trauma scenarios covering a wide spectrum of major trauma resuscitation cases. Our instructors' greatest motivation for teaching is personal fulfillment in the knowledge that their actions can contribute positively to the lives of others.

17AP02-10

Training in basic hand-held echocardiography for the critical care: not such a difficult task

Belamaric Z., Nagore D., Jimeno J.P., Bilbao A., Garth T., Harky A.

Barts Heart Centre, St. Bartholomew's Hospital, Dept of Anaesthesiology & Intensive Care, London, United Kingdom

Background and Goal of Study: In the last decade focus assessment ultrasound protocols (FAST, FATE, RUSH,...) have been developed. Due to technological development simple scans can be delivered by palm top devices. This study is designed to see if the skills needed to provide basic hand-held echocardiography in the critical care environment can be taught effectively.

Materials and Methods: 12 echocardiography naive junior doctors received a single day course, consisting of lectures, simulation work and familiarisation with the hand held V scanners. After 6 week period they were evaluated to assess knowledge and skills learnt and retained by together a senior ICU Anaesthetist and a senior Cardiologist. The following categories were assessed and classified in a scale of 1 to 5, where (1) poor, (2) fair, (3) good, (4) very good and (5) excellent:

1. Image acquisition of the standard ECHO views and obtaining the windows suitable for interpretation
2. LV assessment of size and function
3. RV function assessment
4. MV and MR assessment
5. Aortic Valve assessment and to identify AS, AR and valve thickening
6. Pericardial effusion assessment
7. Filling status / volume status assessment including IVC measurement
8. Overall Impression of the junior doctor knowledge

Results and Discussion: The mean score of the overall impression of the junior doctors knowledge before and after the course was 1 and 3.4 respectively (p value <0.0001). In the categories of image acquisition, LV assessment and MV assessment the mean score achieved was 3.4 which was compliant with the mean score of 3.4 in the overall impression of the junior doctor knowledge (p value=1).

Pericardial effusion and AV assessment mean scores were 3.7 and 3.2 respectively which in comparison with mean score of overall knowledge showed no statistical significance (p=0.2 and p=0.5).

Mean RV and filling status assessment scores were 2.8 and 2.9 respectively, and showed a statistically significant difference with the overall impression of junior doctor knowledge (p=0.01 and p=0.02 respectively).

Conclusion(s): Junior doctors have significantly improved overall knowledge in the basic echocardiography after the course. The level of knowledge was equally distributed in all categories except in RV and filling status assessment where students showed lower skills level. Therefore, appropriate clinical and imaging supervisory pathways should always be available where this kind of activity is undertaken.

17AP02-11

A European and global perspective on airway management education and assessment. Results from the World Airway Management Meeting Questionnaire

Armstrong L.¹, Critchley J.¹, Harding F.¹, McNarry A.²

¹South East Scotland School of Anaesthesia, Dept of Anaesthesiology, Edinburgh, United Kingdom, ²Western General Hospital, Dept of Anaesthesiology, Edinburgh, United Kingdom

The 2015 Difficult Airway Society Guidelines¹, and the German Society of Anesthesiology & Intensive Care Medicine Guidelines on Airway Management² advocate advanced airway techniques, including fiberoptic and video laryngoscopy and emergency front of neck access.

Methods: A questionnaire was distributed before the World Airway Management Meeting in November 2015 looking at how airway equipment, education and assessment varies globally. We report the European results.

Results: 2363 responses were from respondents in European countries (48%, n=4921).

Availability of airway guidelines was greater in European than non European countries (73.4% vs. 56.4%, p<0.001). Equipment availability is better in European than non-European countries (table 1).

Is following immediately available?	European			Non-European			Pvalue
	Yes	n	%	Yes	n	%	
Airway guidelines	1085	1479	73.4	1001	1775	56.4	<0.0001
Emergency airway container	1405	1482	94.8	1605	1775	90.4	<0.0001
Emergency cric. equipment	1314	1479	88.8	1344	1768	76.0	<0.0001
Equipment to confirm ET placement	1453	1478	98.3	1697	1772	95.8	<0.0001
Fibreoptic equipment	1341	1481	90.5	1378	1770	77.9	<0.0001
Video-laryngoscope	1320	1476	89.4	1306	1766	73.9	<0.0001

[Table 1 Chi Square analysis]

83% of European respondents received airway training, similar to 84.9% overall. Frequency of training provision was similar in Europe to the rest of the world; (65% frequent, 29% infrequent and 5.4% training not provided). Most (76.9%) report supervised teaching in the operating room (OR) as the most common form of airway education, followed by workshops (12.6%) then self taught in OR 8.7%.

Fewer European respondents felt airway management should be assessed than non European (87% vs. 94%, $p < 0.0001$). Mandatory airway education for trainees was reported as compulsory for completion of training by 55.8%. 28.5% felt it was required for ongoing consultant medical education.

Conclusion: Availability of equipment is better in European countries, but do we know how to use it? Most respondents felt airway management skills should be assessed, however significant numbers do not think airway education should be mandatory, especially for consultants. Whilst training programmes exist to train and assess trainees, providing ongoing education and assessment for consultants will be much more difficult.

References:

1. Frerk C et al. DAS 2015 guidelines for management of unanticipated difficult intubation in adults. *BJA* Nov 2015.
2. Piepho T et al. Guidelines on airway management: Guideline German Soc. Anesthesiology & ICM. *Anaesthesist*. 2015;64 Suppl1:27-40.

17AP02-12

Structured assessment of anaesthesiologists' non-technical skills in a simulated setting

Jepsen R.M.¹, Gjeraa K.¹, Dieckmann P.¹, Ringsted C.², Østergaard D.¹

¹Copenhagen Academy for Medical Education and Simulation, Capital Region of Copenhagen and University of Copenhagen, Herlev, Denmark, ²Centre for Health Sciences Education, Faculty of Health, Aarhus University, Aarhus, Denmark

Background and Goal of Study: The importance of good non-technical skills (NTS) is acknowledged by societies of anaesthesiology and intensive care medicine. Training NTS has the potential to improve patient safety. Recently, we customized an instrument to assess anaesthesiologists' NTS (ANTSdk (1)). NTS assessment using behavioural marker systems such as ANTSdk are introduced in specialist training programmes and novices' NTS are compared to what is expected from experienced anaesthesiologists'. However, literature is sparse on experienced anaesthesiologists' NTS. Goal: To explore if ANTSdk can differentiate between novice, intermediate and expert anaesthesiologists in an unexpected difficult airway simulation scenario.

Materials and Methods: A purposely sample of 28 participants was included: ten 1st year trainees, eight 3rd year trainees, and 10 qualified specialists. The scenarios were videorecorded and rated by two trained raters using ANTSdk. A global rating score (GRS) Likert scale from 1-7 was used. Rating of categories and elements were rated using a 5 point Likert scale.

Results and Discussion: The ANTSdk GRS means (SD) were 4.0 (.67), 5.6 (.68), and 6.0 (.60) for first year trainees, third year trainees, and qualified specialists, respectively. A significant difference in ANTSdk ratings was found between 1st year trainees and 3rd year trainees ($P < 0.05$, confidence interval (CI) .78-2.34), and for 1st year trainees and qualified specialists ($P < 0.05$, CI 1.21-2.69). Significant differences in ANTSdk ratings between 1st year trainees and 3rd year trainees as well as qualified specialists were also found for ratings of ANTSdk categories and elements. No significant difference was found between 3rd year trainees and specialists. No significant differences were found between the three groups regarding the ANTSdk element 'demonstrating self-awareness'. Novice anaesthesiologists' lower ANTSdk ratings might be explained by cognitive overload carrying out technical tasks, thus comprising their use of NTS. This is in line with situation awareness theory. A possible explanation of the insignificant finding regarding awareness of own competence could be early emphasis on this in training.

Conclusion: ANTSdk ratings can be used to differentiate 1st year trainees from 3rd year trainees as well as from qualified specialists in simulated scenarios.

References: 1. Jepsen RM et al. *Int J Med Educ*. 2015 Feb 22;6:17-25.

SUBJECT INDEX

- Acupuncture
14AP03-9
- Age factors
03AP04-9, 06AP02-2, 06AP02-11,
07AP09-6, 13AP09-9, 14AP03-6,
14AP04-1, 14AP06-6, 15AP01-1
- Airway
01AP04-3, 01AP04-4, 01AP04-11,
01AP06-3, 02AP01-1, 02AP03-5,
05AP04-7, 05AP05-1, 05AP05-3,
05AP05-5, 05AP05-6, 05AP06-5,
11AP01-4, 11AP01-5, 11AP01-8,
11AP01-10, 11AP02-1, 11AP02-2,
11AP02-3, 11AP02-4, 11AP02-6,
11AP02-7, 11AP02-8, 11AP02-9,
11AP02-11, 11AP03-3, 11AP03-5,
11AP03-10, 11AP04-2, 11AP04-4,
11AP04-9, 11AP05-8, 11AP06-10,
11AP08-1, 11AP08-4, 11AP08-8,
11AP08-9, 14AP08-1, 16AP07-4,
16AP07-6, 16AP08-6, 17AP02-11
- Airway, anatomy
05AP04-10, 11AP03-8, 11AP05-6,
11AP08-10
- Airway, complications
05AP01-1, 05AP01-4, 05AP05-5,
10AP01-1, 10AP01-8, 11AP02-5,
11AP03-7, 11AP04-1, 11AP05-1,
11AP05-3, 11AP05-5, 11AP06-4,
11AP06-10, 16AP06-3, 16AP07-3,
16AP07-5, 16AP07-8, 16AP07-9,
16AP08-6, 17AP02-4
- Airway, infections
13AP02-6, 13AP09-3, 13AP13-1
- Airway, obstruction
04AP06-8, 11AP02-10, 11AP03-9,
11AP04-7, 11AP05-2, 11AP05-3,
11AP06-6, 11AP06-10
- Airway, pressure
11AP04-3
- Airway, reflexes
11AP01-6, 11AP08-11, 15AP01-3
- Alcohol
02AP01-5, 03AP01-10
- Allergy
16AP02-3
- Anaesthesia, audit
01AP12-1, 01AP12-2, 01AP12-9,
02AP01-9, 05AP02-6, 05AP07-3,
08AP02-3, 08AP04-9, 08AP05-5,
08AP06-8, 11AP08-1, 11AP08-4,
14AP05-3, 14AP05-6, 14AP08-5,
16AP01-5, 16AP01-6, 16AP01-7,
16AP03-1, 16AP03-9, 16AP04-4,
16AP07-8, 17AP01-5, 17AP02-2,
17AP02-5
- Anaesthesia, day-case
02AP02-1, 02AP02-4, 02AP02-8,
02AP03-5, 02AP03-9, 03AP10-3,
05AP04-9, 07AP06-4, 08AP01-6,
08AP02-1, 08AP04-1
- Anaesthesia, dental
08AP01-7
- Anaesthesia, depth
01AP07-2, 01AP07-3, 01AP07-7,
01AP09-3, 01AP16-7, 04AP06-7
- Anaesthesia, emergency service
01AP12-7, 04AP06-5, 05AP01-2,
05AP01-8, 10AP01-2, 10AP01-3,
10AP01-4, 10AP01-5, 10AP03-9,
11AP03-9, 11AP08-1
- Anaesthesia, general
BAPC-3, 01AP01-1, 01AP03-4,
01AP03-8, 01AP03-10, 01AP04-2,
01AP04-8, 01AP04-10, 01AP06-4,
01AP07-10, 01AP07-11, 01AP08-5,
01AP09-5, 01AP11-2, 01AP12-2,
01AP12-5, 01AP12-6, 01AP13-2,
01AP13-6, 01AP13-9, 01AP14-8,
01AP16-10, 06AP01-10, 06AP02-9,
06AP05-6, 06AP06-3, 07AP01-3,
07AP08-7, 08AP01-1, 08AP01-10,
10AP03-6, 11AP01-8, 11AP01-10,
11AP07-6, 11AP08-10, 12AP02-4,
14AP07-3, 14AP08-6, 14AP08-9,
14AP09-4, 14AP10-3, 16AP04-5,
17AP02-11
- Anaesthesia, geriatric
06AP01-8, 11AP01-1, 12AP03-3,
14AP02-5, 15AP01-2, 15AP01-3,
15AP01-5, 15AP01-6, 15AP01-7,
15AP01-8, 15AP01-9, 15AP02-2,
15AP02-4, 15AP02-6, 16AP01-2
- Anaesthesia, neurosurgical
06AP01-1, 06AP01-3, 06AP01-5,
06AP01-8, 06AP01-9, 06AP01-11,
06AP03-8, 06AP03-10, 06AP04-4,
06AP04-6, 06AP04-7, 06AP05-1,
06AP05-3, 06AP05-4, 06AP05-7,
06AP05-10, 06AP06-5, 06AP06-6,
06AP06-7, 06AP06-8, 06AP06-11,
11AP02-2, 12AP05-9
- Anaesthesia, obstetric
03AP02-11, 04AP01-3, 04AP01-4,
04AP01-5, 04AP01-6, 04AP01-11,
04AP02-2, 04AP02-3, 04AP02-4,
04AP02-7, 04AP02-8, 04AP02-10,
04AP02-11, 04AP03-3, 04AP03-4,
04AP03-5, 04AP03-6, 04AP03-10,
04AP03-11, 04AP04-4, 04AP04-6,
04AP04-9, 04AP04-11, 04AP05-1,
04AP05-5, 04AP05-6, 04AP05-7,
04AP05-8, 04AP05-10, 04AP06-3,
04AP06-5, 04AP06-6, 04AP06-8,
04AP06-10, 04AP07-3, 04AP07-5,
04AP07-7, 04AP07-10, 04AP08-1,
04AP08-2, 04AP08-3, 04AP08-4,
04AP08-5, 04AP08-6, 04AP08-9,
04AP08-10, 04AP08-11, 12AP02-1,
16AP02-3
- Anaesthesia, otolaryngological
01AP05-8, 06AP05-5, 11AP03-2,
11AP08-11, 14AP02-10, 16AP07-12
- Anaesthesia, paediatric
BAPC-2, 01AP04-1, 02AP01-1,
03AP01-6, 03AP02-10, 03AP05-11,
03AP06-7, 03AP08-5, 03AP09-6,
04AP06-8, 05AP01-1, 05AP01-2,
05AP01-3, 05AP01-4, 05AP01-8,
05AP01-9, 05AP02-2, 05AP02-3,
05AP02-5, 05AP02-6, 05AP02-7,
05AP04-2, 05AP04-4, 05AP04-6,
05AP04-7, 05AP04-8, 05AP04-9,
05AP05-1, 05AP05-6, 05AP06-2,
05AP06-4, 05AP06-5, 05AP06-8,
05AP06-10, 05AP06-11, 05AP07-1,
05AP07-2, 05AP07-3, 05AP07-5,
05AP07-6, 05AP07-8, 05AP07-9,
10AP01-2, 10AP03-9, 11AP02-5,
12AP05-3
- Anaesthetic techniques, bronchoscopy
01AP04-2
- Anaesthetic techniques, conduction
05AP04-10, 05AP07-5
- Anaesthetic techniques, endobronchial
14AP09-10
- Anaesthetic techniques, extradural
03AP01-6, 04AP01-4, 04AP03-11,
04AP08-4, 08AP04-11, 12AP01-4
- Anaesthetic techniques, fiberoptic
07AP02-1, 11AP02-8, 11AP03-9,
11AP03-10, 17AP02-7
- Anaesthetic techniques, i.v.
01AP02-5, 01AP06-7, 03AP03-6,
05AP01-7, 07AP02-6, 07AP09-7,
07AP12-8, 11AP05-8
- Anaesthetic techniques, induction
01AP01-2, 01AP03-9, 05AP02-7,
11AP01-6, 11AP03-4
- Anaesthetic techniques, inhalation
01AP05-8, 01AP10-3, 01AP10-7,
01AP16-9, 04AP06-9, 05AP06-10,
16AP06-6, 17AP01-3
- Anaesthetic techniques, insufflation
11AP02-3
- Anaesthetic techniques, laryngoscopy
01AP04-1, 01AP04-5, 01AP04-10,
01AP06-3, 04AP05-5, 11AP04-2,
11AP04-8, 16AP07-4
- Anaesthetic techniques, neuroleptanaesthesia
06AP05-6
- Anaesthetic techniques, preoxygenation
01AP05-3, 11AP02-3
- Anaesthetic techniques, regional
03AP01-1, 03AP01-2, 03AP01-3,
03AP01-4, 03AP01-6, 03AP01-8,
03AP01-9, 03AP02-4, 03AP02-7,
03AP02-9, 03AP03-1, 03AP03-3,
03AP03-10, 03AP04-1, 03AP04-2,
03AP04-8, 03AP05-1, 03AP05-2,
03AP05-3, 03AP05-4, 03AP05-9,
03AP05-11, 03AP06-1, 03AP06-2,
03AP06-3, 03AP06-4, 03AP06-5,
03AP06-6, 03AP06-7, 03AP07-1,
03AP07-2, 03AP07-4, 03AP07-5,
03AP07-6, 03AP07-7, 03AP07-9,
03AP08-1, 03AP08-2, 03AP08-5,
03AP08-7, 03AP08-8, 03AP08-10,
03AP09-1, 03AP09-2, 03AP09-4,
03AP09-6, 03AP09-7, 03AP09-9,
03AP10-5, 03AP10-6, 03AP10-7,
03AP10-8, 03AP10-9, 03AP10-10,
04AP01-1, 04AP01-8, 04AP02-10,
04AP03-7, 04AP03-10, 04AP08-3,
05AP04-7, 06AP06-3, 07AP04-4,
07AP12-5, 08AP02-2, 08AP03-1,
08AP03-3, 08AP03-5, 08AP03-6,
08AP03-8, 08AP03-9, 08AP03-10,
08AP03-11, 08AP04-2, 08AP04-4,
08AP04-6, 08AP04-10, 09AP02-2,
09AP05-1, 11AP08-11, 16AP02-7,
17AP02-2
- Anaesthetic techniques, subarachnoid
03AP01-5, 03AP02-1, 03AP02-3,
03AP02-5, 03AP02-7, 03AP02-8,
03AP02-12, 03AP09-7, 03AP10-1,
04AP02-8, 04AP02-9, 04AP05-3,
15AP02-2
- Anaesthetics gases
01AP13-3, 13AP10-1, 13AP10-2
- Anaesthetics gases, trace concentrations
04AP06-9, 05AP06-10,
11AP01-9
- Anaesthetics i.v., etomidate
01AP13-8, 01AP13-11
- Anaesthetics i.v., ketamine
05AP01-8, 08AP06-9, 08AP06-10,
09AP02-3

- Anaesthetics i.v., propofol
01AP09-7, 01AP14-11, 01AP16-6,
02AP02-3, 03AP03-7, 03AP03-8,
03AP10-5, 06AP01-11, 16AP07-1,
16AP07-2
- Anaesthetics i.v., steroid
05AP02-2, 07AP11-9
- Anaesthetics i.v., thiopentone
01AP16-11
- Anaesthetics local
01AP07-9, 02AP03-2, 03AP02-11,
03AP03-5, 03AP03-6, 03AP03-10,
03AP06-5, 04AP08-11, 05AP03-8,
14AP03-1, 14AP10-1
- Anaesthetics volatile
01AP13-2, 07AP11-2, 11AP06-7,
17AP01-3
- Anaesthetics volatile, atmospheric pollution
01AP10-2
- Anaesthetist, activity
01AP12-9, 06AP05-3, 14AP02-6,
14AP05-8
- Anaesthetist, risks
01AP12-11, 04AP01-3, 04AP04-8,
16AP01-7
- Analgesia, obstetric
04AP01-2, 04AP01-5, 04AP02-6,
04AP03-1, 04AP03-2, 04AP03-7,
04AP03-9, 04AP04-1, 04AP04-8,
04AP05-7, 04AP06-1, 04AP06-11,
04AP08-7, 08AP01-3, 08AP04-11
- Analgesia, paediatric
03AP05-9, 03AP06-7, 05AP01-5,
05AP02-2, 05AP03-8, 05AP07-8
- Analgesia, patient-controlled
04AP02-6, 04AP03-1, 08AP05-11,
08AP06-5, 08AP06-6, 08AP07-3
- Analgesia, postoperative
01AP06-1, 01AP06-7, 02AP02-2,
03AP04-2, 03AP05-8, 03AP06-4,
03AP06-5, 03AP07-3, 03AP07-4,
03AP07-5, 07AP07-2, 08AP01-1,
08AP01-4, 08AP01-7, 08AP02-2,
08AP02-3, 08AP02-4, 08AP02-7,
08AP03-4, 08AP03-9, 08AP03-10,
08AP04-6, 08AP04-8, 08AP04-9,
08AP05-5, 08AP05-9, 08AP05-10,
08AP05-11, 08AP06-5, 08AP06-7,
08AP06-10, 08AP07-2, 08AP07-8,
14AP04-3, 14AP10-4
- Analgesia, pre-emptive
08AP07-7
- Analgesic techniques, extradural
03AP09-1, 04AP03-1,
08AP04-5
- Analgesic techniques, i.v.
01AP09-3
- Analgesic techniques, infiltration
03AP04-1, 08AP03-9
- Analgesic techniques, infusion
03AP08-7
- Analgesic techniques, regional, i.a.
03AP02-4, 03AP05-6, 03AP08-9,
03AP10-2, 04AP03-9, 04AP04-9,
08AP04-8, 08AP05-2, 09AP05-7
- Analgesic techniques, subarachnoid
03AP02-10, 03AP02-11, 08AP03-2,
09AP01-2, 14AP05-5
- Analgesics anti-inflammatory, steroid
03AP04-1, 03AP04-8
- Analgesics opioid
BAPC-2, 01AP09-4, 01AP11-1,
01AP13-7, 08AP01-4, 08AP04-8,
08AP05-4, 08AP06-5, 08AP07-6,
08AP07-8, 14AP04-6, 15AP01-3
- Analgesics, non-opioid
01AP02-8, 03AP08-1, 04AP03-3,
08AP01-2, 08AP01-4, 08AP01-9,
08AP01-10, 08AP06-2, 08AP06-3,
08AP07-3, 08AP07-6, 09AP01-7,
14AP04-6
- Analgesics, postoperative
03AP07-2, 08AP01-5, 08AP01-8,
08AP03-5, 08AP03-8
- Animals Procedures Act
03AP03-9
- Antagonists, neuromuscular block
01AP08-1
- Antagonists, opioid
01AP09-4
- Antibiotics
13AP05-4, 13AP05-5, 13AP12-4,
13AP12-8, 13AP13-2
- Arterial pressure
01AP01-3, 06AP01-3
- Arterial pressure, drug effects
01AP01-4
- Arterial pressure, hypertension
02AP01-6, 07AP08-1
- Arterial pressure, hypotension
03AP01-11, 06AP03-2, 14AP06-6,
15AP01-2
- Arterial pressure, measurement
01AP01-2, 16AP06-10
- Arteries, aorta
04AP04-10
- Arteries, cannulation
07AP11-7
- Arteries, cerebral
07AP08-5, 10AP03-8
- Assessment, preanaesthetic
01AP11-3, 01AP12-9, 04AP03-10,
07AP08-9, 14AP05-10, 14AP06-11,
14AP08-1, 15AP02-1, 16AP01-8
- Asthma
11AP06-7
- Blood, anticoagulants
07AP01-6, 12AP04-4, 12AP05-5,
14AP09-1
- Blood, coagulation
01AP14-10, 03AP06-6, 04AP07-4,
07AP03-11, 07AP10-6, 07AP10-7,
12AP01-2, 12AP01-3, 12AP01-4,
12AP01-9, 12AP02-1, 12AP02-2,
12AP02-3, 12AP02-7, 12AP03-2,
12AP03-5, 12AP03-6, 12AP04-2,
12AP04-3, 12AP04-7, 12AP04-8,
12AP05-7, 12AP05-9, 13AP11-2,
14AP09-1, 14AP09-11
- Blood, flow
02AP01-7
- Blood, flow, skin
01AP05-5
- Blood, glucose
13AP09-8, 14AP03-10,
14AP08-9
- Blood, haematopoiesis
12AP01-1
- Blood, haemodilution
07AP03-11, 07AP08-10
- Blood, haemoglobin
07AP09-10, 12AP02-4, 14AP01-6,
14AP06-3, 14AP07-2, 14AP08-11
- Blood, loss
01AP15-11, 03AP01-10, 04AP02-1,
05AP04-3, 10AP01-5, 12AP02-5,
12AP02-9, 12AP05-1, 16AP02-5
- Blood, platelets
01AP08-6, 01AP14-12, 04AP01-1,
04AP01-2, 04AP01-3, 06AP06-7,
07AP01-5, 12AP03-5, 12AP05-8,
14AP04-8
- Blood, salvage
12AP03-4
- Blood, transfusion
01AP13-9, 01AP15-10, 04AP07-1,
05AP04-1, 05AP04-2, 05AP04-4,
07AP01-1, 07AP01-4, 07AP03-6,
07AP06-5, 12AP02-6, 12AP03-1,
12AP03-2, 12AP03-8, 12AP04-2,
12AP04-6, 12AP05-1, 12AP05-6,
14AP01-6
- Brain, anaesthesia, molecular effects
01AP07-3, 01AP16-6,
06AP02-9
- Brain, anatomy
05AP04-3
- Brain, blood flow
01AP08-5, 03AP01-7, 06AP03-1,
06AP03-5
- Brain, carbon dioxide tension
01AP08-5
- Brain, cerebral cortex
01AP16-10, 06AP05-8, 07AP04-5
- Brain, electroencephalography
01AP07-2, 01AP07-5, 01AP07-11,
01AP13-3, 01AP16-11, 05AP06-11,
06AP02-6, 06AP03-7, 06AP05-8,
06AP05-11, 06AP05-12, 07AP11-8,
10AP02-6, 16AP06-4
- Brain, evoked potentials
06AP05-10
- Brain, injury
06AP02-6, 06AP03-6, 06AP03-7,
06AP03-11, 06AP03-12, 06AP05-12,
06AP06-12, 12AP02-2, 13AP01-1,
13AP08-8, 13AP10-4, 14AP04-9
- Brain, intracranial haemorrhage
06AP01-7, 06AP02-10, 06AP03-3,
06AP04-2, 06AP05-2, 06AP06-7,
06AP06-9, 08AP04-11, 13AP08-4,
13AP08-9, 13AP10-4
- Brain, intracranial neoplasm
06AP03-9, 06AP04-9
- Brain, intracranial pressure
06AP04-9, 06AP06-12
- Brain, ischaemia
06AP01-3, 06AP03-3, 06AP04-5,
10AP01-6, 13AP07-4, 14AP09-5
- Brain, magnetic resonance imaging
BAPC-6, 09AP04-2
- Brain, metabolism
06AP05-2, 07AP01-7, 13AP12-3
- Brain, oxygen consumption
05AP06-1, 06AP04-3, 07AP01-7,
07AP03-3
- Brain, synapses
09AP03-12
- Burns
08AP06-6, 10AP03-3, 13AP10-6,
13AP10-7, 13AP10-8, 13AP10-9
- Cancer
01AP13-11, 03AP02-9, 03AP03-6,
03AP03-7, 03AP03-8, 03AP10-5,
08AP06-9, 12AP03-1, 14AP01-1,
14AP01-2, 14AP01-6, 14AP02-5,
14AP06-3, 14AP10-1, 16AP08-4
- Carbon dioxide, measurement
11AP07-1
- Carbon dioxide, partial pressure
11AP06-3
- Cardiorespiratory system
01AP01-11, 05AP01-7, 07AP09-7,
07AP11-5, 07AP12-10, 10AP02-6,
13AP01-3, 13AP04-1, 14AP02-4,
14AP08-4
- Cerebrospinal fluid
06AP02-11
- Chemotherapy, cancer
01AP03-11, 07AP04-7,
13AP06-8

- Clinical trials
01AP01-5, 01AP09-7, 03AP07-1,
07AP05-10, 09AP03-4, 09AP04-3,
11AP01-5, 12AP02-7, 14AP07-1,
14AP07-9
- Complications
01AP01-5, 01AP08-11, 01AP11-2,
01AP11-3, 02AP02-1, 02AP02-3,
03AP01-10, 03AP02-12, 03AP08-6,
03AP10-1, 04AP01-5, 04AP01-8,
04AP02-1, 04AP08-9, 05AP01-5,
05AP01-9, 06AP01-6, 06AP01-8,
06AP05-4, 07AP06-4, 08AP05-2,
10AP03-3, 11AP03-2, 13AP04-5,
13AP11-1, 13AP11-7, 14AP01-1,
14AP03-7, 14AP03-9, 14AP04-1,
14AP09-12, 15AP01-1, 16AP03-7,
16AP03-8, 16AP03-11, 16AP04-4,
16AP08-5
- Complications, abscess
03AP01-2
- Complications, accidents
01AP12-10, 16AP05-4, 16AP08-5
- Complications, adult respiratory distress
syndrome
13AP01-2
- Complications, airway obstruction
11AP08-2, 13AP07-4
- Complications, anaemia
12AP02-9, 14AP06-9
- Complications, anaphylaxis
16AP02-3
- Complications, anastomotic dehiscence
14AP06-7, 14AP07-4
- Complications, aneurysm
07AP08-9
- Complications, anoxia
10AP03-6
- Complications, aortic rupture
07AP11-10
- Complications, aortic valve disease
03AP02-2
- Complications, arrhythmia
07AP03-9, 07AP04-4, 07AP12-9,
07AP12-10, 14AP07-8
- Complications, arteriovenous malformation
04AP08-6, 14AP08-6
- Complications, backache
04AP08-2
- Complications, cardiac arrest
03AP02-1, 07AP11-4, 13AP08-5
- Complications, catheter migration
01AP08-7, 03AP07-6, 16AP02-12,
16AP04-8
- Complications, catheter misplacement
01AP08-7, 13AP07-6, 13AP09-2
- Complications, cerebral ischaemia
07AP08-8, 07AP10-3, 13AP02-9
- Complications, chylothorax
05AP07-11
- Complications, coagulopathy
04AP01-7, 07AP05-9, 12AP05-4
- Complications, coma
13AP08-7, 13AP08-10
- Complications, coronary vasospasm
14AP09-2
- Complications, death
04AP06-6, 13AP04-6, 14AP02-3
- Complications, diabetes
13AP08-11
- Complications, disseminated intravascular
coagulation
04AP07-10
- Complications, drug resistance
07AP06-8, 13AP03-1
- Complications, dural puncture
04AP06-1
- Complications, Ehlers-Danlos type IV
04AP04-4
- Complications, embolism
10AP02-3, 16AP02-12
- Complications, fistula
04AP08-3
- Complications, haematoma
03AP01-1, 04AP08-5, 06AP06-4
- Complications, haemorrhage
01AP14-9, 06AP01-2, 06AP06-4,
07AP01-5, 12AP02-1, 16AP02-10
- Complications, haemorrhagic disorder
04AP01-9, 12AP03-7
- Complications, head injury
10AP01-6, 14AP04-9
- Complications, headache
14AP09-4
- Complications, hepatic
12AP01-3
- Complications, hyperalgesia
01AP09-4
- Complications, hypertension
04AP04-6, 04AP04-11, 07AP06-2
- Complications, hyperthermia
01AP03-11
- Complications, hypotension
04AP02-8, 04AP02-9, 04AP04-7,
06AP05-1, 07AP06-7, 13AP01-7,
14AP02-6, 14AP09-8
- Complications, hypothermia
01AP11-1, 01AP14-2, 03AP02-10
- Complications, hypovolaemia
05AP06-3, 06AP06-4, 07AP09-9,
13AP07-3
- Complications, hypoxia
13AP01-7
- Complications, infections
01AP01-6, 13AP04-7, 13AP13-4
- Complications, intubation endobronchial
13AP01-7
- Complications, intubation tracheal
11AP04-8
- Complications, laryngospasm
03AP10-9, 06AP06-1, 11AP05-10
- Complications, morbidity
BAPC-1, 01AP01-9, 07AP06-3,
15AP01-5, 16AP04-3
- Complications, multiple organ dysfunction
syndrome
13AP06-10, 15AP01-8
- Complications, muscular dystrophy
01AP08-3
- Complications, myalgia
14AP09-9
- Complications, myocardial infarction
07AP06-1
- Complications, neurological
01AP06-5, 01AP16-9, 03AP09-4,
07AP03-10, 07AP04-8, 07AP04-9,
16AP02-4
- Complications, neuromuscular disease
13AP04-3, 14AP03-4
- Complications, neuropathy
01AP06-4, 04AP01-6
- Complications, obesity
01AP05-1, 01AP05-9, 01AP11-7,
01AP14-9, 07AP01-6, 11AP03-6,
11AP06-5, 13AP05-6, 16AP03-11,
16AP05-6
- Complications, obstructive sleep apnoea
05AP07-10, 11AP05-7, 14AP07-7,
16AP07-1
- Complications, pheochromocytoma
13AP04-12, 14AP08-10
- Complications, positional
04AP01-4, 16AP02-8
- Complications, postoperative desaturation
07AP07-5, 11AP05-10, 16AP01-11
- Complications, pulmonary
07AP02-10, 07AP07-3, 07AP12-1,
14AP05-2
- Complications, pulmonary hypertension
01AP05-1, 02AP01-5
- Complications, pulmonary oedema
04AP04-7, 07AP04-7
- Complications, renal
01AP15-2, 01AP15-3, 14AP07-4,
16AP01-10, 16AP05-8
- Complications, respiratory
01AP05-9, 01AP11-8, 03AP02-6,
03AP07-4, 03AP10-2, 11AP05-10,
11AP06-3, 11AP06-7, 11AP07-2,
13AP11-11
- Complications, rib fractures
14AP04-1
- Complications, septicaemia
13AP09-5, 13AP11-9, 13AP12-7
- Complications, shivering
16AP02-5
- Complications, skin injury
16AP02-2
- Complications, spinal injury
03AP01-1, 03AP01-2, 04AP01-7,
06AP03-2, 07AP01-9
- Complications, stenosis
11AP05-9
- Complications, stridor
11AP05-2
- Complications, thrombosis
12AP01-2, 12AP01-5, 12AP01-7,
12AP01-9
- Complications, trauma
06AP03-6, 06AP03-12, 10AP01-3,
10AP01-7, 10AP01-8, 10AP01-9,
12AP04-6
- Complications, ultrasound
01AP14-6, 10AP01-7
- Complications, vasoconstriction
06AP03-3
- Diabetes
01AP05-4, 07AP03-3, 11AP06-8,
12AP01-9, 13AP06-5, 14AP06-8
- Donors, organ transplantation
16AP05-8
- Drug delivery
01AP12-10, 04AP03-6, 09AP01-8,
11AP06-9, 14AP03-6, 16AP05-1
- Drug delivery, computerized
01AP10-5, 01AP16-7, 13AP08-3
- Drug delivery, nasal
05AP03-3
- Drug delivery, subcutaneous
09AP02-9
- Drug delivery, sublingual
08AP01-3, 08AP01-6, 08AP01-8
- Drug delivery, volume
03AP02-2
- Education
01AP12-5, 01AP12-10, 03AP09-1,
08AP04-10, 10AP02-4, 10AP02-5,
12AP05-1, 13AP09-11, 14AP09-11,
16AP02-11, 16AP04-1, 16AP04-2,
16AP07-3, 16AP08-1, 17AP01-6,
17AP01-7, 17AP01-8, 17AP02-2,
17AP02-7, 17AP02-9, 17AP02-10,
17AP02-12
- Education, continuing
17AP01-5, 17AP01-9, 17AP02-1,
17AP02-3, 17AP02-4, 17AP02-5,
17AP02-6, 17AP02-9, 17AP02-11
- Education, medical students
17AP01-10
- Education, untrained personnel
11AP01-4, 17AP02-9

- Ehlers-Danlos syndrome
04AP04-4
- Embolism, air
06AP01-5
- Epilepsy
06AP05-5, 06AP05-6, 10AP02-7
- Equipment, airway
01AP04-4, 11AP01-1, 11AP01-3,
11AP01-10, 11AP02-1, 11AP03-1,
11AP03-2, 11AP03-5, 11AP03-10,
11AP04-7, 11AP05-9, 11AP06-5,
13AP02-3
- Equipment, anaesthesia machines
01AP10-2
- Equipment, breathing systems
11AP06-9, 13AP08-3, 13AP10-1
- Equipment, bronchoscopes
11AP03-1
- Equipment, cannulae intravascular
16AP02-11
- Equipment, catheters extradural
04AP03-9
- Equipment, cell savers
07AP05-9
- Equipment, computers
01AP10-5, 14AP06-5
- Equipment, extracorporeal circulation
07AP06-9, 13AP04-9
- Equipment, Finapres
14AP02-10
- Equipment, gas analysers
01AP10-1
- Equipment, laryngoscopes
11AP03-6, 11AP04-8
- Equipment, laryngoscopes fiberoptic
01AP04-11, 11AP04-1
- Equipment, lasers
09AP05-10
- Equipment, masks anaesthesia
02AP01-6, 02AP03-1, 11AP03-3
- Equipment, monitors
01AP03-6, 01AP07-2, 01AP07-3,
08AP05-12, 14AP02-10, 14AP08-11,
16AP03-3
- Equipment, needles
03AP09-3
- Equipment, pacemakers
07AP03-9
- Equipment, pulse oximeters
07AP09-3, 11AP07-4
- Equipment, servo systems
13AP10-2
- Equipment, tourniquets
06AP02-9
- Equipment, tubes double-lumen
11AP05-6
- Equipment, ultrasound machines
01AP14-5, 05AP06-9, 14AP09-8
- Equipment, warming devices
01AP14-3, 14AP01-8, 16AP04-10
- Ethics
16AP08-3
- Eye, cataract
02AP01-7, 05AP04-6
- Eye, pupil
16AP06-1
- Fetus
04AP06-3, 04AP08-11
- Fluid balance
01AP01-6, 01AP03-4, 01AP03-5,
01AP03-9, 01AP10-9, 04AP08-8,
05AP04-1, 07AP12-1, 13AP01-8,
13AP04-1, 13AP07-1, 13AP07-8,
14AP07-4
- Fluids, i.v.
01AP01-1, 01AP01-7, 01AP10-8,
01AP15-1, 04AP08-8, 10AP03-3,
- 12AP05-4, 14AP03-11, 14AP06-5,
14AP07-3
- Formulations, bupivacaine
03AP01-4, 03AP01-9, 03AP03-2
- Gases non-anaesthetic
07AP05-1, 13AP03-6
- Gastrointestinal tract
10AP03-7, 14AP07-5
- Gastrointestinal tract, endoscopy
03AP08-9, 11AP06-4,
16AP07-2
- Genetic factors
01AP05-11, 01AP08-2, 06AP01-6,
12AP01-5, 13AP09-7
- Geriatrics
13AP09-1, 15AP01-7, 15AP02-1
- Head, injury
10AP01-6
- Heart, angiography
14AP08-3
- Heart, arrhythmia
01AP06-8, 07AP01-2, 07AP01-11,
07AP04-11, 07AP05-5, 07AP09-11,
10AP02-2, 14AP09-3
- Heart, blood flow, myocardial
07AP10-8, 14AP08-3
- Heart, cardiac output
01AP01-7, 01AP03-3, 07AP11-8,
11AP07-1, 13AP04-1, 13AP13-6
- Heart, cardiopulmonary bypass
07AP01-4, 07AP01-5, 07AP01-6,
07AP03-6, 07AP04-8, 07AP05-7,
07AP10-8, 07AP12-10, 10AP02-3,
12AP02-8
- Heart, catheterization
05AP01-9, 07AP10-3, 14AP08-2
- Heart, conduction
07AP01-11
- Heart, congenital defects
01AP08-4, 04AP04-2, 04AP04-3,
05AP01-7, 05AP03-4, 07AP10-8,
14AP08-7
- Heart, coronary artery bypass
07AP01-11, 07AP03-3, 07AP08-10,
16AP02-1
- Heart, coronary occlusion
04AP04-5, 16AP02-1
- Heart, esmolol
07AP05-4, 07AP09-11
- Heart, heart rate
03AP04-9
- Heart, ischaemia
01AP11-10, 07AP05-1, 07AP05-10,
07AP11-1
- Heart, myocardial function
01AP08-8, 03AP02-4, 04AP04-1,
06AP04-2, 07AP05-3, 07AP05-5,
07AP09-7, 07AP10-7, 13AP04-12,
13AP07-3, 13AP07-9, 14AP03-5,
14AP08-8
- Heart, myocardial preservation technique
07AP10-1
- Heart, preservation
07AP11-1
- Heart, resuscitation
06AP02-3, 10AP02-5, 10AP02-7,
10AP03-6
- Heart, transplantation
07AP04-1, 07AP10-11, 13AP07-7
- Heart, ventricles
07AP10-2, 14AP08-2
- Histamine, antihistamines
13AP13-3
- Hormones, antidiuretic
01AP15-11
- Hormones, atrial natriuretic peptide
01AP10-9
- Hormones, growth
09AP04-4
- Hormones, insulin
10AP02-1
- Hormones, renin
13AP03-2
- Hypertrophic obstructive cardiomyopathy
14AP03-8
- Hypothermia
01AP14-1, 01AP14-2, 07AP01-7,
10AP02-6, 14AP01-7, 14AP01-8,
14AP06-1, 16AP02-5, 16AP04-10
- Hypoxaemia
01AP05-10, 01AP08-4, 05AP01-3,
07AP01-10, 13AP01-8
- Hypoxia
01AP05-10, 02AP02-5, 03AP08-6,
05AP07-9, 10AP02-4
- Immune response
01AP09-8, 01AP15-8, 06AP02-2,
08AP07-7, 09AP03-5, 13AP01-5,
13AP02-5, 13AP03-7, 13AP05-6,
13AP06-1, 13AP06-3, 13AP12-6,
14AP04-9, 15AP01-8
- Induction, anaesthesia
01AP15-9, 07AP09-2, 11AP03-4
- Infants
05AP05-5, 05AP07-1, 16AP03-6
- Infection, bacterial
03AP08-10, 04AP01-10, 13AP03-5,
13AP03-8, 13AP06-3, 13AP06-6,
13AP12-2, 13AP12-5, 13AP13-3,
13AP13-7, 14AP04-4
- Infection, central nervous system
13AP04-7
- Infection, control
13AP05-1, 13AP12-8, 13AP12-9,
13AP13-2, 13AP13-8, 14AP04-4
- Infection, nosocomial
13AP03-1, 13AP03-8, 13AP05-7,
13AP05-8, 13AP05-9, 13AP08-10,
13AP12-4, 13AP13-1
- Infection, pulmonary
13AP01-5, 13AP02-6
- Infection, upper respiratory tract
13AP09-3
- Infusions
13AP07-2, 14AP09-6
- Infusions, i.v.
04AP08-8, 14AP03-5
- Intensive care
01AP08-11, 05AP06-3, 05AP07-11,
06AP03-11, 06AP05-12, 07AP01-10,
07AP06-10, 13AP02-1, 13AP02-3,
13AP02-4, 13AP03-5, 13AP04-3,
13AP04-4, 13AP04-5, 13AP04-8,
13AP04-10, 13AP04-11, 13AP05-2,
13AP05-8, 13AP06-3, 13AP06-5,
13AP07-2, 13AP07-3, 13AP07-8,
13AP07-9, 13AP08-2, 13AP09-1,
13AP09-4, 13AP09-6, 13AP09-7,
13AP09-8, 13AP09-9, 13AP09-11,
13AP10-6, 13AP10-7, 13AP10-8,
13AP10-9, 13AP11-3, 13AP11-4,
13AP12-8, 14AP07-8, 16AP07-10
- Intensive care, analgesia
07AP04-4
- Intensive care, audit
13AP04-11, 13AP08-4, 13AP13-4
- Intensive care, infections
10AP03-4, 13AP03-2, 13AP03-7,
13AP03-8, 13AP05-3, 13AP05-5,
13AP05-6, 13AP05-7, 13AP05-9,
13AP09-5, 13AP12-3, 13AP12-4,
13AP12-6, 13AP13-1, 13AP13-4,
13AP13-5, 13AP13-8, 14AP04-4,
14AP06-7

- Intensive care, sedation
13AP09-11, 13AP10-1, 13AP10-2,
13AP10-3, 13AP10-4
- Intubation endobronchial
11AP08-8
- Intubation nasotracheal, complications
11AP03-1
- Intubation nasotracheal, technique
11AP02-11
- Intubation tracheal
01AP04-5, 01AP09-1, 01AP11-5,
01AP13-7, 07AP09-8, 10AP01-2,
11AP01-4, 11AP03-6, 11AP04-4,
11AP08-9
- Intubation tracheal, complications
01AP13-7, 05AP03-3, 11AP04-3,
11AP04-5, 11AP06-4, 11AP08-4
- Intubation tracheal, difficult
01AP04-3, 01AP04-6, 01AP04-10,
01AP04-11, 04AP02-4, 04AP05-5,
11AP02-2, 11AP02-6, 11AP02-9,
11AP02-11, 11AP04-7, 11AP04-9,
11AP05-1, 11AP06-5, 11AP06-8,
11AP08-2, 14AP08-1, 16AP08-6
- Intubation tracheal, technique
11AP02-4, 11AP04-4, 11AP04-5,
11AP04-6
- Intubation tracheal, training
11AP02-9, 11AP04-5, 17AP01-10,
17AP02-4
- Ions, chloride
04AP02-11
- Ions, ion channels, voltage-gated
03AP03-3, 06AP02-7, 09AP03-8
- Ions, magnesium
01AP02-2, 01AP02-3, 05AP03-5
- Ions, sodium
06AP02-7
- Kidney, blood flow
01AP15-3, 07AP06-9
- Kidney, diuretics
13AP01-8
- Kidney, failure
01AP08-2, 01AP15-3, 01AP15-5,
07AP04-2, 13AP06-1, 13AP06-4,
13AP06-6, 13AP06-8, 14AP02-6,
14AP03-11, 14AP04-2, 14AP05-4,
14AP07-10, 16AP01-10
- Kidney, function
01AP01-1, 01AP15-4, 05AP03-4,
14AP03-6, 14AP04-2
- Kidney, transplantation
01AP03-2, 01AP15-1, 01AP15-4,
07AP08-7, 08AP05-9, 13AP06-9
- Larynx, cricoid pressure
04AP02-3
- Larynx, damage
03AP10-9
- Larynx, laryngoscopy
11AP04-2, 16AP07-4
- Larynx, laryngoscopy fiberoptic
11AP04-9
- Larynx, vocal cords
01AP04-9
- Liver, blood flow
01AP06-6, 01AP15-11, 12AP01-3
- Liver, cirrhosis
13AP11-3, 14AP04-5
- Liver, damage
01AP15-8, 07AP02-3, 10AP03-2
- Liver, disease
13AP11-5
- Liver, function
01AP15-8, 13AP11-1, 13AP11-2,
14AP04-5
- Liver, hepatotoxicity
01AP13-5
- Liver, metabolism
01AP13-5, 01AP15-7
- Liver, protein synthesis
12AP01-1
- Liver, transplantation
01AP03-10, 01AP11-10, 10AP03-2,
12AP02-10, 12AP03-6, 12AP04-3,
12AP04-8, 13AP11-6, 13AP11-10,
13AP13-8, 14AP04-2, 14AP05-11,
14AP07-8, 14AP07-10, 14AP08-8,
14AP08-11
- Lung, adult respiratory distress syndrome
11AP07-3, 13AP01-9, 13AP01-10,
13AP02-5, 13AP02-8
- Lung, atelectasis
05AP06-8, 07AP04-3, 11AP07-5,
11AP07-7
- Lung, bronchus
17AP02-7
- Lung, compliance
13AP02-7
- Lung, damage
07AP05-11, 07AP07-6, 07AP12-9,
11AP07-11, 13AP09-7
- Lung, function
03AP07-10, 07AP04-6
- Lung, hypoxia
07AP02-8, 07AP04-6, 07AP07-5
- Lung, lavage
07AP07-6
- Lung, mechanics
01AP05-6, 07AP02-7, 11AP07-10
- Lung, metabolic function
13AP01-10
- Lung, model
07AP05-6, 07AP07-6
- Lung, oedema
06AP03-8, 13AP01-5
- Lung, pathophysiology
01AP05-4, 07AP02-10
- Lung, pneumothorax
07AP07-2, 11AP05-4
- Lung, respiratory distress syndrome
07AP04-6, 13AP01-6, 13AP02-7
- Lung, respiratory resistance
06AP05-1
- Lung, shunting
01AP05-4, 07AP07-1, 11AP07-1
- Lung, surfactant
13AP02-7
- Lung, tidal volume
BAPC-3, 11AP07-3
- Lung, transplantation
07AP12-7, 12AP04-7, 13AP04-9,
13AP07-7
- Lung, vasculature
14AP08-2
- Malignant hyperthermia
01AP08-3
- Measurement techniques, accelography
01AP02-8
- Measurement techniques, airway elastance
11AP07-9
- Measurement techniques, airway
obstruction
16AP07-1
- Measurement techniques, airway resistance
11AP07-8
- Measurement techniques, arterial pressure
01AP01-2, 07AP08-2, 16AP06-10
- Measurement techniques, cardiac output
01AP01-5, 01AP03-1, 01AP03-2,
01AP03-3, 01AP03-5, 01AP08-2,
07AP03-2, 07AP08-2, 07AP09-1
- Measurement techniques, coagulation
04AP01-9, 07AP10-6, 12AP02-6,
12AP02-8, 12AP04-1, 12AP04-3,
12AP04-9, 12AP05-6
- Measurement techniques, Doppler
echocardiography
07AP05-5, 14AP07-3
- Measurement techniques, drug
concentration
13AP11-1
- Measurement techniques, elastance
11AP07-8
- Measurement techniques,
electrophysiology
05AP03-8
- Measurement techniques, flow velocity
waveform analysis
13AP07-1
- Measurement techniques, lung shunting
11AP07-7
- Measurement techniques, microdialysis
07AP09-5
- Measurement techniques, neuromuscular
block
01AP02-1
- Measurement techniques, oximeters
06AP04-3, 07AP09-4
- Measurement techniques, thermodilution
01AP03-1
- Measurement techniques,
thrombelastography
07AP06-5, 12AP02-3, 12AP04-2,
12AP04-4, 12AP04-6, 12AP05-4
- Measurement techniques, ultrasound
02AP01-7, 03AP03-10, 03AP07-6,
03AP09-7, 05AP06-3, 06AP03-5,
13AP05-4, 16AP06-6
- Measurement techniques, ventilation
volumes
11AP07-8, 13AP01-4, 16AP07-7
- Measurement techniques, visual analogue
scale
08AP05-3, 08AP05-5, 09AP03-4
- Medico-legal
16AP03-3, 16AP07-5
- Memory
07AP06-6
- Metabolism, endocrine
13AP08-11
- Metabolism, free radicals
13AP06-10
- Metabolism, glucose
14AP10-2
- Metabolism, lactate
06AP03-9, 07AP09-5, 10AP03-4
- Metabolism, lipid
01AP08-3, 14AP09-9
- Methaemoglobinaemia
03AP08-6
- Microcirculation
01AP03-8, 05AP04-1, 07AP09-11
- Model, animal
01AP16-10, 13AP12-3, 13AP12-9,
13AP13-3, 13AP13-6
- Model, breathing systems
11AP06-9
- Model, computer simulation
17AP02-1
- Model, mathematical
07AP02-10, 14AP02-3
- Model, neuropathy
09AP03-3
- Model, pharmacodynamic
01AP13-1
- Model, pharmacokinetic
13AP05-4
- Model, pulmonary aspiration
11AP01-3
- Model, respiratory failure
16AP07-11

- Monitoring, anaesthetist activity
16AP03-10, 17AP02-12
- Monitoring, apnoea
11AP05-7
- Monitoring, arterial pressure
01AP01-3, 01AP03-2, 01AP03-4,
03AP01-11, 05AP04-8, 07AP08-1,
07AP09-1, 07AP09-8, 16AP06-10
- Monitoring, carbon dioxide
04AP06-6, 05AP06-5, 16AP06-2,
16AP06-3
- Monitoring, cardiopulmonary
01AP01-11, 01AP03-5, 01AP03-7,
07AP03-2, 07AP08-6, 07AP09-9
- Monitoring, computerized
01AP09-1
- Monitoring, cuff pressure
11AP03-7
- Monitoring, depth of anaesthesia
01AP07-4, 01AP07-11, 01AP11-6,
01AP16-7, 01AP16-8, 05AP06-4,
07AP09-6, 09AP04-3, 16AP03-10,
16AP06-5
- Monitoring, echocardiography
07AP03-1, 07AP03-5, 07AP10-2,
10AP02-3, 13AP07-6, 13AP07-9,
13AP11-8
- Monitoring, electrocardiography
01AP01-11
- Monitoring, electroencephalography
01AP07-5, 01AP07-6, 06AP04-8,
07AP08-5, 10AP02-7
- Monitoring, evoked potentials
06AP04-8, 06AP06-11
- Monitoring, intensive care
06AP02-6, 07AP09-3, 13AP07-1,
13AP09-8
- Monitoring, intraoperative
01AP03-1, 01AP03-6, 01AP03-9,
01AP05-7, 01AP06-6, 01AP09-6,
01AP10-4, 01AP10-9, 01AP11-10,
01AP15-10, 01AP16-3, 03AP05-4,
06AP04-5, 06AP06-5, 06AP06-11,
07AP03-4, 07AP09-10, 08AP05-12,
12AP04-8, 14AP09-7, 16AP04-3,
16AP06-4
- Monitoring, neuromuscular function
01AP02-7, 05AP03-5, 06AP04-8
- Monitoring, oxygen
01AP05-7, 07AP03-10, 07AP04-5,
13AP08-9
- Monitoring, radiological
16AP02-9
- Monitoring, respiratory sinus arrhythmia
02AP03-6
- Monitoring, spirometry
01AP05-9
- Monitoring, temperature
01AP14-1, 01AP14-2, 14AP01-8
- Monitoring, ultrasound
01AP10-1, 05AP06-8, 06AP03-5,
07AP02-5, 07AP11-10, 08AP04-6,
13AP02-4
- Monitoring, vapours
01AP10-1, 01AP10-3
- Monitoring, ventilation
02AP01-3, 02AP03-8, 07AP07-8,
11AP07-4, 11AP07-9, 13AP04-6,
16AP07-7
- Muscle cardiac, contractility
10AP02-1
- Muscle skeletal
01AP08-1, 03AP02-3, 09AP05-1
- Muscle skeletal, diaphragm
07AP02-5, 13AP02-1
- Muscle skeletal, metabolism
13AP04-3, 14AP03-4
- Muscle skeletal, relaxation
04AP05-9
- Muscle vascular, responses
14AP09-7
- Myasthenia gravis
11AP02-10
- Neonates
04AP03-4, 04AP05-8, 05AP02-1,
05AP04-10, 07AP03-4
- Nerve, damage (postoperative)
01AP06-5
- Nerve, synaptosome
09AP03-11
- Nerve, transmission
09AP03-8
- Neuromuscular block
01AP07-7, 01AP11-5, 05AP03-5,
05AP03-6, 11AP03-4, 11AP08-8,
14AP03-3
- Neuromuscular block, antagonism
01AP02-6, 01AP02-7, 01AP14-12
- Neuromuscular block, potentiation
01AP02-2
- Neuromuscular block, recovery
01AP02-1, 01AP02-3, 01AP02-7,
01AP02-10, 16AP05-8
- Neuromuscular block, rocuronium
01AP02-1, 01AP02-2, 01AP02-3,
01AP02-4, 01AP02-5, 01AP02-6,
01AP02-8, 01AP02-10, 01AP08-1,
01AP14-12, 05AP03-7, 06AP01-6
- Neuromuscular function, synapses
01AP02-4
- Neuromuscular transmission
01AP02-4
- Non-steroidal anti-inflammatory drugs
01AP09-9, 06AP02-5, 08AP01-5,
09AP02-2, 14AP04-3, 14AP04-8
- Operating rooms, personnel
01AP12-4, 14AP02-7, 16AP01-1,
16AP04-2, 16AP04-5, 16AP04-9
- Organizations, Committee on Safety of
Medicines
07AP01-3, 10AP01-4, 16AP01-5,
16AP01-6
- Oxygen, measurement
05AP06-1
- Oxygen, partial pressure
13AP02-10
- Oxygen, saturation
07AP07-10, 07AP10-3, 08AP01-5,
13AP01-3, 16AP01-11, 16AP06-7
- Oxygen, therapy
04AP01-10, 05AP07-9,
13AP09-3
- Oxygen, tissue
01AP05-5, 07AP03-4
- Oxygen, toxicity
13AP05-1
- Pain
01AP09-5, 01AP09-6, 01AP13-3,
02AP02-7, 02AP03-2, 02AP03-6,
03AP06-2, 04AP02-2, 04AP03-6,
04AP03-8, 04AP05-6, 04AP08-9,
05AP02-1, 07AP09-8, 08AP01-1,
08AP02-8, 08AP03-8, 08AP04-4,
08AP05-7, 08AP05-10, 08AP05-12,
08AP06-3, 08AP07-1, 09AP01-8,
09AP02-1, 09AP02-3, 09AP05-2,
09AP05-3, 09AP05-4, 09AP05-8
- Pain, acute
08AP01-2, 08AP01-3, 08AP01-7,
08AP01-9, 08AP01-10, 08AP02-3,
08AP02-4, 08AP02-7, 08AP02-8,
08AP03-1, 08AP03-11, 08AP04-9,
08AP04-10, 08AP05-3, 08AP05-4,
08AP05-8, 08AP05-9, 08AP05-11,
08AP06-8, 08AP06-9, 08AP07-3,
08AP07-4, 08AP07-8, 09AP03-6
- Pain, chronic
BAPC-6, 07AP06-10, 07AP12-5,
08AP02-1, 09AP01-2, 09AP01-3,
09AP01-7, 09AP01-8, 09AP02-2,
09AP02-4, 09AP02-5, 09AP02-6,
09AP02-7, 09AP02-10, 09AP02-11,
09AP03-2, 09AP03-6, 09AP03-7,
09AP03-10, 09AP04-1, 09AP04-5,
09AP05-1, 09AP05-3, 09AP05-5,
09AP05-6, 09AP05-9, 09AP05-10
- Pain, experimental
01AP09-1, 01AP09-8, 02AP01-2,
08AP07-6, 09AP01-5, 09AP02-4,
09AP03-8, 09AP03-10, 09AP03-12,
09AP04-4
- Pain, injection
09AP02-4, 09AP05-11, 14AP04-6
- Pain, mechanism
06AP02-7, 09AP03-6, 09AP03-7,
09AP03-12
- Pain, neurolysis
09AP05-6
- Pain, neuropathic
09AP01-1, 09AP01-3, 09AP01-4,
09AP01-5, 09AP01-6, 09AP02-8,
09AP03-3, 09AP03-11, 09AP04-2,
09AP05-11
- Pain, pathological
09AP04-4
- Pain, postoperative
02AP01-4, 02AP02-2, 03AP05-6,
03AP06-1, 03AP07-7, 03AP07-10,
04AP05-8, 04AP08-2, 06AP03-10,
07AP12-5, 08AP01-6, 08AP01-11,
08AP02-5, 08AP02-6, 08AP02-7,
08AP02-8, 08AP03-2, 08AP04-1,
08AP05-1, 08AP05-6, 08AP06-1,
08AP06-2, 08AP06-4, 08AP07-2,
08AP07-4, 08AP07-7, 16AP05-6
- Parasympathetic nervous system
09AP04-3
- Partial pressure, oxygen
01AP05-10
- Pharmacodynamics
01AP02-5, 01AP02-6, 01AP07-4,
01AP16-8, 13AP05-3, 14AP10-7
- Pharmacokinetics
BAPC-2, 01AP07-4, 05AP03-1,
13AP05-3
- Pharmacokinetics, models
12AP02-5
- Pharmacology
01AP07-6, 01AP09-7, 01AP16-8,
05AP05-3, 06AP01-11, 09AP03-5,
14AP04-8
- Pharmacology, agonists adrenergic
01AP15-4, 07AP07-9
- Pharmacology, agonists opioid
08AP01-8
- Pharmacology, benzodiazepines
02AP01-2, 14AP04-7
- Pharmacology, dose-response
14AP10-7
- Pharmacology, synergism
03AP03-5, 14AP10-7
- Physics, fluid dynamics
07AP08-10
- Placenta
04AP07-3, 04AP07-5
- Polypeptides, cytokines
10AP01-9, 13AP06-10
- Position, effects
06AP06-2
- Position, lateral decubitus
03AP06-2

- Position, prone
02AP03-5, 03AP01-7, 06AP04-3,
16AP07-2
- Position, sitting
01AP16-3
- Position, Trendelenburg
01AP14-11
- Potency, anaesthetic, ED50
11AP01-9
- Pregnancy
04AP01-7, 04AP02-1, 04AP02-10,
04AP03-3, 04AP04-2, 04AP04-3,
04AP04-6, 04AP04-8, 04AP04-10,
04AP04-11, 04AP05-3, 04AP05-7,
04AP06-2, 04AP07-1, 04AP07-6,
04AP07-8, 12AP02-3
- Premedication
06AP01-9
- Protein, albumin
01AP15-9, 14AP07-10
- Protein, plasma
13AP13-6
- Psychological responses
06AP05-4, 08AP07-1
- Records, anaesthesia
07AP01-3, 16AP08-4
- Records, medical
08AP05-1, 08AP05-3, 16AP03-1,
16AP03-3
- Recovery
09AP01-3, 14AP01-4, 14AP01-5,
14AP02-8, 14AP03-1, 14AP06-2,
14AP06-4, 16AP02-2
- Recovery, cognitive
BAPC-5, 01AP05-8, 01AP16-3,
06AP02-2, 06AP02-3, 07AP04-5,
14AP01-5, 16AP03-10
- Recovery, neurological
06AP02-10, 06AP05-2, 13AP02-10,
13AP04-5, 13AP08-2, 13AP08-5,
13AP08-7
- Recovery, postoperative
05AP06-4, 05AP06-11, 05AP07-6,
14AP01-1, 14AP01-3, 14AP01-5,
14AP01-7, 14AP01-9, 14AP01-10,
14AP02-5, 14AP02-9, 14AP06-2,
14AP06-10, 14AP07-6, 15AP02-3
- Reflexes, chemoreceptor
14AP02-4
- Reflexes, laryngeal
05AP03-3
- Reflexes, threshold
06AP06-6
- Research, anaesthesia
01AP14-8, 01AP16-4, 02AP01-4,
05AP06-1, 14AP05-8
- Research, animal
BAPC-4, 01AP16-4, 07AP05-10,
09AP03-3, 13AP01-10, 13AP12-6
- Risk
01AP03-6, 01AP11-3, 02AP02-1,
03AP09-2, 04AP04-1, 04AP04-2,
08AP02-6, 12AP01-4, 12AP03-5,
13AP04-6, 13AP10-6, 13AP10-7,
13AP13-5, 14AP02-3, 16AP02-6,
16AP03-7, 16AP03-8, 16AP05-7
- Safety
01AP04-8, 01AP11-4, 01AP12-7,
02AP01-3, 02AP03-7, 02AP03-8,
04AP01-1, 04AP07-7, 05AP01-2,
06AP06-2, 07AP08-9, 10AP02-4,
13AP08-9, 14AP02-1, 14AP05-9,
16AP01-1, 16AP01-3, 16AP01-4,
16AP01-6, 16AP01-8, 16AP01-9,
16AP01-11, 16AP02-10, 16AP02-12,
16AP03-1, 16AP03-2, 16AP03-4,
16AP03-5, 16AP03-6, 16AP03-7,
16AP03-8, 16AP04-1, 16AP04-2,
16AP04-4, 16AP04-5, 16AP04-6,
16AP04-7, 16AP05-2, 16AP06-1,
16AP06-6, 16AP07-5, 16AP07-8,
16AP08-1, 16AP08-2, 16AP08-3,
16AP08-4, 16AP08-5, 16AP08-7,
17AP01-1, 17AP01-2, 17AP01-3,
17AP01-5, 17AP02-6
- Safety, drug
04AP03-4, 04AP04-9, 08AP06-3,
14AP09-3, 16AP01-4, 16AP05-1,
16AP05-4, 16AP05-7
- Safety, equipment
10AP03-4, 16AP06-7
- Safety, techniques
03AP09-2, 04AP01-11, 13AP07-6,
16AP02-1, 16AP02-11, 16AP04-8,
16AP05-1, 16AP06-2, 16AP07-3
- Scoliosis
03AP09-6, 05AP07-4
- Screening
01AP12-11, 13AP12-2, 13AP13-5,
14AP09-11
- Sedation
01AP04-6, 01AP13-4, 02AP01-1,
02AP01-3, 02AP02-3, 02AP02-5,
02AP03-4, 02AP03-6, 02AP03-9,
03AP03-1, 03AP08-3, 03AP10-1,
04AP04-7, 05AP01-3, 05AP03-1,
06AP05-5, 06AP05-9, 07AP03-10,
07AP12-8, 08AP05-7, 09AP02-9,
11AP06-3, 13AP08-8, 13AP10-5,
14AP04-7, 14AP07-9, 16AP06-3
- Serotonin (5-hydroxytryptamine),
antagonism
15AP01-4
- Skin, blood flow
01AP05-5, 03AP08-10
- Sleep
02AP03-9
- Sleep apnoea
01AP05-1, 02AP03-1, 05AP05-6,
14AP05-7
- Spinal cord, extradural pressure
04AP06-1
- Spinal cord, GABA
03AP03-1
- Spinal cord, motor block
03AP02-2
- Spinal cord, vertebral interspace
04AP01-11
- Statistics
01AP01-3, 01AP11-5, 13AP10-8,
16AP04-9
- Strabismus
05AP05-1
- Stress
01AP08-8, 04AP02-2, 08AP07-1,
13AP02-6, 14AP02-7, 17AP01-1
- Surgery, abdominal
BAPC-1, 01AP01-6, 01AP03-11,
01AP06-3, 01AP11-4, 01AP12-3,
01AP15-9, 11AP07-2, 12AP01-1,
13AP03-5, 13AP05-8, 13AP06-6,
14AP06-7
- Surgery, aneurysm
06AP01-7, 07AP06-9, 07AP08-7,
07AP09-4
- Surgery, cardiovascular
BAPC-5, 01AP14-8, 05AP01-4,
05AP06-9, 05AP07-11, 07AP01-1,
07AP01-2, 07AP01-8, 07AP01-9,
07AP01-10, 07AP02-4, 07AP02-7,
07AP03-5, 07AP04-7, 07AP04-9,
07AP06-2, 07AP06-7, 07AP08-4,
07AP08-8, 07AP09-1, 07AP11-7,
07AP11-8, 07AP11-9, 07AP12-4,
12AP02-6, 12AP03-2, 13AP02-3,
13AP06-1
- Surgery, craniotomy
06AP05-3, 06AP05-9
- Surgery, day-case
01AP04-4, 02AP01-2, 02AP01-4,
02AP02-7, 02AP02-9
- Surgery, endarterectomy
07AP08-1
- Surgery, endoscopy
01AP11-2, 02AP03-8
- Surgery, gastrointestinal
08AP01-11, 08AP03-2, 08AP06-2,
13AP11-11, 14AP10-10, 16AP07-10
- Surgery, gynaecological
04AP01-10, 04AP04-3, 04AP07-8,
08AP02-5, 08AP06-8, 14AP05-5,
14AP07-7
- Surgery, hepatic
01AP14-10, 01AP15-10
- Surgery, hormonal response
14AP08-9
- Surgery, laparoscopy
01AP09-9, 01AP11-7, 01AP11-8,
01AP14-9, 01AP15-2, 04AP08-10,
08AP02-6, 11AP07-9, 11AP07-10,
14AP03-3, 14AP07-6, 14AP09-4,
14AP10-4, 15AP01-4, 16AP04-10,
16AP06-9
- Surgery, laparotomy
01AP12-7, 13AP11-4
- Surgery, laser
11AP02-6
- Surgery, maxillofacial
11AP04-1, 12AP03-4
- Surgery, metabolic response
07AP12-1
- Surgery, neurological
06AP01-2, 06AP02-10, 08AP02-1,
13AP08-11
- Surgery, non-cardiac
01AP01-9, 13AP04-8, 13AP04-10,
13AP06-5, 13AP09-9, 14AP03-8,
14AP05-2, 14AP10-2, 16AP01-8
- Surgery, ophthalmological
02AP01-9, 03AP10-7, 03AP10-8,
11AP02-1, 11AP04-3, 11AP04-6
- Surgery, orthopaedic
01AP13-9, 02AP03-3, 03AP01-5,
03AP02-3, 03AP06-1, 03AP06-6,
03AP07-2, 03AP07-3, 03AP08-7,
08AP03-3, 08AP03-11, 09AP02-10,
10AP01-9, 12AP02-9, 12AP03-8,
14AP03-1, 14AP03-5, 14AP05-9,
15AP02-1, 15AP02-2, 15AP02-3,
15AP02-4, 15AP02-5, 16AP01-10
- Surgery, otolaryngological
03AP08-1
- Surgery, pheochromocytoma
01AP06-2, 13AP04-12, 14AP08-10
- Surgery, plastic
03AP08-5
- Surgery, postoperative period
01AP11-7, 03AP07-3, 05AP06-9,
05AP07-8, 07AP06-7, 08AP01-11,
08AP05-1, 08AP06-1, 11AP05-7,
12AP02-7, 12AP03-8, 12AP04-5,
13AP06-4, 13AP06-8, 14AP04-5,
14AP07-6, 14AP07-7, 15AP02-3,
16AP03-9, 16AP04-3
- Surgery, post-transplantation
01AP05-11, 07AP10-11,
12AP04-7
- Surgery, preoperative period
BAPC-1, 01AP06-2, 01AP08-8,
12AP01-7, 12AP04-5, 13AP11-10,
14AP02-4, 14AP03-4, 14AP05-11,

- 14AP06-1, 14AP07-2, 14AP08-10
- Surgery, spinal
 - 03AP01-7, 05AP01-5, 05AP04-4,
 - 06AP03-10, 06AP06-3, 09AP05-2,
 - 12AP01-2, 15AP01-5, 16AP02-8,
 - 16AP06-1
- Surgery, thoracic
 - 03AP05-6, 07AP02-1, 07AP02-3,
 - 07AP02-5, 07AP02-9, 07AP07-1,
 - 07AP07-2, 07AP07-3, 07AP07-5,
 - 07AP07-9, 07AP07-10, 07AP12-8,
 - 08AP02-2, 08AP03-5, 09AP05-2,
 - 13AP09-10, 14AP09-10
- Surgery, thyroidectomy
 - 01AP04-9, 11AP05-1, 11AP05-2,
 - 16AP07-12
- Surgery, transplantation
 - 03AP10-7, 10AP03-2, 12AP04-1,
 - 12AP04-9
- Surgery, urological
 - 01AP15-5, 01AP16-9, 03AP05-4,
 - 03AP06-3, 12AP03-1, 14AP01-2,
 - 14AP09-5
- Surgery, vascular
 - 02AP01-5, 07AP06-1, 07AP06-5,
 - 07AP08-2, 07AP08-6, 13AP09-5,
 - 14AP02-1, 14AP09-2
- Surgery, war injuries
 - 10AP03-1
- Sympathetic nervous system
 - 02AP01-6, 03AP02-1
- Sympathetic nervous system, adrenergic block
 - 07AP02-3
- Sympathetic nervous system, clonidine
 - 04AP05-3
- Sympathetic nervous system, dexmedetomidine
 - 01AP04-6, 01AP06-7, 09AP02-9,
 - 13AP10-5, 16AP05-6
- Sympathetic nervous system, ganglion block
 - 08AP03-3
- Sympathetic nervous system, noradrenaline
 - 01AP15-5, 14AP01-2
- Sympathetic nervous system, phenylephrine
 - 01AP01-4
- Temperature
 - 01AP02-10, 01AP14-4, 04AP08-7,
 - 06AP03-11, 10AP03-5, 14AP06-1
- Temperature, monitoring
 - 09AP03-4, 10AP03-5, 17AP02-5
- Theories of anaesthetic action, systems neuroscience
 - 06AP05-8
- Toxicity
 - 13AP02-10
- Toxicity, local anaesthetics
 - 10AP02-1, 10AP02-2
- Transfusion
 - 04AP07-1, 05AP04-2, 10AP01-5,
 - 12AP02-2, 12AP02-5, 12AP02-10,
 - 12AP03-6, 12AP03-7, 12AP04-1,
 - 12AP04-9, 12AP05-6, 14AP08-8,
 - 14AP09-12, 17AP01-2, 17AP01-9
- Transfusion, autotransfusion
 - 07AP05-9, 12AP02-4,
 - 12AP03-4
- Transfusion, stored blood
 - 12AP05-3
- Uterus
 - 04AP07-3, 04AP07-7, 12AP04-5,
 - 12AP05-5
- Veins, cannulation
 - 01AP14-6, 05AP02-5, 07AP11-7,
 - 14AP09-6, 14AP10-10
- Veins, complications
 - 14AP10-10
- Veins, jugular
 - 01AP14-5, 14AP09-6
- Veins, subclavian
 - 13AP09-2
- Ventilation, airway pressure
 - 07AP02-4, 11AP07-10
- Ventilation, analgesics
 - 08AP05-7
- Ventilation, artificial
 - 11AP07-3, 11AP07-6, 13AP05-1,
 - 13AP05-7
- Ventilation, continuous positive pressure
 - 01AP08-4, 02AP03-1
- Ventilation, failure
 - 13AP02-4, 13AP02-9
- Ventilation, fresh gas flow
 - 01AP10-2
- Ventilation, high frequency
 - 11AP02-10
- Ventilation, high frequency jet
 - 10AP01-8
- Ventilation, hypoventilation
 - 16AP06-2, 16AP07-7
- Ventilation, mechanical
 - 01AP03-7, 01AP05-6, 01AP05-11,
 - 03AP10-2, 05AP06-2, 07AP02-7,
 - 07AP07-8, 07AP12-7, 11AP07-2,
 - 13AP01-2, 13AP01-3, 13AP01-6,
 - 13AP01-9, 13AP08-8, 13AP08-10,
 - 13AP10-9
- Ventilation, mechanics
 - BAPC-3, 07AP02-4, 13AP01-2
- Ventilation, muscle, diaphragm
 - 13AP02-1, 13AP02-9
- Ventilation, one-lung
 - 07AP02-1, 07AP02-6, 07AP02-8,
 - 07AP07-1, 07AP07-3, 11AP05-4,
 - 14AP09-10
- Ventilation, positive end-expiratory pressure
 - 01AP05-2, 11AP07-5, 11AP07-7,
 - 13AP07-5
- Ventilation, postoperative
 - 11AP07-5, 13AP11-11
- Ventilation, spontaneous
 - 01AP04-2, 13AP10-3
- Vomiting, antiemetics
 - 14AP10-9
- Vomiting, nausea
 - 01AP11-11, 02AP02-7, 02AP03-2,
 - 04AP05-1, 14AP03-9, 14AP10-9,
 - 15AP01-4
- Vomiting, nausea, anaesthetic factors
 - 01AP03-8, 01AP11-11, 03AP01-3,
 - 14AP05-5, 14AP10-5
- Vomiting, nausea, patient factors
 - 01AP11-6, 01AP11-11, 14AP06-10
- Vomiting, nausea, surgical factors
 - 01AP11-9, 09AP05-6, 14AP03-2,
 - 14AP10-6

AUTHOR INDEX

- A**
Aantaa R.t. 09AP02-9
Aaytee H. **04AP07-7**
Abad Gurumeta A. 11AP04-4
Abarca L. 10AP03-3
Abascal E. 03AP01-11
Abbas M. **13AP04-11**
Abbes A. **05AP01-1, 05AP02-3**
Abdallah N. 10AP03-2
Abdallah N.A. **13AP07-7**
Abdallah Kassab N.A. **07AP12-7**
Abdel Raouf M. **14AP04-2**
Abdel Salam Y. 12AP04-7
Abdelaziz A. 13AP13-8
Abdelhay O. 09AP05-10
Abdi W. 07AP09-8
Abdulina L. 01AP01-2
Abdullah H.R. **14AP05-6, 14AP06-9**
Abdyli A. **13AP09-3, 16AP02-7**
Abe R. **07AP04-1**
Abela C. 13AP04-4
Abela G.P. **13AP09-6**
Abelha F. 13AP04-5, 14AP01-1, 14AP01-3, 14AP01-4, 14AP01-5, 14AP01-7, 14AP01-9, 14AP01-10, 14AP02-5, 14AP02-8, 14AP02-9, 14AP03-2, 14AP06-2, 14AP06-4, 14AP06-10, 16AP03-10
Abлонczy L. 05AP07-11
Abnet K. 02AP03-8
Abo Ali A. 05AP03-7
Abou Elenain K. 14AP04-2, 14AP04-5
Abraão M.A. **17AP01-10**
Abraham P. **13AP04-1, 16AP03-1**
Absalom A. 05AP07-9, 06AP01-11
Absalom A.R. 06AP02-11
Abubakra S. 07AP02-3
Abubakra Abubakra S. 16AP01-3
Acevedo Bambaren I. **05AP07-4, 08AP04-2, 15AP02-5**
Achimás Cadariu P. 08AP01-11
Ackermans L. 06AP05-6
Acosta C.M. **05AP06-8**
Acuña Castroviejo D. 13AP06-10
Acuña Fernández C. 12AP05-6, **13AP06-10**
Adachi Y. **01AP07-2, 01AP07-3**
Adembri C. **13AP05-3**
Adler C. 13AP06-3
Adrego T. 08AP05-9
Adrover A. 12AP04-9
Afifi M. 12AP04-7, 14AP04-2
Afonso A. 08AP03-6, 08AP06-7
Afonso D. 11AP03-2
Afshari A. 05AP07-1, 05AP07-2
Agarwal A. 05AP04-6
Aggelis F. 05AP01-5
Agnolletti V. 06AP03-6, 06AP03-12
Aguar M. 09AP05-4
Agudelo M.E. 07AP12-9
Aguar I. 01AP06-2, 07AP01-9
Aguar J. 16AP03-11
Aguar J.G. 01AP11-7
Aguar Pereira I. **11AP02-6**
Aguilar C. 07AP06-5
Agustí M. 01AP09-5
Ahmad A. 04AP02-3
Ahmed A.R. 12AP04-7
Ahmed O. 04AP06-11
Akafori T. 16AP05-8
Akbas S. 11AP04-3, 11AP04-6
Akça B. 06AP06-1
Akimoto R. 06AP02-9
Akinci S.B. 05AP04-1
Akpınar B. 07AP01-5
Al Sebaey A. 14AP04-2
Alabbasi H. 07AP03-1
Al-Ani T. **03AP09-2**
Alarcon L. **13AP11-1, 13AP11-2**
Alarcón A. **16AP01-6**
Albajar A. 13AP07-7
Albajar Bobes A. 07AP12-7, **10AP03-2**
Albaladejo Magdalena J. **11AP06-4**
Alberola Estelles M.J. 03AP05-1
Albersen J.J.E. **10AP01-2**
Alberti C. 01AP10-3
Albokrinov A. 03AP01-6, 05AP03-8
Albrecht E. 03AP01-3, **03AP04-2, 03AP06-4, 03AP07-5**
Albrecht M. 06AP02-5
Albu G. 13AP01-3
Albuquerque D. **03AP08-10, 08AP02-3**
Alcaraz García-Tejedor G. 12AP03-3
Aldecoa C. 13AP09-9
Aldecoa Santullano C. 13AP05-2
Alegret N. 03AP02-1
Alegret Monroig N. 10AP01-3, 10AP01-4
Aleixandre F. 02AP03-5
Alexopoulou A. 13AP10-3, 13AP10-4
Al-Hakami M. 05AP07-3
Ali H. 16AP01-2
Aliaño M. 07AP06-4
AlJabari A. **01AP08-11, 08AP05-6**
AlJa'bari A. **01AP04-5, 03AP04-7**
Alkan M. 03AP06-2
Alkasem M. 12AP01-9
Alkholany M. **04AP01-2**
Allaert S. 01AP01-4, 01AP10-2
Allender C. 13AP12-5
Almeida C. 14AP09-2
Almeida V. 08AP06-6, 16AP02-10
Almudi Ceinos D. 13AP05-2
Alonso A. 07AP06-5
Alós L. 16AP03-4
Alós-Zaragoza L. 07AP08-6
Alparslan T. **16AP07-7**
Alparslan V. 11AP01-10
Alsina E. 04AP08-5, 16AP01-4, 16AP01-5, 16AP05-4
Altıntaş Ö. 05AP05-1
Altan Y. 01AP08-4
Alvar E. 04AP03-2, **04AP08-11, 05AP05-5, 09AP05-3, 09AP05-4**
Alvarez M. 01AP05-9
Álvarez A. 13AP07-7
Álvarez L. 05AP01-7, **05AP02-1**
Álvarez Alvarez A. 11AP06-4
Álvarez Arias C. 03AP04-1, 03AP10-2
Álvarez Barrial A.M. 11AP06-4
Álvarez Bartolomé A. 07AP12-7
Álvarez Escudero J. 13AP01-7
Álvarez Garoña M. **03AP10-9**
Álvarez González M. 16AP02-11
Álvarez Martínez D. 07AP12-4
Álvarez Remetería R. 07AP02-1, 10AP02-3
Alves A. 07AP09-10
Alves C. 04AP04-6, 04AP04-11
Alves D. 01AP06-2
Alves D.R. **04AP01-8, 04AP08-6**
Alves J. 02AP01-1, 14AP09-3
Alves J. 02AP01-2
Alves P. 14AP09-3
Alves R.L. 14AP05-5
Alzaben K. 03AP04-7
Amaral R. 14AP08-5
Amaro L. 02AP01-2
Ameye L. **08AP04-1**
Amim S. 04AP01-8
Ammous A. 04AP01-10
Amorim J. **03AP10-8, 10AP01-8, 14AP05-10, 16AP01-7**
Amorim P. 16AP03-10
Amorim Ribeiro R.A. 01AP05-6
An T.H. 14AP04-6
Anagnostopoulou P. 05AP06-5
Anaya R. **03AP02-9**
Andersen K. **10AP03-9**
Ando T. **03AP03-10, 05AP01-3**
Andrade D. **11AP03-9**
Andrade da Silva L. 14AP01-8
André A.I. 01AP06-2
Andreasen S. 04AP06-6
Andreenko A. **11AP01-4**
Andreeva A. **01AP04-6**
Andrei S. 07AP11-10, 13AP04-9
Andronova I. 06AP02-6, 06AP03-7, 06AP05-2, 06AP05-11
Angeletti P.M. 13AP07-9
Anger M. 01AP06-7
Ankay Yilbas A. 06AP06-1
Anna P. 06AP06-6
Anselmo A. 01AP08-2
Antonopoulos N. 07AP11-5
Anttila M. 08AP04-8
Antunes C. 03AP02-4, 04AP01-8
Antunes P. 01AP08-7, 16AP04-6
Anzai A. **07AP02-8, 07AP07-5**
Aoyama Y. 11AP07-9
Apidechakul P. **17AP02-3**
Aptekman B. 04AP03-1
Aquino E. 04AP01-8, 11AP05-3
Aracil Escoda N. **16AP01-3**
Arakawa Y. 03AP03-10
Arapi B. 13AP09-3
Arapidou M. 08AP07-7
Arastey S. 07AP06-4
Araujo M. 01AP12-6
Araujo Rebelo P.I. 14AP03-2
Aravelo J. 03AP03-6, 03AP10-5
Arbonés E. 08AP05-1
Arcas Bellas J.J. 07AP02-1, 07AP06-9, 10AP02-3
Areal I. 13AP04-12
Arede M.J. 01AP08-7
Arevalo J. **07AP02-1, 10AP02-3**
Arfaoui H. 11AP07-2
Argente Navarro M.P. 06AP05-7, 14AP03-3, 14AP06-3
Argente Navarro P. 03AP05-1, 03AP05-2, 11AP05-4, 13AP11-11
Aristy C. 01AP05-9
Aristy Ortiz C.A. 03AP10-9
Arkalaki E. 12AP02-2
Armstrong L. **17AP02-11**
Arnal Velasco D. 08AP05-5
Arora M. 05AP04-6
Arora M.K. 13AP02-1
Arranz R. 07AP02-10
Arslan E. 06AP06-1
Arslan Z.I. **05AP05-1, 11AP01-10**
Arslantaş M.K. 02AP03-6
Artemenko V. **15AP02-6**
Artnasiaw B. 11AP06-9
Asakura A. **01AP16-4**
Asandei D. 13AP09-7
Asehnoune K. 13AP01-1
Asensio-Samper J. 07AP06-10
Ashmawi H. 04AP05-8, 08AP04-4
Asibey-Berko T. **13AP09-7**
Aspide R. **06AP04-9**

- Assouline B. 12AP01-1
 Assunção J.P. 01AP08-7, 14AP08-5,
 14AP09-2
 Astyrakaki E. 12AP02-2
 Atallah F. **03AP05-3**
 Atance Martínez J.C. 01AP11-4,
 16AP04-1
 Atmosoerodjo S.D. **06AP02-11**
 Attaallah A. 16AP05-6
 Attard Cortis P. 13AP09-6
 Aubrun F. 02AP03-9, 12AP04-1
 Augey L. 16AP03-1
 Augustin P. 13AP04-9
 Augusto Bastos Mello C. 08AP01-1
 Aurilio C. 03AP08-9, 08AP02-1
 Ávalos E. 07AP05-4
 Averdunk L. **13AP06-1**
 Aversano M. **04AP03-3, 04AP05-7**
 Avidan A. **03AP01-4, 16AP03-3**
 Avila Gonzalez C. 01AP14-6
 Avram O. **13AP11-5**
 Ayas B. **11AP05-4**
 Aykac Z. 02AP03-6
 Aykut A. 07AP11-8
 Aytac I. 03AP06-2
 Ayub K. **17AP02-2**
 Azale M. **11AP02-9**
 Azcoitia J. 10AP03-2
 Azevedo B. **14AP09-5**
 Azevedo J. 10AP01-8, 14AP01-1,
14AP01-3, 14AP01-4, 14AP01-5,
14AP01-7, 14AP01-9, 14AP02-9,
14AP06-4, 14AP06-10
 Azevedo L. 14AP02-1, 14AP05-9
 Aziz M.F. 16AP07-5
 Azumaguchi R. 04AP07-6
- B**
- Babik B. 01AP05-4, 07AP03-3, 11AP07-8
 Babo N. 02AP01-9
 Babych V. 08AP02-6
 Baca Pose B. 14AP03-1
 Backof A. 16AP03-9
 Badenes R. **06AP03-1**
 Badii F. 01AP13-4, 03AP01-8
 Bae H. 13AP01-5, 13AP12-6
 Bae H.B. 05AP07-5
 Baehner T. 05AP07-8
 Baftiu N. 13AP08-8
 Bago J. 12AP01-2
 Bahk J.-H. 01AP01-9
 Bahlmann H. **01AP01-5**
 Bainac Albadalejo A. 10AP03-6
 Bajic Z. 05AP02-7, 05AP07-6
 Bajo R. 07AP12-9
 Bajocco C. 03AP04-8
 Bajraktari M. 03AP01-5
 Bakalaki V. 08AP07-8, 11AP05-10
 Bal O. **02AP02-4**
 Bala I. 01AP09-7
 Balacumaraswami L. 07AP01-4
 Balaguer J. 02AP03-5
 Balandina E. 01AP14-8
 Balcaen M. **08AP06-1**
 Balcan A. 08AP03-4, 16AP02-2
 Balenovic D. 03AP03-3
 Balescu-Arion C. 13AP05-6
 Bali E. 12AP04-3
 Baliuliene V. **04AP03-4, 04AP03-6,**
04AP08-7
 Balogh A.L. 01AP05-4, **11AP07-8**
 Baltaci B. 01AP04-10
 Balzer F. **15AP01-1**
 Ban S.Y. 16AP02-8
 Banevicius G. 03AP01-7
 Bang J.-Y. 07AP09-7
- Baños Lapuente V. 03AP02-9
 Barajas C. 12AP03-8
 Barbagallo A. 09AP01-2, 09AP02-7
 Barberan-Garcia A. BAPC-1
 Barbin Zuccolotto E. 03AP10-1
 Barbosa T. 04AP07-5
 Barchetti M. 14AP09-6
 Barends C. 05AP07-9
 Bargaoui A. 15AP02-2
 Barisic I. 03AP03-3
 Barragán L. 05AP02-1
 Barragán M.L. 05AP01-7
 Barrio I.M. 01AP15-10
 Barrio Perez I.M. **01AP15-7**
 Barros A. 03AP02-4
 Barros Silva J. 04AP01-11
 Barsoum S. 02AP03-1, 05AP05-6,
 16AP07-2
 Bartha E. 01AP11-3, 14AP02-3
 Bärtsch P. 01AP05-10
 Bartzi K. 08AP07-8, 11AP04-9, 11AP05-10
 Barvais L. 01AP10-5, 07AP09-1
 Basar H. **01AP04-10**
 Bashir M. 07AP01-11
 Baskakov D. **07AP12-5**
 Baskan S. 03AP06-2
 Batalla A. 10AP03-6
 Batan S. 01AP13-9
 Bathory I. 03AP07-5
 Baud F. 10AP02-6, 13AP02-10
 Baudin F. 05AP06-3
 Baumgarten G. 04AP04-3
 Baute Sanjuan J. 10AP01-4
 Bayat S. 13AP01-3
 Baydar M. 03AP06-2
 Baygin O. **13AP12-7**
 Baykova E.E. **13AP08-7**
 Bayraktar S. 11AP03-6
 Beaudeau J. 10AP03-4
 Beaussier M. 01AP10-3, 02AP02-1
 Becerra A. **14AP10-4**
 Becerra I.A. 07AP12-9
 Bedevi R. 01AP04-10
 Begneu E. 01AP10-3
 Bekiroglu G.N. 01AP13-9
 Bekiroglu N. 06AP01-5
 Bela M.L. 02AP01-9, 11AP02-1
 Belamaric Z. **01AP05-3, 01AP16-11,**
17AP02-10
 Belaouchi M. 08AP03-1
 Belda F.J. 11AP07-7
 Belitova M. **11AP05-1**
 Bell M. 14AP02-6
 Bellgardt M. 13AP10-1, 13AP10-2
 Bellón López de Antón-Bueno B.
13AP02-4
 Beloeil H. 01AP06-7
 Belov Y. 07AP06-6
 Beltrao R. 07AP06-5
 Ben Souissi A. 11AP07-2
 Benachi A. 04AP04-4
 Bendjelid K. 13AP04-1
 Ben-Hamouda N. **01AP16-6**
 Benigni A. 05AP05-3
 Benitez M. 15AP01-4
 Benitez Cano A. 13AP05-5
 Benoit V. 10AP03-4
 Benoliel A. **12AP01-1**
 Benslama A. 13AP03-8, 13AP05-7,
 13AP12-4
 Bentes C. 07AP08-1
 Bentley M.R. 13AP11-4
 Bento M. 05AP01-9, 05AP02-6
 Bento S. 16AP04-3
 Beqiri V. 03AP01-10
 Berde C. BAPC-2
 Berger M.M. 01AP05-10
- Berger S.P. 01AP15-1
 Bergman P. 04AP03-9
 Bergs J. 16AP08-1, 16AP08-3
 Berkenstadt H. 16AP01-11
 Berlandi R. 15AP01-4
 Bermede A.O. **06AP06-3**
 Bermejo S. 02AP02-5
 Bermejo Alvarez M.A. 11AP06-4
 Bermejo Martínez S. 13AP05-5
 Bermúdez Geant G.J. 01AP07-10
 Bernard F. 09AP04-3
 Bernat I. 01AP01-6
 Bernhagen J. 13AP06-1
 Berrio D.L. 13AP04-6
 Bertellini E. 14AP09-6
 Bertilsson M. **01AP11-3**
 Besnier E. **13AP07-8, 13AP13-6**
 Betolaza Weimer L. **12AP02-10**
 Beton S. 06AP01-2
 Bhadra Brown P. 08AP01-5, 14AP04-3
 Bhardwaj M. 04AP02-3, 12AP02-1
 Bianchi C. **14AP08-2**
 Biancofiore V. 13AP07-9
 Bielka K. 08AP02-6, 08AP05-7
 Bignami E. **07AP01-10, 07AP02-4,**
07AP02-7
 Bilali P. 12AP04-8
 Bilbao A. 01AP05-3, 01AP16-11,
 17AP02-10
 Bilgin H. 11AP03-6
 Billard V. 16AP06-7
 Bilotta F. 06AP03-1, 06AP03-6, 06AP03-12
 Bilskiene D. 03AP01-7
 Bin L. 07AP05-11
 Bindal M. 01AP04-4, 07AP03-10
 Biosca E. 11AP03-5
 Biosca Perez E. 03AP05-6
 Birkelbach O. 15AP01-1
 Biroli F. 10AP01-6
 Bittar Nehemy M. 02AP01-7
 Björne H. 11AP07-1
 Blaha J. 04AP01-5
 Blanco J. 01AP06-6, 01AP15-10
 Blanco Pérez I. **01AP04-9**
 Blas M. **07AP07-3**
 Blandszun G. 12AP01-1
 Blot S. 16AP08-1, 16AP08-3
 Bluth T. BAPC-4, **11AP07-5, 13AP01-2,**
13AP01-6, 13AP01-10
 Boayam W. **16AP04-10**
 Boer C. 01AP03-1, 10AP01-2, 10AP01-5
 Boet S. **17AP02-5**
 Boezi M. 14AP02-10
 Bogaert S. 16AP08-1, **16AP08-3**
 Böhm L. 13AP06-3
 Boisson M. **01AP03-5, 10AP03-4**
 Bojic S. **13AP03-5, 13AP06-6**
 Bolívar-Trujillo M. **08AP06-9, 16AP07-6**
 Bolliger D. 07AP06-1
 Bolosi M. 13AP07-5, 13AP12-8, 13AP13-2
 Bombardiere M.T. 09AP05-5
 Bonarelli S. 03AP06-7
 Bong Jae L. 03AP03-9
 Bonnet A. 12AP04-1
 Bonnet V. **04AP04-2, 07AP03-2,**
07AP09-5, 13AP03-1
 Bonnot B. 01AP10-3
 Bono P. 13AP11-1, 13AP11-2
 Bonofiglio F.C. 01AP02-7, 04AP01-7
 Boogaerts J. 02AP02-4
 Boogaerts J.G. 01AP13-5
 Booi L. 01AP11-5
 Boor P. 13AP06-1
 Borg N. 13AP09-6
 Borges J. 08AP05-2, 08AP07-2
 Borges R. 02AP01-9
 Borges R.M.J. 16AP03-9

- Borges Marques J. 05AP04-7
 Borja Andrés H. 04AP07-8, 07AP12-4
 Borque Martin J.L. 04AP02-8, 04AP02-9
 Borrat X. 04AP04-7
 Borrero-Cortés C. 16AP07-6
 Borsellino B. 13AP09-8
 Bortolotti G. 13AP02-9
 Borys M. **08AP05-10**
 Bos E.M.E. **03AP01-1, 03AP01-2**
 Bos M. **06AP05-6**
 Bosch E. 03AP02-1
 Bosch Duran L. **11AP06-10**
 Bosco J. 02AP03-3, 02AP03-7
 Boselli E. 09AP03-4, **09AP04-3**
 Bossers S.M. 10AP01-2, 10AP01-5
 Bouakaz A. 13AP05-4
 Bouattour K. 01AP05-1
 Boubeche S. 13AP07-8
 Bouchez S. 01AP01-11
 Boudart C. **07AP09-1**
 Bouderra S. 13AP08-11
 Boudjouraf N. 03AP10-10
 Boughatas W. 17AP01-2
 Boulares S. 02AP02-4
 Bouregba M. 02AP02-1
 Bourgain J.-L. 16AP06-7
 Bousseimi R. 15AP02-2
 Boutaarout I. 03AP10-10
 Bouthors-Ducloy A.-S. 04AP07-10
 Bouzit Z. **01AP09-1, 07AP09-8**
 Bova G. 09AP01-2, 09AP01-6, 09AP02-7
 Bowen J. 13AP12-5
 Bowen M. 04AP06-2
 Boyarkin A. 01AP14-8, 14AP09-10
 Bozkurt M. 06AP01-2
 Boztosun B. 07AP10-3
 Brackhahn M. **05AP03-1**
 Bradley W. 01AP12-1
 Braga A. 14AP01-1, 14AP01-4,
14AP01-7, 14AP01-9, 14AP01-10,
14AP02-5, 14AP06-10
 Braga E. **15AP01-4**
 Braun F. 16AP06-10
 Braune A. BAPC-4, 13AP01-6, 13AP01-10
 Braunecker S. 13AP06-3
 Brauner M. 15AP01-1
 Brembilla C. 06AP06-4
 Brinzeu A. 06AP01-6, **06AP06-2**
 Brito Do Carmo M.A. **14AP03-5**
 Brogly N. 16AP01-4, 16AP01-5
 Broseta A.M. 11AP03-5
 Brugioni L. 14AP09-6
 Brull R. 03AP07-5
 Bruna M. 14AP07-6
 Brunel E. 16AP06-6
 Brustowicz R. 12AP02-5
 Bryson G. 17AP02-5
 Bucala R. 13AP06-1
 Buchfelder M. 06AP03-3
 Buck R. 03AP07-1
 Buffat S. 01AP07-11
 Bulku E. 03AP02-6, 13AP11-8
 Bunyatyan A.A. 11AP06-5
 Burckett St Laurent D. 16AP06-1
 Burgetová A. 05AP03-6
 Burgos J. 05AP07-4
 Buriticá Aguirre A.M. **04AP07-8,**
07AP12-4
 Burkhard F.C. 01AP15-5, 12AP03-1,
 14AP01-2
 Burkovskiy I. 14AP04-9
 Burmuzoska M. **13AP09-10**
 Burnand B. 09AP02-6
 Burton I. 05AP03-1
 Busetto N. 08AP01-3
 Busujima Y. 01AP08-3
 Butterworth G. 07AP01-4
 Buyse K. **13AP01-4**
 Buzatu G. 08AP03-4
 Byloos B. 03AP07-1
- C**
 Caballero A. 04AP04-7
 Caballero M. **14AP09-8**
 Cabellos Olivares M. 01AP11-4, 16AP04-1
 Cabral F.M. 11AP02-2
 Cabral T. 01AP05-5, **03AP08-5,**
 08AP05-2, 08AP07-2
 Cabrera L. 14AP10-4
 Cabrerizo P. 16AP03-2, 16AP03-5,
 16AP05-1
 Cabrerizo Torrente P. 13AP06-8, 16AP08-2
 Cacho-Asenjo E. 01AP15-8
 Cadisco A. 06AP06-4
 Cadore Stefani L. 08AP04-10
 Caiazza I. 06AP06-12
 Cakirca M. 01AP04-10
 Calim M. 11AP03-3
 Calancea E. 12AP01-3
 Caldeira A. 03AP08-10, **05AP01-8,**
 06AP05-5, **14AP05-10, 14AP08-10**
 Calhau R. **05AP04-7**
 Callado A.N. 11AP02-2
 Callan C. 16AP02-12
 Callejo D. 10AP02-2
 Callicó Ros F. 11AP04-5
 Caló N. 14AP07-1
 Calvão Santos C. 05AP04-7
 Calvete Alvarez I. 10AP02-3
 Calvo A. 04AP04-7
 Calvo Rey A. **13AP01-7**
 Calvo Vecino J.M. 11AP04-4, 16AP01-3
 Calvo-Vecino J.M. 14AP03-7
 Câmara L. 04AP04-8
 Cámara Rosell M. 07AP04-7
 Camorcía M. 04AP03-11
 Campos G.O. **14AP05-5**
 Campos M. 09AP05-3
 Camu F. 08AP01-5
 Canal M. 11AP01-9
 Canal Alonso M.I. 13AP06-8
 Canas M. 11AP03-9
 Canbay O. 05AP04-1
 Candeias M. **01AP08-1**
 Candeias M.J. 03AP02-10
 Canelli R. 11AP05-6
 Canet J. 04AP01-4, 16AP01-6
 Canet Capeta J. 07AP04-7
 Cannesson M. 01AP10-5, 01AP10-8
 Cansabuncu G. 08AP03-9
 Cansabuncu S. 08AP03-9
 Cao K.T.T.S. 13AP08-4
 Cao López L. 11AP04-5
 Capogna G. 04AP03-11
 Capsi P. 01AP09-5
 Carazo Cordobés J. 13AP05-5
 Carballo C. 13AP04-12
 Carbon N. 13AP04-3
 Cardia L. **09AP01-2, 09AP01-6,**
09AP02-7, 09AP05-5
 Cardoso C. 11AP02-8
 Cardoso G. 08AP03-6
 Cardoso P.F.N. 05AP03-5
 Caria T. 03AP02-10, **12AP05-9**
 Carli P. 10AP02-6, 10AP03-5, 13AP02-10,
 13AP05-1
 Carlos R.V. 05AP03-5
 Carneiro A. 01AP08-6, 01AP12-10
 Carneiro J. 03AP10-8
 Caro J. 04AP08-11
 Carol F. 14AP07-1
 Caroletti F. 06AP06-12
 Caroline F. 07AP11-7
 Carramiñana Domínguez A. **07AP04-7**
 Carrapatoso I. 07AP08-7
 Carrero E. 02AP01-3
 Carreteiro J. 01AP06-2, **01AP08-5,**
11AP08-11
 Carrió-Font M. 16AP08-5
 Carrizo Sanchez J. 11AP07-6
 Carro Roibal Á. 13AP13-4
 Caruso G. **05AP01-4**
 Carvalhas J. 04AP04-6, 04AP04-11
 Carvalho A.P. 03AP10-8
 Carvalho B. **04AP07-5, 14AP01-3,**
14AP01-5, 14AP01-10, 14AP02-5,
14AP02-9, 14AP03-2, 14AP06-2,
14AP06-4
 Carvalho J. 07AP08-1
 Carvalho P. 01AP08-5
 Carvalho Vasconcelos G. 02AP01-7
 Casado M. 10AP03-2
 Casanova J. 07AP11-2
 Casanova Barea J. 07AP07-3
 Casans Francés R. 11AP04-4, 14AP09-4
 Casans- Francés R. 14AP03-7
 Casares Acuña S. 01AP07-10
 Casas Vila I. 01AP04-11
 Casasempere Sanus A. **08AP03-1**
 Casimiro L.G. **13AP04-5**
 Cassinello F. 03AP03-6, 03AP03-7,
 03AP03-8, 03AP10-5, 14AP10-1
 Castanheira C. 04AP01-6
 Castel H. 06AP02-10, 13AP13-6
 Castellort L. 11AP06-10
 Castillejo-Pérez S. 08AP05-8, 10AP03-1
 Castillo M.P. 09AP05-4
 Castres Saint Martin L. 13AP05-1
 Catalá J.C. 16AP03-4
 Catav Z. 07AP11-8
 Catré D. 01AP08-7
 Cattán A. 04AP01-1, 04AP01-3
 Caubet Busquet E.J. 01AP04-9
 Cavalcante S.L.F. 01AP07-5, **07AP08-5,**
 11AP02-4, 16AP06-4
 Cavalcanti I. 15AP01-4
 Cavaleiro C. 01AP12-5, 01AP14-4,
 03AP10-7
 Cebrián J. 05AP02-1
 Cecchetti M. 03AP06-7
 Çekmen N. 13AP11-10
 Cenicante T. 03AP02-10
 Cerny V. **14AP04-9, 14AP05-8**
 Cerro Zaballos C. 14AP07-10
 Chakkarapani E. 01AP10-1, 13AP08-3
 Chakroun A. **01AP12-3, 01AP12-4,**
13AP09-4, 13AP13-7
 Chalari E. **01AP14-2**
 Challet E. 01AP16-6
 Chamorro E. 07AP07-6, 16AP03-2,
16AP03-6
 Chamorro García E. 16AP04-7, **16AP08-2**
 Chan H.S.P. **11AP06-8**
 Chan K.C. 14AP08-11
 Chan M. 09AP03-7
 Chang C. 16AP07-7
 Chang S.L. **13AP09-2**
 Chang Y.-J. 01AP03-8
 Chaniotaki F. 12AP02-2
 Chanza M. 04AP04-7
 Chao Y.-M. **04AP04-1**
 Chaouch O. 04AP01-10
 Charuluxananan S. **16AP03-8**
 Chatham-Zvelebil N. 16AP04-5
 Chatzimichali A. 14AP03-11, 14AP05-4
 Chatziperi A. **08AP02-4**
 Chawla A. 07AP03-9
 Chebbi N. 01AP07-9, 03AP01-9,
 13AP09-4
 Chen C. **06AP02-2, 06AP02-3**

- Chen G. **01AP13-6**
 Chen H.H. **01AP03-10**
 Chen J. 01AP15-4
 Chen J.-S. 07AP02-6
 Chen J.Y. 07AP12-10, 09AP01-7, 16AP07-12
 Chen T.-L. **13AP11-3**
 Chen Y.H. 07AP12-10, **09AP01-7**
 Cheng H.-L. **03AP10-6**
 Cheng K.I. 01AP03-10
 Cheng Y.J. 14AP08-11
 Cheng Y.-J. 07AP02-6
 Chequer S. 14AP07-2
 Cherait C. 07AP09-8
 Cheremskiy A. 08AP05-4
 Cherian B.P. 14AP04-4
 Cherif A. 04AP01-10
 Chernetsky O. 06AP06-5
 Cherniy S. 07AP07-9
 Cherniy T. 06AP05-11, 06AP05-12
 Cherniy V. **06AP02-6, 06AP03-7, 06AP05-2, 06AP05-11, 06AP05-12**
 Chernova O. 09AP02-2
 Cheung R. 08AP01-5, 14AP04-3
 Chew S. 14AP03-10
 Chew S.T.H. 07AP04-2, 11AP06-8
 Chew T.H.S. 13AP04-8, 13AP06-5
 Chiang M.-H. **01AP11-6**, 16AP07-1
 Chiarenza F. 04AP03-11
 Chierogato A. 06AP03-6, 06AP03-12
 Chijiwa M. 13AP12-3
 Chin J.-C. 01AP11-6
 Chiquito M.T. 01AP15-8
 Cho A. 14AP10-9
 Cho C.-K. 01AP02-2, 01AP02-3
 Choi B.-M. 07AP09-7
 Choi D.-K. 07AP08-10
 Choi E. 01AP16-9
 Choi E.K. 13AP06-9, **13AP11-6**
 Choi H.R. 01AP02-4
 Choi H.-Y. 14AP04-3
 Choi J. **05AP03-4**
 Choi J.I. 02AP03-4, 05AP07-5, 09AP03-3
 Choi J.J. 14AP10-5
 Choi S.H. 01AP05-11, 16AP06-9
 Choi S.-S. 08AP04-5
 Cholvisudhi P. **03AP05-8**
 Chouchene A. 03AP01-9
 Choudhury M. 16AP08-6
 Choupina B. 13AP04-5
 Chow S.Y. 11AP03-10
 Christofaki M. 04AP07-3, 12AP02-2
 Chu C.C. 07AP12-10
 Chuang F.-L. 01AP03-8
 Chui J. 06AP01-3
 Chung J.-Y. 09AP03-10
 Chung S.S. 05AP07-5
 Chung S.-S. 02AP03-4
 Chung Y.H. **06AP06-11**
 Chung Y.-K. 07AP11-1
 Chuni C. **14AP06-11**
 Chunwoo Y. **03AP07-7**
 Chutipongtanate S. 11AP06-9
 Ciccozzi A. 13AP07-9
 Cichon J. 01AP16-10
 Cindea I. **08AP03-4**, 16AP02-2
 Cinicola M. 06AP06-12
 Cioc A.D. 14AP05-7
 Cirillo F. 10AP02-4, 13AP06-3
 Clark S. 14AP06-6
 Claroni C. 04AP03-3, 04AP05-7
 Clausen N.G. **05AP06-1**
 Clauzet E. 03AP05-3
 Clavier T. **06AP02-10, 13AP13-6**
 Clotas Palou E. 14AP03-1
 Cobilinschi C. 13AP02-6
 Coca Martínez M. 14AP05-11
 Coccoluto A. **04AP03-11**
 Cococcia L. 01AP13-4, 03AP01-8
 Coeckelenbergh S. **14AP06-5**
 Coffey F. **08AP01-2, 08AP01-9, 08AP07-3**
 Cohen M. **13AP11-4**
 Cohen M.P.A. 15AP02-4
 Coimbra L. 02AP01-2, **07AP08-1**
 Coldea L. 13AP11-5
 Coleman E. **04AP06-2**
 Colesnicenco A. 08AP03-3
 Colilles C. 03AP02-1
 Colin P.J. 01AP07-4, 01AP16-8
 Collacchi D. 06AP06-12
 Collenot T. 07AP09-11
 Colomina M.J. **12AP01-2**
 Columb M. 13AP09-1
 Comas M. 08AP05-1
 Compagnone C. 04AP08-4
 Company Teuler R.J. 03AP10-9
 Compère V. 06AP02-10, 13AP13-6
 Comps O. 08AP04-11
 Conceição V.M. 09AP01-8
 Conde P. 07AP09-10, 11AP05-5
 Conil J.-M. 16AP06-6
 Constantinescu C. 11AP08-9
 Contreras del Barrio Á. 14AP03-7
 Cooper A. 08AP07-3
 Coppens S. 01AP14-1
 Copuroglu E. 04AP06-7
 Corda Teixeira J. **01AP08-8**
 Cordier A.-G. 04AP04-4
 Corlette S. 05AP06-2
 Corman Dincer P. 02AP03-6
 Costa C. **04AP01-4**, 09AP05-5
 Costa G. 06AP03-2, 11AP05-2
 Costa Filho M.M. 09AP01-8
 Costa Martins I. **01AP06-2**
 Costa-Martins I. 01AP08-5, 11AP08-11
 Costea D. 16AP02-2
 Cotae A. 08AP03-8
 Coupez C. **07AP06-8**
 Courtois N. 07AP08-2
 Couto C. **01AP14-4**
 Cozowicz C. 14AP07-7, 14AP07-9
 Crerar-Gilbert A. 13AP08-5, 13AP09-11
 Criado-Camargo S. 14AP03-7
 Cristelo D. 14AP09-5
 Critchley J. 17AP02-11
 Cruz A. 14AP08-7
 Cruz Pardos P. 01AP15-7
 Cruz-Conde M.C. 13AP11-9
 Cuesta-Montero P. 16AP08-5
 Cuff G. **02AP03-3, 02AP03-7**
 Cui D. **13AP07-4**
 Cunha P. 14AP06-10
 Cuquerella V. 01AP01-6, 13AP04-6, **14AP06-7**
 Cuttaia H. **01AP13-5**
 Cvetkovic A. **01AP01-7**
 Czajkowska K. **05AP01-9, 05AP02-6, 08AP04-9, 11AP02-1**
 Czempik P. 12AP05-4
 Czobor N.R. 05AP07-11, **17AP01-3**
 Czuczwar M. 08AP05-10
- D**
 Da Costa Paiva V. **09AP02-3**
 Dae Hee K. 01AP04-1
 Dahan A. **08AP01-8**
 Dahlem C. 02AP01-2, 03AP08-8
 Dailler F. 06AP06-2
 Dakic Z. 07AP11-4
 Dalla Corte F. 01AP15-3, **07AP02-5**
 Damas M. 04AP04-10, **14AP08-7**
 Damigos D. 08AP07-6
 Danilov G. 06AP01-10
 Dantas Cardoso Neiva Lemos D. 02AP01-4
 Dantas Cardoso Neiva Lemos L. **02AP01-4**
 Daouphars T. **01AP06-7**
 Darcin K. 07AP10-3
 Darias Delbey B. 13AP06-10
 Darlong V. 05AP06-4
 Darrouzain F. 13AP05-4
 Dart P. 15AP02-4
 Dass C. 05AP04-6
 Dastros-Pitei D. **08AP01-7**
 Daubeny T. 16AP04-5
 Dauri M. 01AP03-4, 01AP08-2, 14AP02-10
 Dautaj B. 03AP01-5, 03AP02-6, 13AP11-8
 David N. 07AP11-7
 Davidson A. 05AP06-2
 Davila B. **05AP04-8**
 Davila Arango N.A. 16AP06-5
 Dávila Arango N.A. **06AP01-7**
 De Almeida Macruz T. 01AP05-6
 De Andrés J. 03AP08-7, 06AP04-8, 07AP06-10, 07AP08-6, 09AP05-3, 09AP05-4, 11AP03-5, 14AP07-6
 De Baeremaeker L. 01AP14-10
 De Bern R.C.G. **14AP01-8**
 De Boer H.D. **05AP03-5**
 De Camillis E. 07AP02-5
 De Deyne C. 10AP02-7
 De Francisco J. 11AP06-7
 De Francisco Moreno J. **10AP01-7**
 De Hert S. 01AP01-11, 01AP03-7, 01AP14-10, 01AP16-3, 07AP03-4, 07AP09-2
 De Jesus Martins M. **08AP01-1**
 De Jong C.J. **02AP02-3**
 De la Calle Elguezabal P. 01AP07-10
 De la Gala F. 07AP02-10, 07AP07-3
 De la Hoz Polo I. 12AP02-10
 De Lacy A.M. BAPC-1
 De Meirsmen S. **03AP07-1**, 16AP08-1, 16AP08-3
 De Miguel A. 01AP06-6
 De Miguel Á. 16AP03-6
 De Miguel V. 16AP03-2
 De Miguel M. 12AP03-3
 De Miguel Guijarro Á. 16AP04-7, 16AP05-2
 De Miguel Negro M. 01AP04-9
 De Nadal M. **13AP09-9**
 De Oliveira P.R.R. 14AP05-5
 De Pasquale M. 09AP01-6
 De Quelerij M. 03AP01-1, 03AP01-2
 De Robertis E. 10AP02-4, 13AP06-3
 De Rydt F. **01AP10-2**
 De Saint Maurice G. 16AP03-7
 De Simone G. 07AP02-4, 07AP02-7
 De Vicente Sánchez J. 05AP02-5
 De Vries T.M. **04AP05-10**
 De Wilde L. 01AP16-3
 De-Andrés-Ibañez J. 08AP03-10
 Debaene B. 01AP03-5
 Dechanet F. 07AP03-2
 Decosterd I. 09AP02-6
 Degiorgis V. **16AP06-10**
 Degreve W. 17AP01-8
 Degreve W. **17AP01-7**
 Deixler A. 17AP02-9
 Dekoninck V. **03AP10-3**
 Dektyarev E. 04AP05-6
 Del Campo A. 13AP07-7
 Del Pino A. 13AP10-5
 Del Rio E. 01AP05-7
 Del Rio M.E. 06AP03-1
 Del Valle S. 13AP07-7
 Delamarre L. **16AP06-6**

- Delaporte A. **01AP10-8**, 14AP06-5
 Delassus R. 08AP07-4
 Delgado I. 07AP01-9, 07AP08-1
 Delgado-Baeza E. 07AP05-3, 07AP05-5
 Delgado-Martos M.J. 07AP05-3, 07AP05-5
 Delort F. **14AP04-1**
 Demir A. **01AP04-4**, **07AP03-6**, **07AP11-8**
 Denis S. 05AP05-5
 Dennis Filippini S. 05AP02-5
 Derbent A. 01AP08-4
 Dereu D. **08AP02-5**
 Desebbe O. 07AP09-1
 Desrues L. 06AP02-10, 13AP13-6
 D'Ettore M. 03AP04-8
 DeVries J.H. 14AP06-8
 Dghoughi S. 13AP03-8
 Dhif N. 06AP03-8
 Dhonneur G.F. 01AP09-1, 07AP09-8
 Di Bella V. 06AP03-10
 Di Girolamo S. 14AP02-10
 Di Lullo A. 07AP01-10
 Di Mauro R. **14AP02-10**
 Di Prospero S. 06AP03-6
 Di Tomasso N. 07AP02-7
 Di Vezza F. 01AP03-4
 Diamanti P. 04AP08-2
 Dias J. 02AP01-1
 Diaz A. **04AP03-7**
 Diaz T. **03AP02-1**
 Díaz C. 07AP06-7
 Díaz Álvarez A. 07AP05-9
 Diaz Cambronero O. 03AP05-1, 03AP05-2, 11AP05-4, 11AP07-10, 14AP06-3
 Díaz Jover R. 01AP04-11
 Díaz Parada P. 13AP13-4
 Diaz Ruano S. 01AP15-7
 Diaz-Cambronero O. **14AP03-3**
 Diaz-Valdés J.R. 12AP05-8
 Dickerson S. 08AP07-3
 Dieckmann P. 17AP02-12
 Diez J. 04AP03-2
 Diez-Picazo L.D. **04AP03-2**
 Dikust Y. 08AP05-12
 Dillemans B. 01AP09-9, 01AP14-9
 Dilly Rushenas M.-P. 07AP11-10
 Dima S. 12AP01-3
 Dimakopoulou A. 01AP04-6
 Dimitriu A. 10AP01-9
 Dimitropoulou E. 05AP01-5
 Dimitrov Y. 13AP01-9
 Dinca A. 12AP01-3
 Dingley J. 01AP10-1, **11AP04-2**, **13AP08-3**
 Diniz I. 01AP08-8
 Dionisi P. 04AP08-2
 Dionys A. **03AP07-3**
 Dispersyn G. 01AP16-6
 Dissmann P. 08AP01-2, 08AP01-9
 Djennane A. **03AP10-10**
 Djudjaj S. 13AP06-1
 Djurdjevic Svraka A. 07AP11-4, **16AP07-11**
 Dobos M. 10AP02-5
 Dobrodeev A. **12AP03-4**
 Docampo C. 02AP03-5
 Docquier M.-A. 07AP09-6
 Doguet F. 13AP07-8
 Dolbneva E. 08AP07-1, 09AP02-2
 Dolbneva E.L. 11AP06-5
 Doldán Pérez P.N. 13AP01-7
 Domenech G. 01AP02-7
 Domi R. 03AP01-10, 13AP09-3, **16AP02-7**
 Domingues S. 12AP03-5
 Domínguez F. 08AP04-2
 Domínguez F. 05AP07-4, 15AP02-5
 Domínguez Y. 14AP10-4
 Domino K.B. **16AP07-5**
 Donat A. **01AP05-1**
 Donatiello V. 08AP02-1
 Donkers A.A. 01AP12-9
 Dooley N. 07AP04-6
 Doorneweerd D. 12AP04-6
 Dopitova P. 01AP09-3
 Doppia M.-A. 11AP02-9
 D'Orlando R. **07AP03-2**
 Dos Santos Tarquinio G. 11AP02-5
 Dostal P. 01AP09-3
 Dostalova V. **01AP09-3**
 Doubleday M. 12AP04-4
 Douma A. 01AP04-6
 Dovbysh N. 06AP06-5
 Dragini G. 11AP05-8
 Drakina O. 07AP06-6
 Dray C. 14AP04-1
 Drees D. 13AP10-1, 13AP10-2
 Dreyfus M. 04AP04-2
 Dridi A. 11AP02-10
 Drizlionoka Gorovenko K. **12AP01-5**
 Dronov O. 01AP11-2
 Drüner M. 13AP13-5
 Dube C. BAPC-2
 Dubois J. 02AP02-9, 03AP07-2, 03AP07-3, 03AP10-3, 05AP06-10
 Dubois M. 06AP02-10
 Dubost C. **01AP07-11**
 Duca A. 01AP05-7, 11AP07-6
 Duclos A. 16AP03-1
 Dudoit T. 08AP07-4
 Duger C. 01AP03-6, 01AP03-9
 Duinker P. 08AP02-2
 Dulger S. 01AP11-8
 Dumont M.W. **13AP08-5**
 Dumot C. 06AP06-2
 Dupont C. 08AP06-1
 Dupont H. 13AP03-1
 Duque P. 13AP11-1, 13AP11-2, 13AP11-9, **17AP02-6**
 Durand S. 10AP03-5
 Dureuil B. 13AP07-8
 Durmus M. 11AP04-6
 Dutta B. **14AP05-3**
 Dworschak M. **13AP08-9**
 Dyaktyarev E. 04AP02-2
 Dziadzko M. **02AP03-9**
- E**
- Ebana H. 11AP07-4
 Eced M. 03AP01-11
 Echevarría Moreno M. 09AP02-1
 Edry R. **08AP05-12**
 Eertmans W. 10AP02-7
 Eidelman L. 04AP03-5
 Einav S. 04AP07-1
 Ekeloef S. **13AP04-10**
 Ekinci O. 01AP13-9
 El Ammari I. 13AP12-4
 El Kenz H. 12AP02-3
 El Mounni M. 01AP15-1
 El Sharkawy O. 05AP03-7
 Éló G. **10AP02-5**
 Elbakry A.A. 06AP05-9
 Eleveld D. 06AP01-11
 El-Hadi H. 05AP07-3
 Elkhateeb S. 04AP06-11
 Ellerkmann R.K. 05AP07-8
 Ellison M. **03AP08-1**, 16AP05-6
 Elnady A. **03AP08-6**
 Elsaudi E. 04AP06-11
 Elter K. 04AP06-7
 Emal D. 01AP10-4
 Emery E. 08AP07-4
 Emmanouil P. 11AP05-8
 Encantado V. 04AP04-10
 Engström C. 14AP10-10
 Eradio Lopez Pradere A. 16AP02-3
 Erb T.O. 05AP06-5
 Erlenwein J. 08AP06-3
 Eroglu T.N. **06AP01-2**
 Errando C.L. **16AP03-4**
 Errando Oyonarte C. 03AP05-1, 03AP05-2, 11AP05-4
 Errando Oyonarte C.L. 11AP07-10, 14AP06-3
 Ertekin U.Ü. 07AP03-6
 Esakov J. 07AP12-1
 Escobar B. 08AP06-9
 Escobar Ayllón M. 14AP03-1
 Escriba F. 11AP01-5
 Escudero Teixidó A. 07AP04-7
 Esen A. **11AP03-3**
 Espada E. 08AP04-4
 Esparza Miñana J.M. 08AP03-1
 Espinar Garcia E. 10AP01-7
 Espinosa W. **12AP02-9**
 Espitalier F. 13AP05-4
 Esposito I. 04AP08-4
 Essex M. **08AP01-5**
 Estadella J. 04AP08-10
 Estañ Pérez A. 03AP10-9
 Estebe J.-P. 01AP06-7, 08AP01-8
 Estruch I. 03AP09-7, 08AP03-3
 Etsuko K. 07AP11-9
 Etulain J. 11AP01-9
 Etulain Santos M.J. **02AP02-7**, **13AP06-8**
 Eun-Jin M. 03AP08-3
 Evans B. 01AP14-3
 Eveleens F. 05AP01-2
 Eventov-Friedman S. 04AP02-1
 Evers S. 02AP02-9
 Ewa K. 13AP07-4
 Ezelsoy M. 07AP01-5
 Ezzouine H. **13AP03-8**, **13AP05-7**, **13AP12-4**
- F**
- Faizov I. 11AP01-4
 Fakir N. 17AP01-5
 Falcao L.F.d.R. 01AP05-6
 Falcon Suarez O. 14AP07-4
 Fallah L. **01AP11-5**
 Fallaha D. 14AP06-6
 Fan Y. 03AP03-1
 Fanelli G. 04AP08-4
 Fanni A. 01AP15-3, 07AP07-1
 Fanous S. **09AP05-10**
 Faouzi M. 09AP02-6
 Faraoni D. 12AP02-3
 Fareh K. 11AP07-2
 Faria A. 04AP07-5
 Farina L.M. **04AP08-2**
 Fariña González T.F. **13AP10-5**, **16AP02-11**, **16AP07-3**
 Farinha F. 07AP10-11
 Faris M. 14AP01-6
 Farron A. 03AP07-5
 Fawzy M. 05AP07-3
 Fayos M. 14AP06-7
 Felix E.A. 16AP03-9
 Fellahi J.L. 07AP09-11
 Fellahi J.-L. 05AP06-3, 07AP09-5, 07AP09-9, 13AP07-3
 Felli A. 13AP08-9
 Fellmann A. 01AP15-5, 12AP03-1, 14AP01-2
 Felloni Tsuha G. 11AP02-5

- Feng G.G. 03AP03-2
 Ferez D. 01AP05-6
 Fernandez Carballal M.F. 13AP05-9
 Fernandes A. **02AP01-2, 04AP04-8,**
 07AP08-1, 07AP08-7
 Fernandes H. **04AP05-8, 04AP06-3,**
08AP04-4
 Fernandes M. **04AP07-4,** 04AP08-9
 Fernandes M.B.C. 01AP07-5, 07AP08-5,
 11AP02-4, 16AP06-4
 Fernandez A. **07AP02-3**
 Fernandez L. 12AP04-2
 Fernández C. **03AP08-7,** 07AP11-2
 Fernández D. 07AP05-5
 Fernández E. 03AP09-6
 Fernández J. 06AP04-6
 Fernández R. 05AP02-1
 Fernandez Martin C. 14AP07-8
 Fernandez Quero L. 16AP03-5
 Fernández Sánchez C.I. **08AP05-5**
 Fernandez-Peña A. 07AP05-6
 Fernandez-Quero L. 13AP11-9
 Ferrandis R. 01AP05-7, 14AP04-8
 Ferrandis Comes R. **06AP05-7,**
13AP11-11
 Ferrando C. 11AP07-7
 Ferrando Ortola C. 11AP07-6
 Ferraz S. **03AP02-10, 03AP08-8,**
 04AP07-5
 Ferreira A. 04AP07-5
 Ferreira C. 01AP11-7, 08AP04-9,
 08AP06-6, 13AP10-6, 13AP10-7,
 13AP10-8, 13AP10-9, 16AP02-10,
 16AP03-11
 Ferreira E. **07AP01-9, 07AP08-7**
 Ferreira J.L. 03AP08-5
 Ferreira L. 03AP10-7
 Ferreira P. **07AP10-11, 14AP09-2**
 Ferreira S. **03AP02-4**
 Ferreira S.P. **02AP01-1**
 Ferreira Silva L.I. 04AP08-9
 Ferrero-Coloma C. **16AP08-5**
 Ferri F. 10AP01-6, 13AP02-9
 Ferrieri A. **03AP04-8**
 Fesenko U. **03AP01-6, 05AP03-8**
 Fesenko V. **03AP06-6**
 Feuillet F. 13AP01-1
 Fielitz J. 13AP04-3
 Figar A. **04AP01-7**
 Fildissis G. 01AP14-2
 Filetici N. 04AP08-2
 Filgueira Davila E. 13AP04-12
 Firment J. 04AP01-5
 Fischer A. 05AP07-8
 Fischer C. 04AP04-4
 Fischer M.-O. 07AP03-2, 07AP09-5,
 13AP03-1
 Flintras D. **11AP05-8**
 Flor Lorente B. 14AP03-3
 Flor Parra F. 09AP02-1
 Focaccio Tejada C.A. **12AP03-8**
 Fodor G.H. **01AP05-4,** 11AP07-8
 Fogagnolo A. **01AP15-3,** 07AP07-1
 Fonseca R. **16AP04-3**
 Fontoura Solla D.J. 02AP01-4
 Foo C.W. **13AP08-4**
 Ford S.M. 03AP09-4
 Fournier W. **07AP09-11**
 Forteza A. 07AP06-2, 07AP10-8
 Fortier L.-P. 01AP09-6
 Fortunato Silva M. 14AP08-9
 Fot E. 07AP09-3, **13AP01-8**
 Fotopoulou G. **13AP10-3, 13AP10-4**
 Fourcade O. 16AP06-6
 Fournier N. 03AP07-5
 Fourrier F. 04AP07-10
 Frade-Mochales M. **07AP05-5**
 Fragata I. 01AP06-3, 01AP08-6,
 01AP12-10, 04AP08-3, 14AP08-1
 Fragoso P. 03AP02-7
 France M.-N. 08AP06-1
 Frances B. 14AP04-1
 Francisco E. 14AP08-5
 Franck M. 04AP04-4
 François K. 07AP03-4
 Frasca D. 01AP03-5
 Fredrik G. 14AP02-6
 Freeman J. **02AP03-8**
 Frei F.J. 05AP06-5
 Freire-Vila E. 04AP05-5, 14AP09-4
 Freitas S. 04AP04-8
 Freitas Silva R. **01AP05-5, 08AP05-2,**
08AP07-2
 Fresnedo Perez R.M. 11AP06-4
 Fried H. 17AP02-1
 Fried I. 06AP05-8
 Fried S. 01AP05-10
 Frigo M.G. 04AP03-3, 04AP05-7
 Frugiuele J. **03AP06-7**
 Fruil I. 01AP11-11
 Frykholm P. 11AP03-4
 Fuduric S. 13AP12-2
 Fuentes I. 01AP05-7
 Fuentes J.R. 05AP01-7
 Fujii T. **07AP03-5**
 Fujino Y. 07AP04-1, 07AP04-4, 07AP10-1,
 09AP01-5
 Fujita H. **05AP01-3,** 13AP12-3
 Fujita M. **01AP13-3**
 Fujita N. **04AP08-1**
 Fujita Y. 03AP03-2, 03AP07-4, 16AP05-8
 Fujiwara Y. 03AP03-2, 03AP07-4,
 16AP05-8
 Fukuda K. 01AP14-12
 Fukui K. 07AP01-3
 Fukunaga S. 07AP11-9
 Fukusaki M. 03AP06-5
 Fukushima R. 01AP11-11
 Fukushima T. 05AP01-3
 Furrer M.A. 01AP15-5, 12AP03-1,
 14AP01-2
 Fuz F. 02AP02-1, 16AP03-7
- G**
 Gaballah K. 14AP04-5
 Gabriela A. **06AP01-3**
 Gacio M. 08AP06-7
 Gago S. 16AP01-1, 16AP03-2, 16AP03-6
 Gago Quiroga S. 13AP06-8, 16AP05-2
 Gajate Martin L. 12AP02-10, 14AP07-8,
 14AP07-10
 Gakuba C. 08AP07-4
 Gál J. 10AP02-5, 17AP01-3
 Gál R. 14AP05-8
 Galacho J. 05AP01-8, **14AP08-10**
 Galante D. **01AP13-4, 03AP01-8**
 Galiana Ivars M. 03AP10-9
 Galitzine S. 17AP02-2
 Gallart L. 02AP02-5, 11AP06-10
 Galve A. 07AP02-3
 Galve A.I. 16AP03-2, **16AP03-5,**
 16AP03-6, **16AP05-1**
 Galve Marqués A.I. 16AP04-7
 Galveias I. 04AP04-10, 07AP09-10
 Gama de Abreu M. BAPC-4, 11AP07-5,
13AP01-2, 13AP01-6, 13AP01-10
 Gambús P.L. **01AP09-5**
 Gamo M. 07AP02-8, 07AP07-5
 Ganaw A.E.A. 12AP01-9
 Gani H. 03AP01-10, 03AP04-9, 16AP02-7
 Garcia B. **03AP09-6**
 Garcia J. 08AP05-3
 García J. 08AP05-1, 10AP03-2, 13AP07-7
 García Alonso L. 13AP10-5
 García Arranz M. 14AP10-1
 Garcia Bernedo C.A. 13AP05-5
 García Claudio N. 06AP05-7
 García del Valle S. 08AP05-5
 Garcia Fernandez E. **05AP07-10,**
16AP06-5
 Garcia Fernandez J. 07AP06-2
 García Fernández E. 06AP01-7
 García Fernández J. 07AP10-8, 07AP12-7
 García Flórez L.J. 14AP07-4
 García González I. 16AP07-3
 García González N. 03AP04-1, **03AP10-2,**
14AP07-4
 Garcia Gregorio N. 11AP07-10, 14AP06-3
 García Gregorio N. **03AP05-1, 03AP05-2,**
 11AP05-4
 Garcia Menendez M.J. 11AP06-4
 García Sanchez D.E. 16AP01-5
 García Suárez J. 07AP12-7
 García-Aroca M.A. 08AP05-8, 10AP03-1
 García-Barberán A. 14AP05-11
 Garcia-Navas R. 07AP05-7
 García-Pérez M.L. 06AP03-1
 García-Reza A. 07AP05-4
 Gargiulo C. 03AP06-7
 Garini E. **05AP01-5,** 07AP11-5
 Garrido A. 16AP01-1, 16AP05-1
 Garrido Sanchez A. 16AP04-7
 Garth T. 01AP05-3, **01AP16-11,**
 17AP02-10
 Garutti I. 01AP11-10, 07AP02-3,
 07AP02-10, 07AP05-6, 07AP07-3,
 07AP07-6, 07AP11-2, 14AP08-8
 Garutti Martínez I. 14AP09-1
 Gasevic Kasagic M. 16AP07-11
 Gasperevic V. 12AP05-7
 Gastaldi G. 06AP02-10
 Gauch J. BAPC-3
 Gautama S. 07AP08-2
 Gavrilov S.V. 11AP06-5
 Gay A. 13AP07-8
 Gazon M. 12AP04-1
 Geerts B. 14AP07-3
 Geerts B.F. 01AP10-4
 Geeta A. **01AP12-7**
 Gemici H. 01AP08-4
 Gemma M. 07AP01-10
 Genovese A. 09AP05-5
 Georgevici I. **13AP10-1, 13AP10-2**
 Georgopoulou E. 12AP04-3, 12AP04-8
 Georgoulis G. 06AP06-2
 Gerard J.-L. 07AP03-2, 07AP09-5
 Gerasimenko A. 06AP05-2
 Germanova L. 05AP01-9, 05AP02-6,
 11AP02-1
 Gessel van E.F. 17AP01-6
 Ghamari S. **05AP07-8**
 Gherghina V. 08AP03-4, **16AP02-2**
 Ghiorghiu Z. 13AP02-6
 Ghosh S. 13AP09-7, 16AP07-10
 Giacoppo C. 09AP01-2, 09AP01-6
 Gianni S. 07AP01-10
 Giannopolo L. 03AP06-7
 Gigante A.R. 11AP01-8
 Gil Bona J. **02AP02-2, 04AP02-8,**
04AP02-9
 Gil Sánchez J.M. 03AP02-9
 Gilberto N. 11AP08-11
 Gilquin N. **12AP04-1**
 Gilsanz F. 04AP03-2, 04AP03-7,
 04AP08-5, 04AP08-11, 05AP05-5,
 09AP05-3, 09AP05-4, 12AP03-7,
 16AP01-4, 16AP01-5, 16AP05-4
 Gilsanz Rodriguez F. 12AP05-1, 17AP01-9
 Giménez Jiménez I. 06AP05-7
 Gin T. **09AP03-7**

- Gine M. 04AP08-10
 Ginel M.D. 16AP05-1
 Ginel Feito M.D. 16AP04-7, 16AP05-2
 Giner-Crespo-Azorin L. **08AP03-10**
 Gioni P. 11AP05-8
 Giraud R. 13AP04-1
 Giulioni M. 06AP06-9
 Gjeraa K. 17AP02-12
 Gkliatis E. 05AP01-5
 Glumac S. **BAPC-5**
 Gnezdilov A. 08AP07-1, 09AP02-2
 Godeanu S.C. 13AP08-2
 Godfried M. 14AP10-2
 Godfried M.B. **14AP07-3**
 Godinho P. 14AP02-7
 Godoroja D. **14AP05-7**
 Gögenur I. 13AP04-10
 Goh J.Y. 07AP04-2
 Gomes A. 01AP05-5
 Gomes L. 11AP03-2
 Gomes P. 03AP02-2, 08AP04-9, 08AP05-9, 08AP06-6
 Gómez B. 07AP05-4
 Gómez L. 03AP08-7
 Gomez Bueno M. 07AP06-2
 Gómez de Diego J.J. 07AP05-5
 Gomez Diago L. **03AP05-6, 06AP04-8, 07AP08-6, 14AP07-6**
 Gomez Martin A. 03AP04-1, 03AP10-2, 14AP07-4
 Gómez Pérez N. 12AP02-10
 Gomez Rojo M. 14AP07-10
 Gómez-Diago L. 08AP03-10
 Gómez-Ríos M.Á. **11AP04-4, 14AP09-4**
 Gómez-Ríos M.-Á. **04AP05-5**
 Goncalves A.S. **01AP05-6**
 Gonçalves C. 11AP01-8
 Gonçalves D. 16AP04-3
 Gonçalves G. 01AP12-5, **01AP12-6, 01AP14-4, 03AP10-7**
 Gonçalves J. 12AP02-4
 Gonçalves L. **14AP02-7**
 Gonçalves M. 11AP03-9
 Gonzalez A.I. 07AP06-2
 Gonzalez M. 04AP01-4
 González A. 07AP10-8
 González C. 01AP09-5
 González T. 11AP01-9
 González Benito E. 14AP08-3
 Gonzalez Bermudez I. 13AP04-12
 González Carrasco F.J. 01AP04-11
 González Cibrián C.C. **07AP06-4, 14AP07-8**
 González Fariña V. 12AP05-6, 14AP03-5
 González García C. 16AP08-2
 González Humbreiro J.A. 03AP10-2
 González López O. 01AP04-9
 González M F. 07AP07-3
 González Moraga F.J. **07AP11-2**
 González Vilar Á. 13AP13-4
 Gonzalez Zarco L. 07AP10-2
 Gonzalez-Cantero J.L. 14AP08-3
 González-Moraga F.J. 14AP09-1
 Goo E.-K. 11AP08-8
 Goobie S. BAPC-2, **12AP02-5**
 Goossens J. 01AP10-2
 Gopez O. 02AP01-6
 Gordillo I. 01AP08-1
 Goren O. 04AP01-1, 04AP01-3, 04AP03-1
 Gori R. 06AP03-10
 Görlinger K. 12AP04-7
 Gornik I. 12AP05-7
 Gorodnik G. 06AP02-6, 06AP03-7, 06AP05-2, 06AP05-11, 06AP05-12
 Goto T. 01AP16-4, 07AP02-8, 07AP07-5, 13AP02-3, 13AP02-8, 13AP07-2
 Göttermann A. 08AP02-7
 Gouzel C. 07AP09-5
 Gouvêa Á. 08AP04-4
 Gouveia F. 02AP01-2, 11AP02-6
 Gouveia J. **03AP02-2**
 Grachev I. 11AP01-4
 Gracia Roche C. 02AP02-2
 Grainat N. 03AP10-10
 Granell M. **11AP03-5**
 Granier L.A. 05AP03-1
 Grape S. **03AP01-3**
 Grasso A. 03AP08-9
 Grati A.H. 01AP09-1, 07AP09-8
 Grauslyte L. **03AP01-7, 11AP08-4**
 Greabu M. 10AP01-9
 Grech A. **13AP04-4**
 Gredilla E. 04AP03-7, 04AP08-11
 Gregório A.R. 03AP02-8
 Greif R. 02AP01-5, 03AP09-1, 16AP07-8, 16AP08-7, 17AP02-7
 Gribben S. 14AP03-6
 Griffiths M. 07AP04-6
 Grigoros I. 14AP01-6
 Grimshaw J. 17AP02-5
 Grintescu I.M. 08AP03-8, 13AP08-2
 Gritsan A. **07AP07-2**
 Gritti P. **05AP05-3, 06AP06-4, 10AP01-6, 13AP02-9**
 Grochova M. 04AP01-5
 Grothe O. 01AP01-3
 Groves D. 12AP04-2
 Gruenewald M. 06AP02-5
 Gruzicic D. 05AP04-3, 06AP04-2
 Grytsan A. **06AP06-5**
 Guarnieri M. 07AP01-10, 07AP02-4, 07AP02-7
 Guasch E. 04AP03-2, 04AP03-7, 04AP08-11, **12AP03-7, 16AP01-4**
 Guasch Arévalo E. 12AP05-1, 17AP01-9
 Gudaityte J. 16AP01-8
 Guedes A. 14AP09-2
 Guedri S. 16AP02-6
 Guerin J.-P. 16AP03-7
 Guerra M. 05AP04-8
 Guerreiro L. 03AP10-8
 Guilabert P. **10AP03-3**
 Guirao Monreal M.Á. **12AP05-1, 17AP01-9**
 Guittet C. 05AP03-1
 Gul K. 11AP03-3
 Güldner A. 13AP01-2, **13AP01-6, 13AP01-10**
 Gunday I. 11AP08-10
 Gundogdu G. 01AP08-4
 Gunt C. **13AP11-10**
 Guollo F. 16AP03-9
 Gural A. 04AP07-1
 Guran C.-T. 13AP05-6
 Gursoy S. 01AP03-6, 01AP03-9, 08AP04-6
 Gutierrez A. 11AP07-7
 Gutiérrez González C. **03AP04-1, 03AP10-2, 14AP07-4**
 Gutiérrez Martín A. 06AP05-7
 Guttenthaler V. 04AP04-3
 Gutton C. **01AP10-3**
 Gwinnutt M. 14AP06-11
 Gysin J. **17AP02-7**
- H**
 Ha D.H. 16AP02-8
 Ha S.H. 11AP01-1
 Haas E. 07AP01-6
 Habre W. 13AP01-3
 Haddad C. 04AP06-3
 Haddad F. **11AP07-2**
 Haddad Silveira C. **03AP10-1, 11AP02-5**
 Hagău N. 11AP08-9
 Hagihara S. 16AP02-1
 Hagihira S. **01AP07-6**
 Hajer B. 05AP02-3
 Hajjiyeva K. **06AP04-4**
 Hakozaki T. 11AP07-4
 Hall J. 13AP12-5
 Hallbäck M. 11AP07-1
 Halldestam I. 01AP01-5
 Hallén K. **01AP05-8**
 Hallegwell G. 01AP10-1
 Hallqvist L. **14AP02-6**
 Hällsjö Sander C. 11AP07-1
 Hamada T. 13AP07-2
 Han D.-K. 01AP14-11
 Han J.-H. **09AP03-10**
 Haney E. 12AP04-4
 Hanna N. 13AP07-3
 Hannachi Z. 11AP02-10
 Hanouz J.L. 08AP07-4
 Hanouz J.-L. 04AP04-2, 11AP02-9, 13AP03-1
 Hanxiang M. **03AP03-1**
 Hanzek I. 06AP01-1
 Hanzu F. 02AP01-3
 Haouache H. 07AP09-8
 Hara T. 03AP06-5
 Harasawa K. 12AP02-6, 12AP03-2
 Harding F. 17AP02-11
 Härkänen L. 09AP02-10
 Harkat S. 03AP10-10
 Harky A. 01AP05-3, 07AP01-11, 07AP04-6, **14AP04-4, 17AP02-10**
 Haroun A. 01AP12-2
 Harput M.V. 06AP01-5
 Harrathi A. 01AP07-9
 Harrathi M.A. 01AP12-3, 01AP12-4, 13AP09-4, 13AP13-7
 Harvey B. 16AP07-7
 Hasan N. **14AP08-6**
 Hascilowicz T. **11AP08-7**
 Hasegawa H. 06AP05-4
 Hasegawa Y. 09AP02-5
 Hashimoto A. 03AP03-2, 03AP07-4, 16AP05-8
 Hassanin A. 12AP04-7
 Hassanin J. 03AP07-1
 Hattori M. **13AP13-3**
 Hattori Y. 13AP13-3
 Haumann J. 03AP01-1, 03AP01-2
 Hayamizu K. 01AP03-2
 Hayashi S. 04AP07-6
 Hayashida M. 07AP02-9
 Hayat D. 06AP05-8
 Hayes S. **01AP16-10**
 Hekimoglu Sahin S. **04AP06-7, 11AP08-10**
 Helfenstein E. 03AP10-1, 11AP02-5
 Helleberg J. **14AP02-3**
 Hendrickx M. **02AP02-9**
 Henriques D. 03AP08-10
 Henry B. 09AP05-10
 Hens N. 01AP11-5
 Herbots J. 05AP06-10
 Heredia C. **04AP08-10**
 Hermanides J. 14AP06-8, **14AP10-2**
 Hernandez Cadiz M.J. 03AP05-6
 Hernández I. **01AP11-10, 01AP15-10, 05AP01-7, 14AP08-8, 16AP01-1, 16AP03-2, 16AP05-1**
 Hernández J. 16AP03-4
 Hernández M.J. 03AP08-7
 Hernández Y. 14AP10-4
 Hernández Aguado C. 14AP03-1
 Hernández-Abadía de Barbará A. 10AP03-1, 12AP05-8

- Hernández-Cádiz M.J. 06AP04-8,
07AP08-6, 08AP03-10, 14AP07-6
Herod J. 06AP05-1
Herold J. 11AP07-5
Hesselink E.M. 01AP12-9
Heylen R. 10AP02-7
Hideyuki H. 01AP02-1
Hideyuki O. 07AP04-8
Highton D. 14AP06-6
Higuchi H. 04AP08-1, 09AP03-5,
14AP04-7
Hijikata T. 10AP03-7, **10AP03-8**
Hill M. **16AP04-4**
Hinkelbein J. **10AP02-4, 13AP06-3**
Hino H. **01AP13-2**
Hino M. **07AP06-3**
Hinojal Blanco I. **01AP04-11, 10AP03-6**
Hinokuchi M. **16AP02-1**
Hipólito C. **11AP01-8, 14AP09-3**
Hirano A. **01AP08-3**
Hiroki T. **09AP01-4**
Hiroshi I. 09AP04-4
Hitosugi T. 16AP02-5
Ho I. 09AP03-7
Ho V.K. 11AP03-10
Hodzovic I. 17AP02-4
Hoefl A. 05AP07-8
Hoff R.G. 17AP01-6
Hoffmann R. 03AP02-9
Hofmeyr R. **11AP01-3, 11AP05-9**
Hohn A. 10AP02-4
Hoka S. 01AP03-2, 14AP10-3
Hollmann M.W. 01AP03-1, 03AP01-1,
03AP01-2, 07AP05-1
Holndonner-Kirst E. 05AP07-11,
17AP01-3
Honda J. **14AP08-4**
Honda-Wakasugi Y. 09AP03-5, 14AP04-7
Honma T. 01AP04-2
Honorato-Cia C. **01AP15-8**
Hopp M. 08AP07-3
Horan R. 04AP06-2
Horeshka S. 03AP01-5
Hori K. 01AP13-2
Hoshen M. 04AP03-5
Hoskote H. **08AP06-8, 16AP02-3**
Hosokawa K. 09AP01-5
Hosokawa Y. **04AP02-7**
Hou S.-Y. 01AP11-6, **16AP07-1**
Houben A. 05AP07-8
Hovland A.W. 04AP06-6
Hovsepian K. 16AP07-7
Howell S. 03AP08-1
Hoydonckx Y. 03AP10-3
Hresko T. 12AP02-5
Hsao-Hsung H. 07AP12-8
Hsu Y.-C. 07AP02-6
Huang C.-J. 04AP04-1, 04AP04-5
Hubert M. **13AP01-1**
Hubrich M. **14AP10-10**
Huckle D. **13AP12-5**
Huercio I. 03AP09-6
Huffmyer J. 12AP04-2
Hughes J. 04AP02-3, 12AP02-1
Huhle R. BAPC-4, 11AP07-5, 13AP01-2
Hui-Hsun H. 07AP12-8
Huijnk T.M. 01AP15-1
Hulst A.H. **14AP06-8**
Humbert P. 01AP07-11
Hung C.J. 13AP09-2
Huopio J. 09AP02-10
Hüpfel M. **17AP02-9**
Hur M. 01AP01-9
Husson N. 02AP01-9, 06AP03-2
Hutchins J. 08AP01-6
Huti G. 13AP09-3
- Huybrechts I. 07AP09-1
Hwang G.S. 01AP15-2
Hyung-Mo J. 03AP08-3
- I**
Ibáñez Esteve C. 07AP04-7
Ibrahim E. **04AP05-9, 06AP05-9**
Ibrahim M. **03AP05-11**
Ichikawa J. 07AP10-6, **12AP02-8**
Ichimura M. 09AP02-5
Ickx B. 01AP10-8, 14AP06-5
Ida M. **01AP12-11**
Idialiso R. 10AP02-6, 13AP05-1
Ilevins T. 13AP02-5
Iglesias Gonzalez J.L. 07AP05-7
Iguar A. 13AP11-9
Iida H. 09AP02-4
Iijima K. **09AP04-2**
Ijaz N. 08AP06-8
Ikeda E. BAPC-6
Ikeda M. **14AP10-3**
Ilie M. 13AP11-5
Ilieva V. **13AP01-9**
Illingworth J. 07AP08-2
Illyés M. 14AP09-7
Ilyin S. 07AP12-1
Imabayashi T. 16AP02-1
Imaizumi T. 14AP08-4
In J.Y. 01AP02-4
Inada E. 07AP02-9
Inagawa G. 01AP16-4
Ince C. 05AP04-1
Incertis R. 01AP05-7
Inomata S. 01AP13-3, 03AP05-9,
03AP06-1, 09AP04-2, 11AP03-1
Inoue S. 01AP12-11
Intas G. 01AP14-2
Irie Y. 16AP02-1
Irimie A. 08AP01-11
Irina A. 06AP05-12
Iritakenishi T. 07AP01-1
Isbir A.C. 01AP03-6, 01AP03-9, 08AP04-6
Iseki Y. 14AP08-4
Isherwood J. **14AP03-6**
Ishibashi T. **01AP03-2**
Ishida Y. **13AP12-3**
Ishutin V. 07AP07-2
Isosu T. 11AP07-4
Itai J. 11AP04-7
Italiano S. 03AP02-9
Ito H. **07AP04-5**
Ito T. 10AP03-8
Itoi K. 08AP03-5
Izate G. 07AP09-9
- J**
Jackman S. 16AP02-12
Jacobs T. 01AP16-3
Jacot-Guillarmod A. 03AP07-5
Jacquet Lagrèze M. 07AP09-11
Jacquet-Lagrèze M. **05AP06-3,**
07AP09-9, 13AP07-3
Jae Hee W. **03AP07-10**
Jae-Woo Y. 03AP08-3
Jaffro M. 03AP05-3
Jaho E. 03AP01-5
Jain A. **01AP09-7, 11AP08-2**
Jamaer L. 02AP02-9, 03AP07-2,
03AP07-3, 03AP10-3, 05AP06-10
Jame V. **01AP10-5**
Jang E.A. 13AP12-6
Jang M.-S. 09AP03-10
Janicic D. 07AP11-4
Janiszewska A. 17AP01-1
Jano A. 16AP02-7
- Jans F. 10AP02-7
Jansen S. 10AP02-4
Janssen J.J. 01AP10-4
Janssen M. 06AP05-6
Jaremko I. **16AP01-8**
Jaunberga Z. 04AP03-8
Javouhey E. 05AP06-3, 13AP07-3
Jeeji R. 07AP01-4, 11AP02-7
Jensen E.W. 01AP09-5
Jeon Y. **01AP16-9, 11AP03-7**
Jeong M.A. **08AP01-4**
Jeong S. 02AP03-4, **05AP07-5,**
13AP01-5, 13AP12-6
Jepsen R.M. **17AP02-12**
Jerez-Rodríguez P. 14AP03-7
Jerrari A. 13AP12-4
Jesus G.N. 14AP05-5
Jesus J. 05AP01-9, 05AP02-6
Jesus T. 03AP02-4
Ji F. 01AP15-4
Ji FB. 14AP03-9
Ji Eun K. 01AP04-1, **15AP01-3**
Jiang H. **09AP03-2**
Jiang J.L. 03AP03-5
Jiang W. 13AP07-4
Jimenez Y. 04AP01-4
Jimenez de la Fuente C. 01AP11-10,
07AP10-2, 14AP08-8
Jiménez De La Fuente C. 13AP06-8
Jiménez Martín M.J. 13AP10-5
Jimeno J.P. 01AP05-3, 01AP16-11,
17AP02-10
Jin S.-J. **08AP04-5**
Jin Woo J. 14AP10-6
Jing L. 07AP05-11
Jinhong W. 16AP07-9
Jin-Shing C. 07AP12-8
Jiyoung L. 15AP01-3
Jo J.-H. 01AP16-9
Jo Y.Y. 05AP03-4, 14AP10-5
Joffe A.M. 16AP07-5
Johnston J. 02AP03-2
Jonathan O.A. 02AP02-7
Jones J. 03AP02-2
Jong Yeop K. **01AP04-1**
Jonker G. 17AP01-6
Joosten A. 01AP10-5, 01AP10-8,
07AP09-1, 14AP06-5
Jørgensen G. 10AP03-9
Jouffroy R. **10AP02-6, 10AP03-4,**
10AP03-5, 13AP02-10, 13AP05-1
Joung K.W. 01AP15-2
Jovaisa T. 01AP15-9
Jovanovski-Srceva M. 13AP09-10
Jove M. 08AP01-6, 08AP01-8
Juanola Galceran A. **11AP04-5**
Juarez Pichardo J.S. 08AP01-10
Julian S. 11AP04-5
Jun I.G. 01AP15-2
Jung H.-M. 11AP03-8
Jung H.S. 01AP01-9
Jung J. 10AP02-1
Jung J.-W. 01AP11-9
Jung K.T. 01AP11-1, 01AP13-7
Jung Eun K. 03AP03-9, **09AP05-8**
Jun-Young C. **03AP08-3**
Jurado Pulgar A. 11AP07-6
- K**
Ka K. 05AP02-2
Kaabachi O. **15AP02-2**
Kacem I. 16AP02-6, 17AP01-2
Kahilogullari G. 06AP01-2
Kahloul M. **01AP07-9, 01AP12-3,**
01AP12-4, **03AP01-9, 13AP09-4,**
13AP13-7, **16AP02-6, 17AP01-2**

- Kahn D. 07AP04-9
 Kajekar P. 11AP02-3
 Kajitani M. 07AP06-3
 Kalamkar Y. **04AP06-5, 07AP01-4, 11AP02-7**
 Kalan Ustar K. 17AP02-9
 Kalidindi R. 04AP02-10
 Kalkman C.J. 03AP01-1, 03AP01-2, 17AP01-6
 Kallionpää R. 01AP16-7
 Kalman S. 01AP11-3, 14AP02-3
 Kalmar A. 01AP01-4, 01AP10-2
 Kalogeromitros A. 13AP10-3, 13AP10-4
 Kaludjerovic M. 05AP04-3
 Kamaraj K. **04AP02-10**
 Kamata K. **06AP05-4**
 Kamber F. **07AP06-1**
 Kamel Y. 13AP13-8
 Kamga H. **08AP07-4, 11AP02-9**
 Kamnev S. **01AP01-2, 01AP10-9, 16AP07-4**
 Kamoun I. **04AP01-10, 11AP02-10**
 Kamoun S. 11AP07-2
 Kempel M.A. **01AP02-7, 04AP01-7**
 Kananchuk S. **03AP05-4**
 Kang H. 01AP07-6, **01AP07-7**
 Kang J.-M. **11AP03-8**
 Kang T.H. 09AP05-11
 Kang T.-W. 01AP04-3
 Kang W.S. 01AP02-6
 Kanmura Y. 16AP02-1
 Kannan T. 11AP02-3
 Kao M.-C. 03AP09-3
 Kapsali A. 03AP07-9, 09AP02-11
 Kara A. 11AP03-6
 Kara D. 07AP03-6
 Karaaslan K. 11AP03-3
 Karaaslan P. 07AP10-3
 Karaduman I. 04AP02-4
 Karagöz A.H. 06AP06-1
 Karamanlioglu B. 04AP06-7
 Karanovic N. BAPC-5
 Kararmaz A. 13AP12-7
 Karashima Y. 01AP03-2
 Karasu D. 01AP06-1, 01AP11-8, 04AP02-4, 08AP03-9
 Karbing D.S. 07AP07-1
 Karbonskienė A. **08AP06-10, 11AP08-4**
 Kardum G. BAPC-5
 Kargi M. 11AP08-10
 Karimi M. 12AP02-7
 Karsten T.M. 14AP07-3
 Kashihara T. 06AP02-7
 Kasputytė G. 08AP06-10
 Kasuya Y. **01AP11-11**
 Kataife E. **12AP04-9**
 Katakura Y. **13AP02-3**
 Kataoka Y. 08AP03-5
 Katary A. **01AP12-2, 04AP06-11**
 Katayama N. 11AP07-9
 Kato F. 09AP03-8, 09AP03-12
 Kato H. 01AP02-5
 Kato R. 04AP02-7
 Katsanevaki A. 08AP07-7
 Katsanoulas K. 03AP09-9, **12AP04-3, 12AP04-8**
 Katsika E. 03AP09-9, 12AP04-3, 12AP04-8
 Katuo T. 01AP01-1
 Kavezou F. 08AP07-8, 11AP05-10
 Kawagoe I. **07AP02-9**
 Kawaguchi M. 01AP12-11
 Kawakami H. **05AP02-2**
 Kawamae K. 01AP03-3, 06AP02-9
 Kawamata M. 01AP09-8, 06AP02-7
 Kawamoto S. **01AP14-12**
 Kawamoto Y. **07AP11-9**
 Kawano T. 09AP01-1
 Kaygin M.A. 07AP03-6
 Kaygusuz K. **01AP03-6, 01AP03-9, 08AP04-6**
 Kazazi E. **03AP02-6, 13AP11-8**
 Kazennov V. 07AP12-1
 Ke B. 01AP13-6, **13AP03-6**
 Keers J. 08AP02-2
 Kendale S. 02AP03-7
 Kennis M. 17AP01-5
 Ker S. **14AP03-10**
 Kerci M. 03AP04-9, **13AP08-8**
 Keskin O. 06AP01-5
 Khan A.R. 15AP01-7
 Khanna P. **05AP04-6**
 Khinich H. 01AP11-2
 Khoronenko V. **01AP15-11, 07AP12-5**
 Khrisanfov D. 01AP11-2
 Kienbaum P. BAPC-3
 Kilicaslan B. **05AP04-1**
 Kim C.H. 03AP07-10
 Kim D.J. **01AP02-8, 01AP11-1, 14AP04-6**
 Kim D.Y. 03AP07-10
 Kim E.-H. 05AP06-9
 Kim E.J. 01AP05-11, 16AP06-9
 Kim H. **01AP02-10, 01AP07-7, 10AP02-1, 16AP01-10**
 Kim H.J. **09AP05-11**
 Kim H.S. 05AP03-4
 Kim H.-S. 05AP06-9
 Kim H.Y. **09AP01-3**
 Kim I.S. **13AP07-6**
 Kim J. 01AP05-2, 13AP12-6
 Kim J.-H. 09AP05-7
 Kim J.-T. 05AP06-9
 Kim J.Y. 14AP10-5
 Kim K. 07AP08-10, **16AP01-10**
 Kim K.C. 03AP07-10
 Kim K.-H. 09AP01-3, 09AP05-2
 Kim K.S. **01AP02-6**
 Kim M.K. **01AP01-9**
 Kim M.-S. 11AP01-1
 Kim N.S. **08AP06-5**
 Kim S. **09AP05-7, 11AP03-7**
 Kim S.G. **01AP15-2**
 Kim S.H. 01AP02-8, **01AP05-2, 01AP11-1, 01AP13-7, 14AP04-6**
 Kim S.-H. 06AP06-11, 13AP03-7, 15AP02-1
 Kim S.I. **14AP10-9**
 Kim T.L. **01AP05-11**
 Kim T.Y. 08AP01-4
 Kim T.-Y. 07AP08-10, **07AP09-7**
 Kim W.H. 01AP01-9
 Kim Y. 01AP02-10, **01AP06-8**
 Kim Y.-A. 07AP11-1
 Kim Y.B. **01AP02-4, 14AP10-5**
 Kim Y.J. 03AP07-10
 Kim Y.O. 09AP03-3
 Kim Y.-S. **01AP14-11**
 Kimizuka M. **04AP07-6**
 Kimura M. 07AP01-8
 Kingery M. 02AP03-3
 Kinnunen M. 08AP04-8
 Kipnis E. 13AP03-1
 Kirac Ogur F. 11AP03-6
 Kirkham K. 03AP04-2, 03AP06-4
 Kirov M. 07AP09-3, 13AP01-8
 Kiss G. 02AP01-6
 Kiss T. **BAPC-4, 11AP07-5, 13AP01-2, 13AP01-6, 13AP01-10**
 Kiyosawa K. 01AP09-8, **06AP02-7**
 Klarin B. 13AP13-1
 Klassen J. 15AP01-9
 Kleine-Brueggeney M. 03AP09-1, 16AP07-8
 Klimov A. 16AP07-4
 Klučka J. 05AP03-6
 Klygunenko O. 04AP08-8, 15AP01-8
 Knoppová L. 05AP03-6
 Ko E.J. 13AP12-9
 Kobayashi Y. 09AP02-5
 Kobinata H. BAPC-6
 Koch S. **05AP06-11**
 Koch T. 13AP01-2, 13AP01-6, 13AP01-10
 Koçulu R. 01AP04-4, 07AP03-10
 Kodaka M. **07AP04-11, 07AP10-6, 07AP10-7, 12AP02-8**
 Koers L. **05AP01-2, 16AP01-9, 16AP05-7**
 Kogelmann K. **13AP13-5**
 Koh J.C. **09AP05-6, 11AP08-8**
 Koh K.F. 14AP09-11
 Koh W.U. 16AP01-10
 Koide Y. 07AP01-3
 Kokki H. 08AP04-8, **09AP02-10**
 Kokki M. **08AP04-8, 09AP02-10**
 Kollmann Camaiora A. **04AP08-5, 16AP01-4, 16AP01-5, 16AP05-4**
 Kollmann-Camaiora A. 12AP03-7
 Kolomachenko V. 03AP06-6
 Kolyvaki S. 14AP03-11, 14AP05-4
 Komann M. 08AP02-8
 Komori M. 07AP04-11, 07AP10-6, 07AP10-7, 12AP02-8
 Konareva T. 13AP08-7
 Kondratiev A. **06AP06-8**
 Koner O. 06AP01-5
 Koning M.V. **08AP03-2**
 Konovalov N. 06AP01-10
 Koo C.-H. 01AP09-4
 Kooij F. 16AP05-7
 Kooij F.O. 14AP06-8
 Kopycheva N. 01AP10-9
 Koraki E. **08AP07-7**
 Korchagin E. 06AP06-5
 Korfali G. 04AP02-4
 Kortoci R. 13AP09-3
 Köse E.A. 07AP10-3
 Kosobe K. 07AP01-8, 07AP07-10, **07AP08-8**
 Kotake Y. 01AP03-3
 Kotur-Stevuljevic J. 13AP03-5, 13AP06-6
 Koufos N. 11AP05-8
 Koukoulitsios G. 13AP10-3, 13AP10-4
 Kouna N. 05AP01-5, **07AP11-5**
 Kovac N. 06AP01-1
 Kovacs M. **04AP06-1**
 Kovalerova N. 01AP01-2
 Kovalev M. 07AP07-9
 Koyama K. 01AP01-1
 Kraiem A. 12AP01-1
 Kramer S. 05AP06-11
 Krebs M. 05AP06-11
 Krichevsky A. 04AP02-1
 Krishnan P. **06AP05-1**
 Krom A.J. **06AP05-8**
 Krukov S. 08AP07-1
 Krupa M. **13AP09-11**
 Krzych &. **12AP05-4**
 Kuşvuran Kurtay M. 07AP11-8
 Kuandykov T. **12AP03-6**
 Kubo N. 05AP01-3
 Kubo T. 09AP01-5, 14AP03-8
 Kuchma A. 08AP05-4
 Kuchyn I. **08AP02-6, 08AP05-7**
 Kuchynska I. **01AP11-2**
 Kuenz S. 14AP03-4, 16AP02-4
 Kuizenga M.H. **01AP07-4, 01AP16-8**
 Kulikov A. 04AP02-2, 04AP05-1, 04AP05-6, **06AP04-5**
 Kumano H. 07AP03-11
 Kumar A. 08AP03-11

- Kumar K. 04AP05-3, 06AP01-8,
08AP03-11, 11AP04-1, 13AP02-1,
15AP01-5
- Kumar S. **04AP05-3, 06AP01-8,**
08AP03-11, **15AP01-5**
- Kumasaka A. **06AP02-9**
- Kume K. 01AP02-5, 01AP11-11
- Kundius U. 14AP09-10
- Kundu R. 13AP06-4
- Kunisawa T. 01AP13-1
- Kuo W.-C. 03AP09-3
- Kurata J. BAPC-6
- Kurihara I. 01AP01-1
- Kurota M. **01AP03-3**
- Kurpanik M. 14AP03-4, 16AP02-4
- Kurti B. 13AP08-8
- Kurz A. 14AP01-8
- Kusumoto G. **07AP03-11**
- Kusunoki S. 11AP04-7
- Kutlu E. **07AP10-3**
- Kuzkov V. 13AP01-8
- Kwack H.J. 01AP02-4
- Kwak H.J. 05AP03-4, **14AP10-5**
- Kwak S. **13AP01-5, 13AP12-6**
- Kwak S.H. 05AP07-5
- Kyriazis D. 03AP09-4
- L**
- Labalde Martínez M. 01AP11-4, 16AP04-1
- Labaste F. 14AP04-1
- Labombarda F. 04AP04-2
- Lacasta A. 12AP03-3
- Lachmann G. 14AP03-4, **16AP02-4**
- Lages Torres R. 03AP08-8
- Lai C.H. 13AP09-2
- Lai H.C. 13AP09-2
- Lal N. 04AP07-7
- Lambadariou A. 08AP07-8, 11AP04-9,
11AP05-10
- Lambo M.S. 01AP13-4, 03AP01-8
- Lan K.M. 07AP12-10, **16AP07-12**
- Lança F. 04AP04-10
- Lance M.D. 12AP01-9
- Landgraf B.R. 05AP05-6
- Landua R. 04AP03-5
- Lantern L.A. 10AP01-6
- Lapage K. 07AP09-2
- Lareiro N. 04AP01-11
- Larsson J. 11AP03-4
- Lascorz L. 06AP03-1
- Laso M. **14AP07-1**
- László I. 14AP09-7
- Latorre J. **05AP02-5, 05AP04-2,**
12AP05-3, 16AP01-4, 16AP01-5
- Latorre M. **07AP06-7**
- Latyshev P. 16AP06-2
- Laudani A. 08AP01-3
- Laura S.M. 02AP02-7
- Lauretta M.P. **07AP08-2**
- Lauro D. 13AP09-8
- Lavado J. 14AP02-7
- Lavand'homme P. 08AP06-1
- Lazarevic I. 05AP04-3
- Leal S. 14AP02-7
- Leal Alves R. 08AP01-1
- Leão P. 11AP03-2
- Lechien A. **12AP02-3**
- Lee B.A. 08AP04-5
- Lee C. 01AP10-4
- Lee H. **09AP02-8, 11AP03-7**
- Lee H.G. **02AP03-4, 05AP07-5, 09AP03-3**
- Lee H.-K. 07AP11-1
- Lee H.W. 09AP05-6
- Lee H.-Y. 01AP11-6
- Lee J. 01AP06-8, 01AP07-7
- Lee J.H. **11AP01-6**
- Lee J.-H. 05AP06-9
- Lee J.-M. 11AP06-3
- Lee J.S. 01AP03-11, **11AP01-1,**
11AP08-8, **16AP02-8**
- Lee J.U. 01AP02-3
- Lee J.Y. 09AP05-11
- Lee K. 08AP04-5
- Lee K.C. 05AP03-4
- Lee K.L. 14AP07-9
- Lee K.-Y. **01AP03-11, 11AP01-1**
- Lee M.-S. **15AP02-1**
- Lee S. 01AP02-4
- Lee S.-H. 09AP01-3
- Lee W.H. 01AP06-8
- Lee W.L. 13AP09-2
- Lee W.S. 07AP04-2
- Lee Y.W. 09AP05-6
- Lee-Kelland R. 13AP08-3
- Lees M. 07AP01-11
- Legouis D. 12AP01-1
- Legrand M. **17AP01-8**
- Leguillier T. 10AP03-4
- Lehmann C. 14AP04-9
- Lehot J.J. 06AP01-6
- Lehtonen M. 09AP02-10
- Leite S. 17AP01-10
- LeJeune M. **01AP16-3**
- Lekprasert V. 16AP03-8
- Lema M. 16AP01-1, 16AP03-5
- Lema Tome M. **16AP04-7**
- Lema Tomé M. 14AP09-1
- Lemaire G. **07AP09-6**
- Lemos T. **16AP03-10**
- Lenkin A. 07AP09-3
- Lenkin P. **07AP09-3**
- Leong M. 04AP02-10
- Lepkowski E. **17AP02-1**
- Lersdirisopon S. 06AP04-7
- Lessa C.N. 14AP05-5
- Leunen I. 03AP07-1
- Levin P.D. 16AP03-3
- Levine B. 17AP02-1
- Levy N. **04AP01-1, 04AP01-3**
- Lévy F. 07AP01-6
- Lew E. 02AP02-8
- Lew J.P. 01AP06-5
- Lewis K. 13AP09-7
- Leykin Y. **08AP01-3**
- Li D. 01AP16-7
- Li M. 06AP02-2, 06AP02-3
- Li T. **BAPC-6**
- Li Z. 01AP15-4
- Lian Kah T. 13AP06-5
- Liao M.-H. 13AP03-2
- Liao R. **03AP06-3**
- Liepina E. 04AP03-8
- Lieutaud S. 03AP05-3
- Lightdale J.R. 16AP06-3
- Lijnzaat L. **01AP06-3, 01AP08-6,**
01AP12-10
- Lilot M. 05AP06-3
- Lim C.H. **13AP12-9, 11AP08-8**
- Lim D.G. **13AP06-9, 13AP11-6**
- Lim H.J. 09AP05-6
- Lim Z.S. 13AP08-4
- Lima C. 01AP05-5, 08AP05-2, 08AP07-2
- Lima F.B. 07AP08-5
- Lima G. 11AP05-2, **13AP10-6, 13AP10-7,**
13AP10-8, **13AP10-9**
- Lima H. 05AP01-9, 05AP02-6
- Lima M. **04AP04-6, 04AP04-11,**
12AP02-4
- Lin C.H. 09AP01-7
- Lin C.-H. **01AP03-8**
- Lin H.-Y. **07AP04-3**
- Lin S.P. 14AP10-7
- Lin T.Y. **09AP03-11**
- Lin T.-Y. 07AP04-3
- Lin Y.-C. 13AP11-3
- Lin Y.T. 16AP07-12
- Lindgren S. 01AP05-8, 14AP10-10
- Lindžič U. **04AP08-7**
- Liou J.Y. **14AP10-7**
- Lirk P. 14AP06-8
- Lirk P.B. 03AP01-1, 03AP01-2
- Liron C. **04AP03-5**
- Lisbona C. 01AP06-6
- Lisbona C.J. 01AP15-10
- Lisencu C. 08AP01-11
- Lissitchkov T.J. 12AP02-7
- Litz R.J. 01AP14-5, 01AP14-6, 03AP07-6
- Liu B. 06AP02-3
- Liu C.C. 09AP03-6
- Liu H. **01AP15-4**
- Liu J. 01AP13-8, 03AP03-5, 06AP02-2,
09AP03-2
- Liu W.L. 07AP04-2
- Liu X. 09AP03-7, 13AP08-3
- Liu Y.J. 14AP08-11
- Ljiljana M. 13AP12-2
- Llaja Villa C.C. 10AP01-7
- Llau J. **01AP05-7, 14AP04-8**
- Lloret Villas B. **14AP03-1**
- Locatelli B. 05AP05-3
- Loer S.A. 10AP01-2, 10AP01-5
- Löffel L. 01AP15-5, 12AP03-1, 14AP01-2
- Lohr D. 03AP07-6
- Lohse N. **05AP07-1, 05AP07-2**
- Lomax M. 08AP01-2, 08AP01-9
- Longhi L.G. 13AP02-9
- Longrois D. **07AP01-1, 07AP11-10**
- Lopes A. 13AP04-5
- Lopes C.G. 01AP07-5, 07AP08-5,
11AP02-4, **16AP06-4**
- Lopes F. 17AP01-10
- Lopez A. 11AP01-5
- Lopez M. 13AP05-8
- Lopez S. 11AP01-5
- Lopez V. **03AP03-6, 03AP03-8, 03AP10-5**
- López M. 10AP03-2
- López Baamonde M. **02AP01-3,**
14AP05-11
- Lopez del Moral Lopez O. 13AP05-2
- López Martínez M. 14AP08-3
- López Palanca S. 13AP02-4
- López Pérez V. **03AP03-7, 14AP10-1**
- Lopez Sánchez C. 01AP07-10
- López-Cedrún J.L. 08AP01-7
- Lopez-Espina C. 12AP04-4, 12AP04-6
- López-Gil M.T. 05AP01-7, 05AP02-1,
16AP03-6
- López-Menchaca R. 10AP02-2
- López-Soberón E. 08AP05-8, 10AP03-1,
12AP05-8
- Loriga B. 13AP05-3
- Lorini F.L. 06AP06-4, 10AP01-6, 13AP02-9
- Lorne E. 07AP09-5
- Lovisari F. **13AP01-3**
- Lu C.W. 09AP03-11
- Lu C.-W. 07AP04-3
- Lu I.C. 01AP03-10
- Lu Y.-F. 07AP02-6
- Lubbe D. 11AP05-9
- Lubnin A. 06AP01-10, 06AP04-5
- Lucas F. 08AP07-4
- Lucas N. **07AP03-9**
- Lucci F. **01AP03-4, 01AP08-2, 14AP02-10**
- Lucena G.D. 11AP02-2
- Luedi M.M. **16AP04-2**
- Luis C. **06AP04-6**
- Luis M. **07AP09-10**
- Lukacs F. 17AP01-3
- Lukaszewicz A.-C. 06AP01-6
- Lukshin V. 06AP04-5

- Lulic D. 17AP02-9
 Lulic I. 17AP02-9
 Lundholm K. 14AP10-10
 Lundström L. 05AP07-2
 Lundström L.H. 05AP07-1
 Lupescu D. **10AP01-9**
 Lupescu O. 10AP01-9
 Lurati Buse G. 07AP06-1
 Lusquinhos J. 14AP01-5
 Lybeck E. 12AP01-4
 Lynch C. 10AP02-1
- M**
 Ma Y. 06AP02-2, **06AP02-3**
 Macabeo C. 02AP03-9
 Macas A. 01AP15-9, 03AP01-7,
 04AP03-4, 04AP03-6, 04AP08-7,
 11AP08-4
 Machado H. 01AP12-6, 01AP14-4,
 03AP10-7
 Machado I.P. **02AP01-7**
 Machado Ortiz S. **04AP01-9**
 Macholz F. **01AP05-10**
 Macieira J. 03AP02-3
 Macovei R.A. 13AP02-6, 13AP11-5
 Madan B. 12AP02-7
 Madden P.B. 14AP08-2
 Madhumitha M. 05AP03-3
 Madrigal A. 05AP01-9, 05AP02-6
 Maecken T. **01AP14-5, 01AP14-6,**
03AP07-6
 Maeda S. 09AP03-5, 14AP04-7
 Maes J.-W. **01AP01-4**
 Maffioletti M. 05AP05-3
 Magalhães J. 03AP02-4
 Maggiore S.M. 03AP04-8
 Magunia H. **07AP03-1**
 Maharani V. 03AP02-11
 Mai K. 13AP04-3
 Maichle S. 16AP02-11, 16AP07-3
 Mairbäurl H. 01AP05-10
 Majic M. 06AP01-1
 Makarenko V. 08AP06-4
 Makita K. BAPC-6
 Makoto O. 01AP02-1
 Makovsek A. **06AP01-1**
 Makrypodis M. 01AP04-6
 Malanova A. 07AP12-5
 Malakhova A. 01AP10-9, **16AP07-4**
 Malshakov V. 01AP14-8
 Malyshev Y.P. 13AP08-7
 Mamaja B. 06AP04-3, 12AP01-5,
 12AP01-7
 Mammi P. 05AP01-5, 07AP11-5
 Manabe H. 01AP02-5
 Manders L.A. **17AP01-6**
 Mankuta D. 04AP02-1
 Man-Ling W. **07AP12-8**
 Mann T. 17AP02-2
 Manninen P. 06AP01-3
 Manrique de Lara C. 09AP05-3
 Manso M.A. 05AP03-1
 Maor A.S. **04AP03-10**
 Maraffi T. 13AP02-10
 Marchesini V. **05AP06-2**
 Marçon F. 05AP03-1
 Marcos L.M. 02AP02-7
 Marcu A. 12AP01-3
 Marcus M.A.E. **12AP01-9**
 Marfin A. 17AP02-2
 Margaritis A. **13AP07-5, 13AP12-8,**
13AP13-2
 Margaron M.P. 13AP11-4, 15AP02-4
 Marie J. **04AP07-10**
 Marimuthu M. **17AP02-4**
 Marin Carcey L. 10AP01-7
- Marín Posada P.A. 13AP11-11
 Marinheiro L. 11AP02-8, 12AP03-5
 Marinho R. 14AP01-3, 14AP01-5,
14AP01-10, 14AP02-8, 14AP02-9,
 14AP06-2, **14AP06-4**
 Marinov T. 11AP05-1
 Mariyaselvam M. **16AP02-12,** 16AP04-8
 Markopoulos I. 12AP04-3, 12AP04-8
 Marmelshtein A. 06AP05-8
 Marocchi L. 06AP06-12
 Marouli D. **14AP03-11, 14AP05-4**
 Marques A. 10AP01-1
 Marques M. 08AP06-6, 13AP10-6,
 13AP10-7, 13AP10-9
 Marques R. 04AP08-3
 Marques de Castro J. 14AP05-9
 Marques Gonzalez A. 03AP05-1,
 03AP05-2
 Marrero G.N. 10AP01-7
 Marrone A. 03AP04-8
 Marta A. 03AP02-6
 Martchenko S. 13AP02-9
 Martí A. 04AP01-4
 Martin A. 04AP03-7
 Martin C. 07AP10-8
 Martin D. 14AP06-6
 Martin L. 09AP04-3
 Martín J. 05AP07-4, 08AP04-2
 Martín N. 10AP03-3
 Martín Alfonso S. 13AP05-2
 Martín Grande A. 14AP07-8
 Martín Lorenzo M.D.C. 12AP05-6,
 14AP03-5
 Martín Martín R. 06AP01-7
 Martín Mora V. 01AP04-9
 Martín Piñeiro B. 07AP06-9
 Martínez A.R. 01AP05-9
 Martínez S. **08AP05-1, 13AP05-9**
 Martínez F. 14AP07-1
 Martínez M. 03AP09-6
 Martínez S. **08AP04-11, 08AP05-3**
 Martínez Hurtado E. 11AP04-4,
 16AP01-3
 Martínez López A. 08AP05-5
 Martínez Triguero M.L. 14AP06-3
 Martínez Ubieto F. 02AP02-2
 Martínez Ubieto J. 02AP02-2, 04AP02-8
 Martínez-Hurtado E. 04AP05-5
 Martínez-Meco Ortiz L.M. **01AP11-4,**
16AP04-1
 Martínez-Molina J. 01AP15-8
 Martínez-Pallí G. BAPC-1
 Martínez-Pallí G. 14AP05-11
 Martínez-Simon A. 01AP15-8
 Martín-Mateos E. **14AP09-4**
 Martino C. **06AP03-6, 06AP03-12**
 Martín-Oropesa R. **07AP05-3, 07AP05-4**
 Martins C.P.M.O. 08AP01-1
 Martins K. **07AP06-5**
 Martins M. 13AP10-6, 13AP10-8
 Martins N. 13AP11-4, **15AP02-4**
 Martins P. 03AP10-8, 16AP01-7
 Martins Cruz K. **01AP07-10**
 Martires E. 04AP07-4
 Marty A.P. 17AP01-6
 Marullo L. **06AP03-5**
 Maruyama T. 06AP05-4
 Marwick P. 11AP05-9
 Masahiro M. 07AP09-4
 Mases A. 02AP02-5, 07AP06-7
 Masgoret P. **04AP04-7**
 Masiliūnienė G. 11AP08-4
 Massad I. 08AP05-6
 Mas-Serrano P. 01AP05-9
 Masso A. 10AP01-3
 Mastrantonio F. 13AP09-8
 Masuda K. 07AP04-8
- Masui K. 01AP13-1
 Mata Francisco N.C. 04AP07-8,
 07AP05-9, 07AP12-4
 Matari Ahmed W. 07AP03-1
 Matas M. **06AP06-7**
 Mateus Marcelino Serzedo P.S. 03AP10-1,
 11AP02-5
 Mathew B. **12AP04-4, 12AP04-6**
 Mathew K. 16AP02-12
 Mathews D. 02AP03-8
 Mathivon S. 08AP02-5
 Mathur D. 03AP08-6
 Matias B. **03AP02-7, 11AP05-5**
 Matias F. 08AP04-9
 Matilde Z. 02AP02-7
 Matos F. 11AP03-9
 Matoses Jaen S. 14AP03-3
 Matot I. 04AP01-1, 04AP01-3, 04AP03-1,
 15AP01-2
 Matsumura A. 09AP04-2
 Matsunaga A. 16AP02-1
 Matsunari Y. 01AP12-11
 Matsushita A. 09AP04-2
 Matsuura T. 01AP13-2
 Matta A. 07AP04-9
 Matteocci F. 01AP03-4
 Matthews A. 11AP03-10
 Mauermann E. 07AP06-1
 Maugeri J. **13AP04-7**
 Máximo M. **14AP09-9**
 Maximos S. 01AP09-6
 Mazerolles M. 03AP05-3
 Mazumdar M. 14AP07-7
 Mazurenko A. 12AP04-5, 12AP05-5
 Mazzinari G. 08AP03-1, **11AP07-10**
 Mc Loughlin S. 01AP02-7, 04AP01-7
 McBride M.W. **13AP09-1**
 Mccann M.E. 12AP02-5
 McGroary M. 02AP01-6
 McGuire J. 11AP05-9
 McIsaac D. 17AP02-5
 McNarry A. 17AP02-11
 Mcnorton D. 14AP03-6
 Mebaouj S. **06AP03-8**
 Mebazaa M.S. 11AP07-2
 Meco B.C. 06AP01-2, 06AP04-4
 Medrano S. 08AP04-11
 Medvedeva L. **07AP06-6, 09AP04-1,**
 09AP04-5, 09AP05-9
 Mehta V. 04AP06-5, 07AP01-4,
 11AP02-7
 Meijer R.P. 01AP12-9
 Meissner W. **08AP02-7, 08AP02-8**
 Melai E. 01AP13-4, 03AP01-8
 Melissopoulou T. 11AP04-9
 Melo A. 03AP02-7
 Melo F. 01AP05-5
 Melo e Assis W. **09AP01-8**
 Melo e Assis W.A.L. **11AP02-2**
 Melone A. **10AP02-2,** 11AP01-9
 Memon L. 13AP03-5, 13AP06-6
 Memtsoudis S.G. 14AP07-7, 14AP07-9
 Mendes Coelho F. 04AP01-6
 Mendonça M. 04AP04-8
 Mera H. 09AP02-5
 Mercadal J. 04AP04-7
 Mercier F. 04AP04-4
 Mercier F.J. 01AP05-1
 Merdj S. 03AP10-10
 Merkely B. 17AP01-3
 Mertens P. 06AP01-6, 06AP06-2
 Mertens P.-M. 07AP01-6
 Mesotten D. 13AP01-4
 Mestek M.L. 16AP06-3
 Mestiri T. 11AP02-10
 Metske H. 16AP01-9
 Meuli J. 03AP09-1

- Mhamdi S. 01AP07-9, 01AP12-3,
01AP12-4, 03AP01-9, 13AP09-4,
13AP13-7, 16AP02-6, 17AP01-2
- Mhiri L. 11AP02-10
- Mi Kyoung L. 03AP03-9, 09AP05-8
- Miccichè V. **14AP05-2**
- Michaloux M. 10AP03-5
- Michel P. 16AP03-1
- Michelotti M. 17AP02-1
- Middleton P. 08AP07-3
- Migliavacca G. 04AP08-4
- Miguel D. 01AP11-7, 16AP03-11
- Miguel Martín M.N. 08AP05-5
- Miguel Ruano G. 04AP08-5
- Mihaljević S. 13AP12-2
- Mihara T. 05AP02-2, 07AP06-3, 10AP03-7,
10AP03-8, 13AP07-2, 14AP07-5
- Mikkelsen S. 10AP03-9
- Miklić-Bublić M. 06AP06-7
- Mikulandra S. **12AP05-7**
- Milakovic B. 05AP04-3, 06AP04-2
- Milanović M. 01AP01-7
- Milanovic M. **03AP08-2**
- Milask T. 16AP07-2
- Milenovic M. 06AP04-2
- Mileo F. 12AP04-9
- Miligy A. 05AP03-7
- Miller D. 11AP01-3
- Mills D. 15AP01-6
- Mills G.H. 13AP09-1
- Mimaroglu C. 01AP03-9, 08AP04-6
- Min S.-H. 01AP09-4
- Mincu N. 13AP05-6
- Minegishi Y. 09AP01-5
- Ming-Hui H. 07AP12-8
- Minkowitz H. **08AP01-6**
- Minville V. 14AP04-1, 16AP06-6
- Miraka M. 13AP09-3
- Mironas A. 13AP09-7
- Mirza K. 08AP01-2, 08AP01-9
- Misa K. **07AP09-4**
- Mishra S. **05AP06-4**
- Mitrev L. 01AP03-1
- Mitsukov D. 07AP07-2
- Miyagi M. 07AP04-8
- Miyake S. **09AP03-5**
- Miyao H. 01AP01-1
- Miyashita R. 01AP04-2
- Miyawaki T. 09AP03-5, 14AP04-7
- Miyazaki M. 10AP03-7
- Miyazawa N. 05AP01-3
- Miyazawa Y. 09AP03-12
- Miyerbekov Y. **07AP01-7**
- Mladić Batinića I. **06AP05-3, 06AP05-10**
- Modesto M.M. 09AP01-8
- Módoło N.S.P. 14AP05-5
- Moerman A. 07AP03-4, 07AP09-2,
17AP01-7, 17AP01-8
- Moguilevitch M. **05AP04-4**
- Mohamed E. 13AP13-8
- Mohammed K. 17AP02-5
- Moinho N. 16AP02-10
- Moise A. **13AP05-6**
- Molenbuur B. 05AP07-9
- Molinari D. 05AP06-8
- Moliner S. 03AP08-7
- Moliner-Velázquez S. 08AP03-10
- Molines A. **13AP04-6, 14AP06-7**
- Molinés A. 01AP01-6
- Molins G. 11AP04-5
- Moll J. **05AP06-5**
- Molnár Z. 14AP09-7
- Moltó L. 06AP04-6
- Momeni M. 07AP04-9, 07AP06-8,
07AP09-6
- Momoyo M. **14AP07-5**
- Mondello C. 09AP02-7
- Mondello E. 09AP01-2, 09AP05-5
- Monedero P. 01AP15-8
- Monica T. 17AP02-5
- Monner A. 08AP01-7
- Monteiro M. 03AP08-10
- Montejo-González J.C. 13AP09-9
- Monten C. 17AP01-7, 17AP01-8
- Montero Tinnirello J. **11AP01-5**
- Montes A. 08AP04-11, 08AP05-1,
08AP05-3
- Monteserín C. 02AP02-7
- Monteserín Matesanz C. **11AP01-9,
14AP08-3, 14AP09-1**
- Montón Giménez N. 12AP05-6, 14AP03-5
- Moore M. 13AP08-5
- Mora M. 02AP01-3
- Morais de Paiva T.T. 14AP01-8
- Moral M.V. 04AP08-10
- Moral García M.V. 03AP02-9
- Moral García V. 01AP04-11, 10AP03-6
- Morales C. 05AP07-10
- Morales García X. 10AP01-3
- Morales Sarabia J. 03AP05-6
- Morandiera Rivas C. 08AP05-5
- Morarach P. 03AP05-8
- Moreno Martínez C.E. **13AP05-5**
- Moret E. 04AP01-4, 16AP01-6
- Mori A. 03AP03-10
- Mori E. 11AP05-7
- Mori F. 14AP09-6
- Mori T. 01AP07-6, 01AP13-2, 07AP04-11
- Moris L. 03AP03-6, 03AP10-5, 14AP10-1
- Morís L. 03AP03-7, 03AP03-8
- Mori-Yoshioka M. 14AP04-7
- Moro F. 01AP15-3
- Mörwald E.E. **14AP07-7, 14AP07-9**
- Mota A. 01AP12-5, 01AP12-6
- Mota S. 04AP07-4
- Motiejaitis M. 04AP03-4
- Mould M. 17AP02-2
- Moura A. 12AP02-4
- Mourad M. 12AP03-8
- Mourão J. 14AP02-1, 14AP03-2,
14AP05-9
- Mousafiri O. 13AP13-2
- Moustafa A. **05AP03-7**
- Moustafa A.M. 11AP06-6
- Moustafa M.A. **11AP06-6**
- Mrizak N. 16AP02-6, 17AP01-2
- Muftahutdinova G. 14AP06-1
- Muggleton E.R. **04AP03-9**
- Muggleton T. 04AP03-9
- Mukouyama Y. 07AP10-6, 07AP10-7
- Mulier J. 01AP14-9
- Mulier J.P. **01AP09-9**
- Muliterno Español E. 14AP03-1
- Müller C. 07AP06-1
- Müller S. 04AP04-8
- Muñoz D. 07AP05-3
- Muñoz J.L. 01AP01-6, 13AP04-6,
14AP06-7
- Muñoz L. 03AP03-6, 03AP10-5, 16AP03-4
- Muñoz Alameda L.E. 07AP06-9
- Muñoz Rodríguez L. 04AP02-8, 04AP02-9
- Mur L. 13AP09-7
- Muragaki Y. 06AP05-4
- Murakami Y. 11AP05-7
- Murakawa M. 11AP07-4, 14AP08-4
- Murata Y. **03AP06-1**
- Muresan A. 12AP04-6
- Murniece S. **06AP04-3**
- Murozono M. **01AP04-2**
- Murphy C. 04AP02-6, 04AP04-9
- Musaeva T. 08AP06-4, 13AP11-7
- Musellec H. 09AP03-4, 09AP04-3
- Mustafin A. **13AP02-7, 13AP02-7,
13AP08-10, 13AP08-10**
- Mutagirov V. 12AP03-6
- Mutlu K. 11AP04-6
- Muto K. 01AP02-5
- Muzha D. 13AP08-8
- Myhal I. 03AP01-6
- Myoga Y. **01AP02-5**

N

- Na S. 01AP05-2
- Nabecker S. **16AP08-7**
- Naco M. **03AP01-10, 03AP04-9**
- Nagamine K. 07AP01-3
- Nagamine Y. 13AP02-8
- Nagano S. 14AP03-8
- Nagarajan S. **02AP02-8**
- Nagea M. 10AP01-9
- Nagore D. 01AP05-3, 01AP16-11,
17AP02-10
- Nagy J. 07AP03-3
- Naija W. 01AP07-9, 03AP01-9
- Naik H. 03AP09-7
- Naili A. **13AP08-11**
- Naithilath S. **01AP14-3**
- Naito Y. 01AP12-11
- Nakada T. 06AP02-7
- Nakae A. 09AP01-5, **09AP04-4**
- Nakagoshi N. 04AP02-11, 14AP03-8
- Nakai K. **09AP01-5**
- Nakajima T. 13AP12-3
- Nakamura N. 05AP02-2
- Nakanishi T. **11AP04-8**
- Nakata Y. **16AP04-9**
- Nakatsuka H. 07AP11-9
- Nakhli M.S. 01AP07-9, 01AP12-3,
01AP12-4, 03AP01-9, 13AP09-4,
13AP13-7, 16AP02-6, 17AP01-2
- Nani F. 04AP06-3
- Nardo G. 04AP03-3
- Narimatsu H. 16AP04-9
- Narvaez J. 13AP11-1, 13AP11-2
- Nascimento J.C.R. 16AP06-4
- Naskar S. 04AP05-3, 06AP01-8
- Nassar H. **05AP07-3**
- Nastashenko I. 01AP11-2
- Nastasovic T. **05AP04-3, 06AP04-2**
- Navarro C. 14AP07-6
- Navarro Suay R. 05AP04-2
- Navarro-Martínez J.A. 16AP08-5
- Navarro-Suay R. **08AP05-8, 10AP03-1,
12AP05-8**
- Nazarenko K. 06AP02-6, 06AP03-7,
06AP05-11, 06AP05-12
- Nazarov R. 06AP06-8
- Nefedov A. 14AP09-10
- Negoi M. 08AP03-8
- Neiva Lemos J. 02AP01-4
- Neofytou K. 14AP09-12
- Neri M. 06AP04-9
- Nessler N. 13AP01-1
- Neto I. 14AP01-10
- Neto M. 11AP08-11, 12AP05-9
- Neto S. 14AP02-5, 14AP06-2
- Neuhaus C. 10AP02-4
- Nevado M. 12AP02-9
- Neves A. 04AP01-11, 15AP01-4
- Neves I. 10AP01-8
- Neves M. 04AP01-6
- Nevo A. **04AP03-1**
- Neyrinck A. 01AP14-1
- Ng R. 14AP03-10
- Nial Q. 01AP12-7
- Nicolini F. 06AP06-9
- Nicolini M. **14AP09-6**
- Nielsen E.W. 04AP06-6
- Nieto S. 11AP03-5
- Nieto Martín L. 04AP07-8

- Nieto Martn L. 07AP12-4
 Nieuwenhuijs-Moeke G.J. **01AP15-1**
 Nihei W. 07AP04-11, 07AP10-6, 07AP10-7
 Nikai T. 11AP07-9
 Nikitina L. 12AP01-7
 Nikitina-Zake L. 12AP01-5
 Nilsson L. 01AP01-5
 Nir Y. 06AP05-8
 Nishigaki A. 04AP02-11
 Nishikawa K. 01AP13-2
 Nishishinya M.B. 12AP01-2
 Nishiwaki K. 01AP07-3, 03AP03-10
 Nishiyama K. 07AP04-11, 07AP10-6, 12AP02-8
 Nishizaka M. 10AP03-8
 Nisiwaki K. 01AP07-2
 Nivet Antoine V. 10AP03-4
 Nóbrega S. **03AP02-12**
 Nodarse Medina J. 13AP06-10
 Nogueira Z. 03AP02-5
 Noguerol del Cid C. 03AP04-1, 14AP07-4
 Noji Y. **11AP07-4**
 Nomura T. 07AP01-3
 Noskova K. 01AP10-9
 Noskova P. 04AP01-5
 Nosova L. 07AP07-2
 Novell A. 13AP05-4
 Novelli A. 13AP05-3
 Noversa C. 12AP02-4
 Novokreshchennykh V. 07AP07-2
 Nowak-Machen M. 07AP03-1
 Noyes Essex M. **14AP04-3**
 Nozumi Y. 07AP04-8
 Nunes F. 01AP08-7
 Nunes L. 01AP08-8, 11AP05-3
 Nunes R.R. **01AP07-5**, 07AP08-5, **11AP02-4**, 16AP06-4
 Nunes Ferreira M. 08AP03-6, **08AP06-7**
 Nunes Filho R.R. 01AP07-5, 11AP02-4
 Nuyens V. 01AP13-5
 Nyktari V. 04AP07-3
- O**
 Oancea I. 13AP11-5
 Obara S. 11AP07-4
 Obata H. 09AP01-4
 Oberding M. 02AP03-8
 O'Brien P. 07AP05-10
 Ochiai R. 01AP03-3
 Oda S. 06AP02-9
 O'Donnell S. 02AP03-8
 Oei G.T.M.L. **01AP12-9**
 Oei G.T. 07AP05-1
 O'Flaherty D. **04AP04-9**
 Oh B.J. **01AP11-9**
 Oh D.S. 09AP05-11
 Oh E. 07AP08-10
 Oh E.-A. **01AP09-4**
 Oh I.-D. 09AP03-10
 Oh Y.N. 08AP01-4
 Ohashi W. 13AP13-3
 Öhman T. 11AP07-1
 Ohri I. 03AP01-10, 03AP04-9, 13AP08-8, 16AP02-7
 Oikonomopoulos D. 07AP11-5
 Oishi R. 14AP08-4
 Oji M. 03AP06-5
 Okamura K. 07AP04-11, **07AP10-7**, 12AP02-8
 Okano S. 13AP08-3
 Okayasu T. **09AP02-5**
 Okitsu K. **07AP10-1**
 Okutomi T. 04AP02-7
 Okuyama K. **01AP02-1**
 Okyay K. 11AP01-10
- Oliveira C. 03AP02-8, 03AP02-12, **05AP04-9**, 07AP08-7, 16AP04-6
 Oliveira J. 01AP11-7, 16AP03-11
 Oliveira M.I. 12AP05-9
 Oliveira S. **08AP04-9**, 08AP05-9
 Olley L. 16AP04-4
 Olmedilla L. 01AP06-6, 01AP11-10, 01AP15-7, 01AP15-10, 13AP11-1, 13AP11-2, 14AP08-8
 Olmedilla Arnal L.E. 14AP03-3
 Olmedillas S. 14AP10-1
 Ologoiu D. 08AP03-8, **08AP03-8**
 Omae T. **07AP08-4**
 Omi S. 11AP05-7
 Ong A.S.C. 11AP08-1, **11AP08-2**
 Ong C.S. 11AP08-1, 11AP08-2
 Ong Y.Y. **01AP06-5**
 Onishi Y. 07AP03-5
 Ono Y. **16AP05-8**
 Oosaka Y. 03AP05-9
 Opfermann P. 13AP08-9
 Oral K. 07AP01-5
 Orbach-Zinger S. 04AP03-5
 Orechova E. 06AP01-9
 Orkin D. 16AP01-11
 Ormonde L. 10AP01-8, 16AP01-7
 Ortega Lucea S. 04AP02-9
 Ortega Monzó J.M. 08AP03-1
 Ortuño Andrés F. 16AP07-3
 Orvalho C. **06AP05-5**
 Ory J.-P. 02AP02-9, 03AP07-2, 03AP07-3, 03AP10-3, 05AP06-10
 Osada Y. 07AP10-7
 Osswald M. 02AP01-5, 17AP02-7
 Østergaard D. 17AP02-12
 Ota S. 13AP02-8
 Ota T. **07AP01-3**
 Otake H. 09AP02-5, 16AP04-9
 Otaki K. 01AP03-3
 Otero I. 04AP08-11
 Oudre L. 01AP07-11
 Ouerghi S. 11AP02-10
 Oueslati M. 15AP02-2
 Ould-Ahmed M. 01AP07-11
 Ovad O. 04AP03-5
 Óveges N. **14AP09-7**
 Over L. 16AP05-7
 Owada G. **13AP07-2**
 Öz I.&. 13AP07-1
 Ozaki M. 01AP11-11, 04AP08-1, 06AP05-4
 Ozasa H. 11AP07-9
 Ozaydin S. 01AP08-4
 Özdemir Kol I. 01AP03-6, **08AP04-6**
 Özgök A. 01AP04-4
 Ozgunay S.E. 01AP06-1, 01AP11-8
 Ozgural O. 06AP04-4
 Ozkan A.S. **11AP04-3**, **11AP04-6**
 Ozkaya G. 08AP03-9
 Ozmen S. 01AP06-1
 Ozolina A. **04AP03-8**, 12AP01-5, 12AP01-7, 13AP02-5
 Ozyuksel A. 07AP10-3
- P**
 Pařízek T. **14AP05-8**
 Pace M.C. 03AP08-9, 08AP02-1
 Pacheco A. 01AP09-5
 Pacheco M. 01AP14-4, 11AP03-2
 Pacreu S. 06AP04-6, 11AP06-10
 Padron O. 12AP03-8
 Pagalidou E. 08AP07-6
 Pagazaurtundúa A. 07AP02-1
 Pain L. 01AP16-6, 06AP03-8
 Paiva E.Y. 14AP01-8
 Palencia M. 16AP01-1, 16AP03-5
- Palencia Jorge M. 16AP05-2
 Pallardó M.A. 16AP03-4
 Palma Mira F. 01AP06-2
 Palomero-Rodríguez M.A. 07AP05-7
 Panafidina V. **07AP07-9**
 Panagopoulos N. 08AP07-6
 Pandey R.K. 05AP06-4, 13AP02-1
 Pandin P. 03AP09-7, 06AP03-5, 08AP03-3
 Panigot N. 06AP03-8
 Pannier E. 16AP08-1, 16AP08-3
 Panoutsopoulos G. 01AP14-2
 Panteleou K. 03AP09-9
 Panzina A. 11AP02-6
 Paolantonio N. 01AP03-4, 01AP08-2
 Papadopoulos G. 13AP07-5
 Papaioannou A. 04AP07-3, 12AP02-2, 14AP03-11, 14AP05-4
 Papaioannou E. **08AP07-8**, **11AP04-9**, **11AP05-10**
 Papakitsos G. **03AP07-9**, **09AP02-11**
 Papakitsou T. 03AP07-9, 09AP02-11
 Papakonstantinou K. 13AP10-3, 13AP10-4
 Papegay B. 01AP13-5
 Paquero X. **09AP03-4**
 Parbhoo P. 12AP02-1
 Pardey Bracho G.F. **06AP01-6**
 Pardo A. 06AP04-6, 11AP06-10
 Pardo Rey C. 13AP10-5
 Paris T. 13AP09-6
 Parise Roux D. 14AP07-8
 Park J.E. 01AP03-11
 Park J.-W. 06AP06-11
 Park K. 11AP05-9
 Park K.S. 09AP03-3
 Park S. 09AP05-6
 Park S.H. 13AP06-9, 13AP11-6
 Park S.J. 13AP12-9
 Park S.-K. 01AP01-9
 Park W. **10AP02-1**
 Parrilla L. 04AP08-10
 Parrilla Quiles L. 10AP03-6
 Parsons J. 03AP08-1
 Parys S. **01AP01-11**
 Pascal P. 10AP03-5
 Pascual Bellosta A. 02AP02-2
 Pascual Lorenzo M.J. 05AP07-10
 Pasheev A. **14AP06-1**
 Pasqualini L. 13AP03-1
 Passavanti M.B. 03AP08-9, 08AP02-1
 Passoni M. 06AP06-4
 Patalano I. 09AP05-5
 Patel B. 05AP05-6
 Patel H.H. 07AP05-1
 Patel S. 08AP06-2
 Patel V. **01AP10-7**
 Patmore C. 16AP04-4
 Patrascanu E. 14AP01-6
 Patsouras D. 13AP07-5
 Paulo L. 06AP03-2, **11AP05-2**
 Paz D. 07AP06-4
 Pazó-Sayós L. 07AP05-3
 Pearse R. 13AP09-9
 Peci J. 03AP02-6, 13AP11-8
 Peckauskas A. **01AP15-9**
 Peclat T. 17AP01-10
 Pedale M. 09AP02-7
 Pedersen T. 16AP08-7
 Pedersen T.H. 02AP01-5, **03AP09-1**, **16AP07-8**, 17AP02-7
 Pedrosa F. 07AP09-10, 14AP08-7
 Pedroso V.M. 01AP08-8, 11AP05-3
 Pedrotti D. 01AP13-4, 03AP01-8
 Pegoli M. **06AP03-11**, 06AP04-9
 Peixoto A.R. **14AP08-9**
 Pelaez de la Fuente E. 01AP04-9
 Pelavski Atlas A. **12AP03-3**

- Pelet-Pascual E. 08AP05-8
Pelicano Paulos J. 01AP06-3, **01AP08-6**,
01AP12-10
Pelosi P. 07AP02-4
Peña Calvo P. 02AP02-2, 04AP02-8,
04AP02-9
Pensado Castiñeiras A. 01AP06-4,
13AP05-8, 13AP05-9, 13AP09-5
Peperstraete H. 07AP03-4
Pereira A.C. **01AP11-7**
Pereira C. **01AP12-5**, 01AP12-6,
03AP02-3, 11AP02-8, **12AP03-5**,
16AP03-11
Pereira E. **04AP08-9**
Pereira F. 03AP05-6, 11AP03-5
Pereira I. 14AP08-10
Pereira L. BAPC-2, 12AP02-5
Pereira M. 14AP09-9
Pereira V. 03AP02-8, 05AP04-9, 06AP01-3
Pereira Alves dos Santos Neto I.M.
14AP02-8, 14AP03-2
Pereira Guimaraes L. 14AP02-8
Pereira Torres L. 12AP02-10
Perez J.M. 13AP11-1, 13AP11-2
Perez L. 11AP06-7
Pérez A. 01AP01-6, 13AP04-6, 14AP06-7
Perez de Lis Novo M. 01AP06-4
Pérez de Lis Novo M. **13AP04-12**,
13AP05-8, 13AP05-9, **13AP09-5**
Perez Diaz D. 17AP02-6
Pérez Ferrer A. 05AP02-5, 05AP04-2,
12AP05-3
Perez Gonzalez A. **13AP05-2**
Perez Peña J. 01AP06-6, 01AP15-7
Pérez-Cerdá Silvestre F. 04AP06-8
Pérez-Ferrer A. 12AP05-8
Pérez-Hoyos S. 13AP09-9
Perez-Peña J.M. 01AP11-10
Pérez-Peña J.M. 01AP15-10, 14AP08-8
Perova-Sharonova V. 05AP03-8
Perry da Câmara C. 04AP08-3
Perry da Câmara L. **04AP08-3**, **14AP08-1**
Pestaña D. 08AP04-2, 15AP02-5
Petak F. 01AP05-4, 11AP07-8
Peták F. 07AP03-3
Peter Coletti Ciglio A. 09AP02-3
Pether J. 01AP05-8
Petkov R. 13AP01-9
Petrişor C. **11AP08-9**
Petrini F. 03AP04-8
Petrou A. 14AP09-12
Petrova A. 06AP01-9, 06AP06-8
Petrovic O. 06AP04-2
Pévet P. 01AP16-6
Peyvandi F. 12AP02-7
Phelps M. **01AP12-1**
Philippe P. 10AP02-6, 13AP02-10,
13AP05-1
Pişkin Ö. **13AP07-1**
Piazza O. 14AP05-2
Pierrel N. 16AP06-10
Pikin O. 07AP12-5
Pimenta M. 11AP03-9
Pina M.F. 14AP09-5
Pinedo G. 12AP03-7
Piñeiro P. 07AP02-10, 17AP02-6
Piñeiro Otero P. 07AP10-2, 14AP08-3
Pinheiro Módolo N.S. 02AP01-4
Pinho S. 01AP12-5
Pintado C. 07AP06-4
Pintaudi S. 13AP04-7
Pinto R. 04AP01-6
Piriou V. 16AP03-1, 16AP03-7
Piscicelli C. 04AP08-2
Pissarra F. 04AP08-3, 14AP08-1
Pitimana-aree S. 16AP03-8
Piver E. 13AP05-4
Piwowarczyk P. 08AP05-10
Plata-Salamán C. 08AP01-7
Platt M. 07AP08-2
Plazikowski E. 16AP08-7
Pletinckx P. 01AP01-4
Ploshchenko Y. **15AP01-8**
Poeria R. 03AP02-12
Poeran J. 14AP07-7
Pogodin A. 04AP05-1
Poirel V.-J. 01AP16-6
Pol R.A. 01AP15-1
Polat N. 11AP04-3, 11AP04-6
Polderman J. 14AP10-2
Pollock R.F. 16AP06-3
Polo Martínez S. 13AP11-11
Pontes D.M. 11AP02-4
Pontes R. 07AP01-9
Pontier B. 01AP03-5
Popat M. 17AP02-2
Popescu M. **12AP01-3**, 13AP08-2
Popescu R. 16AP02-2
Popova O. 14AP01-6
Porta A. 06AP01-3
Portas M. 16AP03-5, 16AP05-1
Portas Gonzalez M.T. 07AP10-2
Portas González M. **16AP05-2**, 16AP08-2
Portran P. 07AP09-11
Portugal F. **02AP01-9**
Posada Mesa L.F. 03AP04-1, 03AP10-2
Posner K.L. 16AP07-5
Posthuma L.M. **07AP05-10**
Pota V. **03AP08-9**, 08AP02-1
Potievskaya V. **04AP06-9**
Poularas I. 13AP10-3, 13AP10-4
Pourcher G. 01AP05-1
Poveda-Marina J.L. 07AP05-7
Powell A. 14AP03-6, **15AP01-6**,
15AP01-7, **15AP01-9**, **16AP01-2**
Powell F. 11AP05-6
Prada de las Heras B. 14AP07-8
Prager C. 05AP06-11
Prates Vitória L. **08AP04-10**
Preckel B. 01AP03-1, 01AP12-9,
05AP01-2, 07AP05-1, 07AP05-10,
14AP06-8, 14AP10-2, 16AP01-9,
16AP05-7
Prete A. 06AP03-10
Prete Merlo M. 16AP01-3
Prie A. 11AP08-9
Prieto Sánchez A. 13AP11-11
Procopiuc L. 13AP10-1, 13AP10-2
Prodromou C. 07AP11-5
ProF. Marinangeli F. 13AP07-9
Provençère S. 07AP01-1
Proxenos M. 11AP05-9
Puchades-Rincón de Arellano R.
12AP05-8
Puchol J. 02AP03-5
Puente-Barba A. 08AP05-8
Puertas-González L.A. 16AP08-5
Puig A. 07AP05-6
Puig J. 11AP07-7
Punj J. 05AP06-4
Punjasawadwong Y. 16AP03-8
Purdy M. 08AP04-8
Puyada A. 08AP01-7
Pylypenko M. **08AP05-4**
- Q**
Qinghong L. 03AP03-1
Quattrone D. 09AP01-2, 09AP01-6,
09AP02-7, 12AP04-1
Qudisat I. 03AP04-7
Quek K.H. **11AP08-1**, 11AP08-2
Quintana-Villamandos B. 07AP05-3,
07AP05-4, 07AP05-5
- R**
Rabanal J.M. 03AP01-11
Rabameda E. 10AP01-3
Rabameda Romero E. **10AP01-4**
Raddaoui K. 15AP02-2
Raevskaya M. 07AP12-1
Ragazzi R. 07AP02-5
Rahimi P. 11AP03-6
Rajala V. 01AP16-7
Rajendran M. **05AP03-3**
Rakanovic D. **07AP11-4**
Ralhan V. **16AP08-6**
Rama Maceiras P. 13AP09-5
Rama-Maceiras P. 13AP05-8
Ramas Diez M. 13AP01-7
Ramia Ángel J.M. 01AP11-4, 16AP04-1
Ramirez C. 12AP03-8
Ramirez L. 11AP06-7
Ramirez Gonzalez M. **14AP07-10**
Ramond C. K. 13AP07-4
Ramos E. 07AP05-4
Ramos P. 01AP11-7, 16AP03-11
Ramos S. **07AP05-6**, **07AP07-6**
Rancan L. 07AP07-6
Ranganathan P. 03AP08-1, **16AP05-6**
Rasero V. 08AP03-3
Ravindran M. 04AP06-1
Ray B.R. 05AP06-4, **13AP06-4**
Re M. 06AP06-4
Rechea V. 08AP05-12
Redondo J.M. **07AP12-9**
Rees S.E. 07AP07-1
Refka K. 05AP02-3
Rego J. 11AP02-8
Rego S. 04AP04-6, **04AP04-11**,
06AP03-2, **08AP06-6**, 13AP10-6,
13AP10-7, **13AP10-8**, 13AP10-9,
16AP02-10
Rehberg-Klug B. 08AP02-5
Rein H. 12AP01-4
Reina-Giménez C. 07AP08-6
Reiner K. **13AP12-2**
Reinoso F. 03AP09-6, 05AP05-5
Reis A.T. 12AP05-9
Reist L. **08AP06-3**
Remerand F. **13AP05-4**
Renaud-Roy E. 01AP09-6
Rennie A. 06AP05-1
Requeijo C. 12AP01-2
Resalt M. 14AP06-7
Resalt-Pereira M. **01AP01-6**, 13AP04-6
Resende A. 03AP10-8, 08AP02-3,
16AP01-7
Resendes H. 08AP05-2, 08AP07-2
Rex S. 08AP04-1
Rey T. 13AP05-8
Rey Carlin R. 13AP13-4
Reyes A. 07AP02-10
Ribeiro B. 01AP08-1
Ribeiro C. **04AP01-11**
Ribeiro K.G. 16AP06-4
Ribeiro P. 04AP08-6, 06AP03-2
Ribera A. 14AP04-8
Ricci L. 05AP06-8
Richardson J. 16AP04-8
Richebé P. 01AP09-6
Ricksten S.-E. 01AP05-8
Rico Feijoo J. 13AP05-2
Riggenbach C. 16AP07-8, 16AP08-7
Rimaitis K. 04AP03-4, 04AP03-6,
04AP08-7
Ringer S.K. 05AP06-1
Ringoir J. **17AP01-5**
Ringsted C. 17AP02-12
Rios LLorente A. 05AP07-10
Rios Llorente A. 16AP06-5
Ríos Llorente A. 06AP01-7

- Ripollés Melchor J. 11AP04-4
 Ripollés-Melchor J. **14AP03-7**, 16AP01-3
 Ripoll-Vidal A. 07AP08-6
 Risco R. BAPC-1
 Risco Martínez R. **14AP05-11**
 Ristescu I. **14AP01-6**
 Ritchie M. 16AP05-6
 Rivera E. 12AP02-9
 Rivera Ordoñez A. 08AP01-10
 Rizos D. 13AP07-5
 Ro Y.J. 16AP01-10
 Robbins M. **04AP02-3**, **12AP02-1**
 Roberts N. 07AP01-11
 Roberts P. 07AP08-9
 Roberts T. **16AP06-1**
 Robertson B. **08AP06-2**
 Robles Fernandez D. 14AP03-3
 Roca J. BAPC-1
 Rocha C. 11AP02-6
 Rocha Abecasis M. **08AP02-3**
 Rodiera Olivé J. 11AP04-5
 Rodondi P.-Y. 09AP02-6
 Rodrigues A. 14AP09-3
 Rodrigues C. **04AP04-10**, **08AP05-9**
 Rodrigues F. 11AP02-6
 Rodrigues H. 07AP01-9, 11AP02-6
 Rodrigues J. 01AP06-3
 Rodrigues M. 11AP03-9
 Rodrigues P.V.T. 01AP07-5
 Rodriguez A. 03AP02-1, 12AP03-8
 Rodriguez M. 05AP07-10
 Rodríguez P. 03AP08-7
 Rodriguez Fraile J.R. 01AP11-4
 Rodríguez Fraile J.R. 16AP04-1
 Rodriguez López J.M. 07AP05-9
 Rodriguez-Gimillo P. 08AP03-10
 Rodriguez-Lopez J.M. 07AP05-7
 Rodríguez-Pérez A. 14AP10-4
 Roimpa A. 03AP07-9, 09AP02-11
 Roisman G. 01AP05-1
 Romao C. 01AP08-6
 Romão C. 01AP06-3, 01AP12-10, 03AP02-12
 Romera A. 05AP01-7, 05AP02-1, 16AP01-1, 16AP03-6
 Romera Rabasa A. 16AP05-2, 16AP08-2
 Rooney G. **04AP02-6**
 Roquilly A. 13AP01-1
 Rosa A. **04AP04-4**
 Rosa P. 01AP05-5
 Rosas Saldívar J.M. **08AP01-10**
 Rosenberger P. 07AP03-1
 Rosi E. 13AP05-3
 Ross C. 12AP02-7
 Róth G. **05AP07-11**
 Rotim K. 06AP05-3, 06AP05-10
 Rouhana K. 02AP03-9
 Roumelioti C. **08AP07-6**
 Rouquette-Vincenti I. 02AP02-1, 16AP03-7
 Rovira Flores E. 04AP02-8, 04AP02-9
 Rovira Lazaro E. **11AP02-11**
 Rovira Soriano L. 08AP03-1
 Rubio M.D.P. 07AP05-9
 Rubio Babiano M.D.P. 04AP07-8
 Rubio Babiano P. 16AP06-5
 Ruchkin D. 07AP12-1
 Rudas L. 14AP09-7
 Ruiz Chiroso M.C. 05AP07-10, 16AP06-5
 Ruiz Escobar A. 04AP06-8
 Rumyantseva M. 06AP06-8
 Rupp L. 05AP06-11
 Rusanov A. 07AP07-9
 Rusanova I. 13AP06-10
 Russo E. 06AP03-6, 06AP03-12
 Russo-Menna I. **05AP04-10**
 Rutkovskiy R. 06AP06-6
- Ryoichi O. 07AP09-4
 Ryu H.-S. 01AP14-11
- S**
 Sa J. 03AP10-7
 Sá A. 01AP14-4
 Saad M. **16AP06-7**
 Saari T. 09AP02-9
 Saastamoinen M. **11AP03-4**
 Sabaté S. 07AP06-7
 Sabelnikovs O. 13AP02-5
 Sabuncu Ü. 01AP04-4
 Sacchetti C. **04AP08-4**
 Sacramento B.B.C. 08AP01-1
 Sadamori T. 11AP04-7
 Sadeghi P. 16AP08-6
 Sadurní M. 11AP06-10
 Sadurní Sardá M. 13AP05-5
 Sagarío M. 13AP09-8
 Sagimbayev A. 13AP02-7, **13AP08-10**
 Saglietti F. 07AP01-10, 07AP02-4, 07AP02-7
 Sahin N. 08AP03-9
 Sahinovic M. **06AP01-11**
 Said E. 14AP04-5
 Said H. 14AP04-2
 Saito S. 03AP06-1, 09AP01-4
 Saiwaew K. 06AP04-7
 Sajko T. 06AP05-3, 06AP05-10
 Sakai N. **15AP02-3**
 Sakakibara K. 03AP03-2
 Sakamoto H. 07AP04-8, **12AP02-6**, **12AP03-2**
 Sakamoto S. 11AP04-8
 Sakimura S. 14AP10-3
 Sakuma K. 09AP05-1
 Sakuma S. 04AP08-1
 Salas K. 12AP01-2
 Salas Rezola E. 01AP05-9
 Salazar K. 10AP03-3
 Sales A.J.B. 07AP08-5
 Salihoglu Z. **01AP08-4**
 Saliu R. 03AP02-6, 13AP11-8
 Salkičević S. 06AP05-3, 06AP05-10
 Salomon C. 03AP01-11
 Salve G. **13AP07-9**
 Samoila B. 08AP03-4
 Samoylova N. **08AP07-1**, **09AP02-2**
 Sampaio J. 03AP02-8, 05AP04-9
 Sampedro-Nuñez M. 01AP07-10
 Sanbe N. 14AP08-4
 Sánchez A. 02AP03-5
 Sánchez Brotons M.J. 09AP02-1
 Sanchez Cesteros C. 16AP02-11
 Sánchez Conde M.P. **07AP05-7**, **07AP05-9**
 Sánchez Crespo J.A. 07AP05-9
 Sanchez García M. 13AP10-5, 16AP02-11, 16AP07-3
 Sánchez Pedrosa G. 14AP09-1
 Sánchez Poveda D. 07AP12-4
 Sánchez-Font A. 02AP02-5
 Sandesc D. 08AP01-11
 Sang Kee M. 15AP01-3
 Sang Sik C. **03AP03-9**, 09AP05-8
 Sangtongjaraskul S. 06AP04-7
 Sansone P. 03AP08-9, **08AP02-1**
 Santa Bárbara R. 03AP02-5
 Santana T.B. 09AP01-8, 11AP02-2
 Santiago Gomez R. 02AP01-7
 Santiago Paniagua P. 07AP06-9
 Santos A. 13AP04-5, 14AP01-1, 14AP01-3, 14AP01-4, 14AP01-5, 14AP01-7, 14AP01-9, 14AP01-10, 14AP02-5, 14AP02-9, 14AP06-2, 14AP06-4, 14AP06-10
- Santos G.B.M. 11AP02-2
 Santos J. **01AP08-7**, 05AP01-8, **14AP08-5**
 Santos S. 04AP05-8, 04AP06-3, 08AP04-4
 Santos Carvalho C. **04AP01-6**
 Sanz Fernández F.J. 14AP09-1
 Sági E. 05AP07-11
 Sara T. 05AP06-8
 Saraci B. 13AP11-8
 Saracoglu A. **07AP01-5**
 Saracoglu K.T. 07AP01-5
 Saraiva L. 04AP01-11
 Sareban M. 01AP05-10
 Sarikas C.M. 07AP03-6
 Sarkele M. **13AP02-5**
 Sarmiento Castro J. 14AP08-9
 Sarna K. 01AP12-2
 Sarrais C. 07AP06-5
 Sarridou D. 07AP03-9
 Sastre I. 07AP07-3
 Sato Y. 03AP07-4, 08AP03-5, 16AP05-8
 Satoh D. 07AP02-9
 Satomoto M. 01AP07-2, 01AP07-3
 Satsumae T. 01AP04-8
 Satya D. 14AP04-4
 Saugel B. 01AP01-3
 Saulénas T. 04AP08-7
 Saunders R. **16AP06-3**
 Saura C. **03AP02-8**, 05AP04-9, **16AP04-6**
 Savarese B. 06AP03-10
 Savino S. **07AP07-1**
 Savoldelli G. 08AP02-5
 Savvina I. **06AP01-9**, **06AP06-6**
 Sawa T. 16AP04-9
 Sawyer A. 16AP04-8
 Saxena S. 14AP03-6, 15AP01-6, 15AP01-7, 15AP01-9, 16AP01-2
 Sayed E. 14AP04-5
 Sayetgaraev A. 14AP06-1
 Saylan A. 05AP04-1
 Sazhyn D. 12AP04-5, 12AP05-5
 Scala E. **09AP02-6**
 Scarabottini S. 14AP09-6
 Scarpati G. 14AP05-2
 Schaefer M.S. **BAPC-3**
 Schaper F. 06AP05-6
 Scheeren T. 01AP01-4
 Scheinin A. 01AP16-7
 Scheinin H. **01AP16-7**
 Scheinin M. 09AP02-9
 Scheller M. 13AP13-5
 Schena M. **02AP01-5**
 Schiffer E. 12AP01-1
 Schildhauer C. 06AP02-5
 Schiraldi R. 04AP03-2
 Schiza C. 11AP04-9
 Schlack W. 05AP01-2, 16AP01-9
 Schlensak C. 07AP03-1
 Schmitt H. 06AP03-3
 Schnaider V. 07AP07-2
 Schober P. 10AP01-2, 10AP01-5
 Schoettker P. 16AP06-10
 Schoorens D. 03AP07-2, 03AP07-3
 Schött U. 12AP01-4
 Schouten-Waisvisz A. **08AP02-2**
 Schranc Á. 07AP03-3
 Schreiberova J. 01AP09-3
 Schroedt J. 01AP10-3
 Schubert M. **07AP04-9**
 Schultz M.J. 11AP07-10
 Schulze L. 01AP14-5
 Schwarte L.A. 10AP01-2, 10AP01-5
 Schwartz B.A. **12AP02-7**
 Schwarz D. 04AP01-5
 Schweizer R. 07AP09-11
 Scricciu A. 08AP03-8
 Se Hee K. 09AP05-8

- Sedinkin V. **04AP08-8**
 Seeberger E. 07AP06-1
 Seguin P. 13AP01-1
 Seidel L. 02AP02-4
 Seidl C. 03AP09-1
 Seijas R. 12AP02-9
 Sekulić A. 06AP06-7
 Sela H.Y. 04AP07-1
 Selvan D. 04AP02-3
 Sen G. 01AP03-6
 Señas García L. 12AP03-3
 Senel H. 01AP03-9
 Seo J.H. **16AP06-9**
 Seo J.-H. 01AP09-4
 Seo K.-H. 01AP14-11
 Seo K.-S. **11AP06-3**
 SerafinoWani R.L. 14AP04-4
 Serchan P. **03AP09-9**, 12AP04-3
 Sergi P. 06AP03-11
 Sergi P.G. 06AP03-10
 Serralta F. **11AP07-7**
 Serrano Zueras C. **07AP06-2**, 07AP10-8
 Sert D.E. 07AP11-8
 Sethna N. 12AP02-5
 Sethuraman D. 02AP03-2
 Seung-Beom K. 03AP08-3
 Sevilla R. 10AP02-2
 Shah U. 05AP05-6
 Shainaaz Dooply S.S.L. 11AP03-3
 Shanmugasundaram P. 16AP08-6
 Sharp A. 10AP03-3
 Shaw C.P. 13AP11-4
 Shaw E. 14AP08-2
 Sheena Cherry B. 05AP03-3
 Sheppard S. 05AP06-2
 Shevtsova G. 07AP06-6, 09AP04-1, 09AP04-5, 09AP05-9
 Shi M. 01AP13-6
 Shi Y. 03AP03-5
 Shibata S.C. 07AP04-1, 07AP04-4
 Shifman E. **04AP02-2**, **04AP05-1**, **04AP05-6**
 Shih C.C. **06AP03-9**
 Shihurkar R. **04AP06-10**
 Shikata Y. 03AP07-4
 Shili A. 15AP02-2
 Shime N. 11AP04-7
 Shin H.W. 11AP08-8
 Shin I. 09AP02-8
 Shin I.-W. **07AP11-1**
 Shin W.J. 01AP15-2
 Shin Y.S. 01AP02-2
 Shindo K. 08AP03-5
 Shinoda M. 13AP13-3
 Shipolini A. 14AP04-4
 Shmigelskiy A. 06AP01-10
 Shmigelsky A. 06AP04-5
 Shono A. **11AP07-9**
 Shpata V. 03AP01-10, 03AP04-9
 Shunichi T. 01AP02-1
 Sidaras G. **02AP03-2**
 Sidhu V. 07AP08-2
 Siegenthaler N. 13AP04-1
 Sigdel S. **07AP04-8**
 Sigmundsson T.S. **11AP07-1**
 Sikiric P. 03AP03-3
 Siliotti R. 09AP01-6
 Silova A. 13AP02-5
 Silva A. 03AP02-10
 Silva C. 04AP04-6, 04AP04-11
 Silva D. 13AP04-5, **14AP01-1**, 14AP01-4, 14AP01-7, 14AP01-9, **14AP02-5**, 14AP02-8, 14AP06-10
 Silva E. 04AP08-9, 11AP05-2, 13AP10-6, 13AP10-7, 13AP10-8, 13AP10-9
 Silva M. 14AP03-2
 Silva R. 03AP08-5
 Silva Carballal I. 01AP06-4
 Silva Pinto J.M. 01AP06-3
 Silva-Costa T. **02AP02-5**
 Silvi M.B. 01AP03-4, 01AP08-2, 14AP02-10
 Silvia D.P. 06AP03-12
 Sim E. 14AP05-6
 Sim M.A. 13AP04-8
 Sim Y.E. 14AP06-9
 Simas J. 08AP05-2, 08AP07-2
 Simic D. **07AP10-8**
 Simic Silva D. 07AP06-2, 07AP12-7
 Simic-Ogrizovic S. 13AP03-5, 13AP06-6
 Simmons E. 02AP03-8
 Simões V. 03AP02-12
 Simon C. 07AP02-3, 07AP05-6
 Simón C. 07AP07-6, 07AP11-2
 Simonet T. 04AP04-2
 Sinbukhova E. **06AP01-10**
 Sindić A. 03AP03-3
 Sindou M. 06AP06-2
 Singh R.M. 11AP04-1
 Sinha R. 05AP04-6, 05AP06-4
 Siow M. 02AP03-7
 Sison R. 02AP01-6, 02AP03-1, 16AP07-2
 Sizemore D. 16AP05-6
 Sizov O. 01AP14-8
 Sizov V. 01AP01-2, **07AP12-1**
 Sjövall S. 09AP02-10
 Skhirtladze-Dworschak K. 13AP08-9
 Skudre A. 06AP04-3
 Slimani Y. 13AP05-7
 Slullitel A. 09AP02-3
 Smeenk H.F. 01AP12-9
 Smeets A.-S. 03AP07-1
 Smetkin A. 07AP09-3, 13AP01-8
 Smirnova N. 06AP05-2
 Smit K. **07AP05-1**
 Smith A. 14AP04-4
 Snygg J. 14AP10-10
 So K.Y. 01AP02-8, 01AP11-1, 01AP13-7
 Sobot Novakovic S. 07AP11-4
 Sobreira Fernandes D. 01AP12-5, 01AP12-6
 Soekarman D. 12AP01-9
 Soh C.R. 13AP04-8, 13AP06-5
 Sohn J.-T. 07AP11-1
 Solà J. 16AP06-10
 Solak H.E. 04AP02-4
 Solak M. 05AP05-1, 11AP01-10
 Solanki S.L. 01AP09-7
 Solar A. 03AP01-11
 Solares G. **03AP01-11**
 Soler E. 07AP06-7
 Solera Marín J. 13AP06-10, 14AP03-5
 Soliveres J. **02AP03-5**
 Somanath S. 14AP05-3
 Somboonviboon W. 06AP04-7
 Sommer B. 06AP03-3
 Son I. **13AP03-7**
 Song I.-K. **05AP06-9**
 Song J. 13AP12-6
 Song J.G. 01AP15-2, 16AP01-10
 Sonia B.K. 05AP01-1, 05AP02-3
 Sonzogni V. 05AP05-3
 Sook Young L. 01AP04-1, 15AP01-3
 Soral M. 02AP03-6
 Soro M. 11AP07-6, 11AP07-7
 Sousa A.M. 09AP02-3
 Sousa L. **03AP02-5**
 Sousa M. 11AP03-2, 14AP01-3, **14AP01-4**, 14AP01-7, 14AP01-9, 14AP02-8, **14AP02-9**, 14AP06-2, 14AP06-4
 Sousa Correia J. **08AP03-6**, 08AP06-7
 Souza Lopes R. 02AP01-7
 Souza Nogueira de Abreu L. 01AP05-6
 Soyly N.B. **11AP03-6**
 Spadaro S. 01AP15-3, 07AP02-5
 Spagnuolo M. 14AP05-2
 Spartinou A. **04AP07-3**, **12AP02-2**
 Spencer L. 04AP08-3, 14AP08-1
 Spennati V. **06AP06-12**, **13AP09-8**
 Sperna Weiland N.H. **01AP03-1**
 Spielmann N. 05AP06-1
 Spies C. 05AP06-11, 14AP03-4, 15AP01-1, 16AP02-4
 Spinoni A. 07AP06-5
 Spiritoso R. 14AP08-2
 Spranger J. 13AP04-3
 Squarcia M. 02AP01-3
 Srikantharajah I. 08AP06-8
 Sriraj W. 16AP03-8
 Sriswasdi P. **BAPC-2**
 Staber M. 03AP09-2
 Stachtari C. 08AP07-7
 Stakanov A. 13AP11-7
 Stalla-Bourdillon A. 01AP05-1
 Stambolija V. 12AP05-7
 Stamer U.M. 08AP06-3
 Stamov V.I. **11AP06-5**
 Stanciu O. 07AP06-9
 Stanculescu E.-L. **13AP08-2**
 Stankunaite J. 01AP15-9
 Steer N. 12AP04-1
 Stefan M. **07AP11-10**, 13AP04-9
 Stefanakis G. 04AP07-3
 Stefani L.C. **16AP03-9**
 Steib A. 07AP01-6
 Steinfath M. 06AP02-5
 Stelea G. 13AP05-6
 Stenqvist O. 01AP05-8
 Stepanovs J. 06AP04-3, 12AP01-5, **12AP01-7**
 Stergiannis P. 01AP14-2
 Stessel B. 02AP02-9, 03AP07-2, 03AP07-3, 03AP10-3, 05AP06-10
 Stevens J. 17AP02-4
 Stevens M. 05AP01-2
 Stöckle P.-A. **01AP09-6**
 Stojanović Stipić S. **05AP02-7**, **05AP07-6**
 Stojeba N. 06AP03-8
 Stolker R.J. 08AP03-2
 Stoppe C. 13AP06-1
 Storm B. **04AP06-6**
 Storti G. 01AP08-2
 Stosic M. 05AP04-3, 06AP04-2
 Stott M. 14AP06-11
 Stourac P. **04AP01-5**, 05AP03-6, 14AP05-8
 Strandberg K. 12AP01-4
 Stratakos G. 11AP05-8
 Stratsiani A. 13AP12-8
 Strauss I. 06AP05-8
 Stremaityte V. 16AP01-8
 Stroem C. 05AP07-2
 Strøm C. 05AP07-1
 Struys M. 06AP01-11
 Struys M.M.R.F. 01AP07-4, 01AP16-8, 16AP06-3
 Struys M.M. 01AP15-1
 Stüber F. 08AP06-3
 Stueber F. 16AP04-2
 Sturce R. 03AP01-5
 Štourač P. 05AP03-6, 14AP05-8
 Sturiale C. 06AP06-9
 Suarez D.C. **07AP02-10**
 Suarez Sipmann F. 11AP07-1
 Subaşı F.D. 01AP13-9
 Subash F. 17AP02-4
 Subbotin V. 01AP01-2, 01AP10-9, 16AP07-4
 Subramanian R. 05AP04-6
 Sud A. 04AP02-3, 12AP02-1

- Sudy R. 01AP05-4, 11AP07-8
 Südy R. **07AP03-3**
 Sueli Pinheiro Módolo N. 08AP01-1
 Süer Kaya G. 07AP03-10
 Suero O. **11AP05-6**
 Sugawara A. **01AP13-1**
 Sugimoto M. **09AP03-12**
 Sugimura Y. 09AP03-12
 Sugiura A. 06AP02-9
 Sugiyama T. **08AP03-5**
 Sugiyama Y. **01AP09-8**, 06AP02-7,
 09AP02-4
 SuHyun S. 01AP04-1
 Suhyun S. 15AP01-3
 Sula H. 03AP04-9, 16AP02-7
 Sulaj E. 13AP08-8
 Sumioka H. 09AP04-4
 Sun H.S. 01AP04-3
 Sundara Rajan R. 04AP06-5, 11AP02-7
 Sung T.-Y. **01AP02-2**, 01AP02-3
 Sun-Joon B. **14AP10-6**
 Susano M.J. 16AP03-10, 16AP04-6
 Susnjar S. 03AP08-2
 Sut N. 04AP06-7, 11AP08-10
 Suto T. 09AP01-4
 Suton P. **16AP02-9**, 16AP04-10
 Suzuki K. **11AP04-7**
 Suzuki T. **01AP01-1**, 01AP08-3
 Svraka D. 07AP11-4, 16AP07-11
 Swinnen W. **16AP08-1**, 16AP08-3,
 17AP01-5
 Syrogianni P. 14AP03-11, 14AP05-4
 Szabo R. 11AP08-9
 Szabó Z. 14AP09-7
 Székely A. 05AP07-11, 17AP01-3
 Szturzová K. **05AP03-6**
- T**
 Taşkınalp O. 11AP08-10
 Taboada Muñiz M. 13AP01-7
 Tabur Z. 01AP11-8
 Taccone F.S. 06AP03-1
 Tachi K. **03AP05-9**
 Tadeu Bueno Costa C. 11AP02-5
 Tadros S.-P. 07AP01-1
 Taenaka H. **07AP04-4**
 Taghouthi S. 04AP01-10
 Taharabaru S. 01AP07-2, **01AP07-3**
 Tajima K. 03AP06-1
 Takada M. 15AP02-3
 Takada T. 01AP08-3
 Takagi S. 04AP08-1
 Takahashi H. 01AP08-3
 Takahashi Y. 09AP03-8, 09AP03-12
 Takaki S. 07AP02-8, 07AP07-5, 13AP02-3,
 13AP07-2
 Takashina M. 01AP07-6
 Takayama W. 07AP06-3
 Takeda A. 01AP04-2
 Takeda M. 11AP05-7
 Takeuchi M. 07AP01-2
 Talla G. 02AP02-4
 Tamada N. 13AP02-8
 Tamburri-Bariain R. 10AP03-1
 Tamhane P. 04AP05-10
 Tamion F. 13AP13-6
 Tamura T. **07AP01-2**
 Tan D.J.A. 14AP05-6
 Tan P.-H. **09AP03-6**
 Tan T.E. 14AP03-10
 Tan Y. **11AP03-10**
 Tanabe K. 09AP02-4
 Tanabe Y. 11AP04-7
 Tanaka K. **03AP03-2**, **03AP07-4**
 Tanaka M. 01AP04-8, 01AP13-3,
 03AP05-9, 03AP06-1, 09AP04-2
 Tanaka S. 01AP09-8, 08AP03-5
 Tanaka Y. 01AP12-11
 Tanimura H. **14AP04-7**
 Tapala S. 16AP04-10
 Tapia B. 16AP05-4
 Tarabrin O. **12AP04-5**, **12AP05-5**
 Tarabrin P. 12AP04-5, 12AP05-5
 Tarraga Honrubia C. **01AP05-9**
 Tarraga Honrubia C. 03AP10-9
 Tateiwa H. **09AP01-1**
 Tatsina E. 13AP12-8, 13AP13-2
 Tavares F. 03AP02-3, **11AP02-8**,
 12AP03-5
 Tavares J. 14AP01-1
 Taymur I. 01AP06-1
 Tébar Cuesta M.I. **04AP06-8**
 Teis Soley A. 07AP04-7
 Teixeira I. 14AP02-1
 Teixeira J. 02AP01-9, **10AP01-1**
 Teixeira J.C. 11AP05-3
 Teixeira M.J. 11AP02-8
 Teles A.R. **14AP02-1**, **14AP05-9**
 Telles M. 14AP01-8
 Tempra E. 03AP06-7
 Ten Hagen A. 08AP02-2
 Teney C. **01AP14-9**
 Teodora N. **07AP08-9**
 Terada T. 01AP03-3
 Terao Y. **03AP06-5**
 Tere V. 06AP04-5
 Terra dos Santos Rossito C. 09AP02-3
 Terracina S. **06AP03-10**
 Terradillos E. **13AP11-9**, 17AP02-6
 Terrasa S.A. 01AP02-7
 Teunissen A.J.W. 08AP03-2
 Teunkens A. 08AP04-1
 Thalmann G. 12AP03-1, 14AP01-2
 Tham Y.Y.S. 13AP06-5
 Theiler L. 02AP01-5, 03AP09-1,
 16AP07-8, 16AP08-7, 17AP02-7
 Theissen A. **02AP02-1**, **16AP03-7**
 Thiel B. 14AP07-3, 14AP10-2
 Thienpont E. 08AP06-1
 Thomas O. **12AP01-4**
 Thompson M. 03AP05-11
 Thongsukh V. **11AP06-9**
 Thorarinsdottir H. 13AP13-1
 Thoresen M. 13AP08-3
 Thornton P. 04AP04-9
 Thygesen L.C. 13AP04-10
 Ti L.K. 07AP04-2, 13AP04-8
 Tiberghien N. 05AP06-3, 13AP07-3
 Tikhova G. 04AP02-2, 04AP05-1,
 04AP05-6
 Tilli I. 09AP02-9
 Tincu I. 13AP02-6
 Tincu R. **13AP02-6**
 Ting C.K. 14AP10-7
 Ting C.-K. **03AP09-3**
 Tingay D. 05AP06-2
 Tisner Madrid M. 16AP08-2
 Toda S. 07AP03-11
 Toda Y. 07AP11-9
 Todde C. 04AP03-3, 04AP05-7
 Tofani L. 13AP05-3
 Tojo K. **13AP02-8**
 Tokar I. 15AP02-6
 Tokinaga Y. 04AP07-6
 Tokuda K. 01AP03-2
 Tokuwaka J. 03AP05-9
 Tollinche L. **16AP08-4**
 Tolnai J. 11AP07-8
 Tomescu D. 12AP01-3
 Tominaga K. 07AP03-11
 Tominaga S. 03AP06-5
 Tomita A. 07AP01-8, **07AP07-10**,
 07AP08-8
 Tore Altun G. **02AP03-6**
 Toriumi T. 11AP04-8
 Torres M.L.A. 05AP03-5
 Torres S. **11AP03-2**
 Torres Dios J.A. 14AP03-5
 Torres Dios J.Á. **12AP05-6**
 Torres Rodriguez D. 13AP01-7
 Torres-Caño N. 06AP04-8
 Toshiyuki H. 14AP07-5
 Toskovic B. 13AP03-5, 13AP06-6
 Ťoukálková M. 05AP03-6
 Tourais I. 08AP06-6, 13AP10-7, 13AP10-8,
 13AP10-9
 Toyama E. 07AP03-11
 Toyota K. 07AP01-3, **07AP01-8**,
 07AP07-10, 07AP08-8
 Trabulo A. 01AP08-8, **11AP05-3**
 Tranberg A. **13AP13-1**
 Trancá S. 11AP08-9
 Traskaite V. 01AP15-9
 Trejo Velasco B. 07AP06-10
 Tremback N. **14AP02-4**
 Trepénaitis D. 01AP15-9
 Treschan T.A. BAPC-3
 Treskatsch S. 15AP01-1
 Tri N. 02AP02-1
 Triki H. 13AP08-11
 Trikoupi A. 08AP07-7
 Trillo L. 08AP05-1, 08AP05-3
 Trindade H. 03AP08-5, 05AP04-7
 Trinidad Martín-Arroyo R. 09AP02-1
 Troisi R. 01AP14-10
 Trombi G. 04AP08-4
 Trujillo Estévez J. 12AP05-6
 Trummer F. 17AP02-9
 Truong H.-N. **08AP03-3**
 Tsagaraki G. 04AP07-3
 Tsai Y.-C. 01AP04-3
 Tsao C.-M. **13AP03-2**
 Tse J. **02AP01-6**, **02AP03-1**, **05AP05-6**,
16AP07-2
 Tseng A.C.-C. **01AP04-3**
 Tsinari K. 08AP07-8, 11AP04-9,
 11AP05-10
 Tsitskari M. 14AP09-12
 Tsou M.Y. 14AP10-7
 Tsuji S. 13AP02-3
 Tsujikawa S. 01AP13-2
 Tsukamoto M. **16AP02-5**
 Tsung Ta W. 14AP08-11
 Tsuuchi Y. **10AP03-7**
 Tuchinda L. 06AP04-7
 Tumkur Nagendra G. **16AP07-10**
 Tuncbilek G. 05AP04-1
 Ture H. **06AP01-5**
 Ture U. 06AP01-5
 Turegano F. 17AP02-6
 Türkyılmaz N. 05AP05-1
 Turna C. 11AP01-10
 Tusman G. 05AP06-8
 Tzima M. 03AP09-9
- U**
 Ubré M. BAPC-1
 Ubre Lorenzo M. 14AP05-11
 Uchida M. **08AP05-11**
 Uchiide Y. 06AP05-4
 Uchimoto K. 01AP16-4
 Uchino H. 13AP12-3
 Uchiyama A. 07AP04-1
 Udodi N. 02AP03-1
 Umezaki K. **11AP03-1**
 Unal H. **03AP06-2**
 Uoshima N. 13AP12-3
 Urabe S. 03AP06-5
 Urbanec R. 14AP05-8

Urli T. **06AP06-9**
 Urrutia G. 12AP01-2
 Usachev D. 06AP04-5
 Ushakov A. 07AP09-3, 13AP01-8
 Ushakov I. 04AP06-9
 Usúa G. 10AP03-3
 Usui Y. 09AP02-4
 Utariani A. 03AP02-11
 Utsumi I. 11AP05-7
 Uusalo P. **09AP02-9**
 Uwimpuhwe G. 01AP11-5
 Üzümcügil F. **06AP06-1**

V

Valeanu L. 07AP11-10, **13AP04-9**
 Valencia L. 14AP10-4
 Valente E. 14AP02-7, 16AP04-3
 Valenti F. 04AP03-3, 04AP05-7
 Valero R. 02AP01-3
 Valero Gómez M. 13AP13-4
 Valgimigli F. 13AP09-8
 Valle A. 03AP02-1, 14AP07-1
 Vallés J. 07AP06-7
 Vallès J. 02AP02-5
 Valli K. 01AP16-7
 Valls Serral A. 07AP06-10
 Van Biesen S. 17AP01-5
 Van de Velde M. 01AP11-5, 08AP04-1
 Van Deenen D. 05AP01-4
 Van der Harst E. 08AP03-2
 Van der Laenen M. 13AP01-4
 Van der Linden P. 01AP10-8, 12AP02-3, 14AP06-5
 Van Der Linden P. 05AP01-4
 Van Dyck M. 01AP14-9, 07AP09-6
 Van Gerven E. **01AP14-1**
 Van Hecke D. **03AP09-7**
 Van Herzelee I. 17AP01-7, 17AP01-8
 Van Kranen-Mastenbroek V. 06AP05-6
 Van Limmen J. 01AP14-10
 Van Obbergh L. 01AP10-5, 01AP10-8, 03AP09-7, 06AP03-5, 07AP09-1, 08AP03-3, 14AP06-5
 Van Ooteghem M. **07AP03-4**
 Van Rooijen T. 14AP07-3
 Van Steen S. 14AP10-2
 Van Turenhout E.C. **10AP01-5**
 Van Vliet M. 14AP07-3
 Van Zundert A. 06AP05-6
 Vanags I. 04AP03-8, 06AP04-3, 12AP01-7, 13AP02-5
 Vandekerckhove K. 07AP03-4
 Vandenbosch T. **01AP03-7**
 Vander Laenen M. 10AP02-7
 Vanderspikken X. **10AP02-7**
 Vanhulle L. **01AP14-10**
 Vanlinthout L. 01AP11-5
 Vanoverschelde H. 01AP01-4
 Vaquero Roncero L.M. 16AP06-5
 Vara E. 07AP02-3, 07AP05-6, 07AP07-6, 07AP11-2
 Varela J.A. **01AP06-6**, 17AP02-6
 Varela O. 10AP02-2
 Varela Cabo J.A. **07AP10-2**
 Varela Durán M. **13AP13-4**
 Vargas Berenjano C.A. **09AP02-1**
 Vargas Fajardo M.D.C. 04AP07-8
 Vargas Muñoz A.M. **10AP01-3**, 10AP01-4
 Varvarin V. 07AP12-5
 Vasconcelos L. 16AP03-10
 Vasilevskis E. 04AP03-8
 Vasquez M. 03AP03-6, 03AP10-5
 Vaz S. 05AP04-8
 Vaz T. 07AP01-9
 Vázquez Antas M. **07AP06-9**
 Veber B. 13AP07-8

Veelo D.P. 01AP10-4
 Veiga M. **07AP06-10**
 Velasco Lopez E. 16AP02-11, 16AP07-3
 Velev B. 13AP01-9
 Velghe A. 17AP01-7, 17AP01-8
 Venkatraghavan L. 06AP01-3, 14AP08-6
 Verbeke N. **05AP06-10**
 Verçosa N. 15AP01-4
 Verdonck O. 01AP09-6
 Vereecke H.E.M. 01AP07-4, 01AP16-8
 Verjus C. 16AP06-10
 Verri M. 07AP02-5
 Veterini A.S. **03AP02-11**
 Viader I. 10AP01-3
 Viader Barraca I.C. 10AP01-4
 Viana I. 03AP02-5
 Vicente Fernandez P. 03AP05-6
 Vicente Guillén R. 13AP11-11
 Vicente-Fernández P. 06AP04-8, 14AP07-6
 Vichitpaisal P. 16AP02-9
 Vichitvejpaisal P. 16AP04-10, 17AP02-3
 Vico M. 14AP08-5
 Vidal P-P. 01AP07-11
 Vidal Seoane M. **01AP06-4**, 13AP04-12, 13AP05-8, **13AP05-9**, 13AP09-5
 Videla S. 08AP01-7
 Vidgeon S. 13AP04-11
 Vieira A. 11AP01-8
 Vieira D. 03AP02-4
 Vieira J. 08AP04-4
 Viejo A. 12AP03-7
 Viejo Llorente A. 05AP04-2, 12AP05-3
 Vienne M. **07AP01-6**
 Vigh E. 01AP05-4
 Vilà E. 06AP04-6
 Vila Montañes M. 03AP05-2, 11AP07-10
 Vila Montañes M. 11AP05-4, **14AP06-3**
 Vilchez Monge A.L. 01AP11-10, 14AP08-8
 Vilke A. 03AP01-7
 Villa G. 13AP05-3
 Villagrasa A. 14AP01-1
 Villahoz Martinez J. 14AP07-10
 Villarino Villa L. 12AP03-3
 Villena A. **11AP07-6**
 Vinel C. 14AP04-1
 Vingerhoets G. 01AP16-3
 Vinnikov V. 13AP10-1, 13AP10-2
 Viola F. **12AP04-2**
 Viquesnel G. 11AP02-9
 Virot C. 09AP03-4, 09AP04-3
 Viso H. 12AP04-9
 Vivek K. 05AP04-4
 Vives M. **11AP06-7**, 14AP09-8
 Vives R. 14AP07-1
 Vives Santacana M. 10AP01-7
 Vivien B. 10AP02-6, 10AP03-5, 13AP02-10, 13AP05-1
 Vivona L. BAPC-4, 11AP07-5
 Vjugins J. 06AP04-3
 Vlad C. 08AP01-11
 Vlainic J. 03AP03-3
 Vojinović Golubović V. 01AP01-7
 Volchikov V. **01AP14-8**, **14AP09-10**
 Volchkova E. 01AP14-8, 14AP09-10
 Volkov O. 04AP08-8
 Volodychev D. 12AP04-5, 12AP05-5
 Volta C.A. 01AP15-3, 07AP02-5, 07AP02-7, 07AP07-1
 Vorokhta Y. 15AP02-6
 Vorotyntsev S. **16AP06-2**
 Vranas D. 12AP04-8
 Vranken D. **03AP07-2**
 Vymazal T. 14AP05-8

W

Wael S. 16AP07-7
 Wagner J.Y. **01AP01-3**
 Wainwright K. **16AP04-5**
 Walker J.D. 11AP07-3
 Walters H. 16AP02-12
 Wang B. 01AP13-8
 Wang C.-H. 01AP11-6
 Wang F. **14AP03-9**
 Wang J. 01AP04-3
 Wang K.F. **07AP12-10**, 16AP07-12
 Wang L.K. 16AP07-12
 Wang M.-L. 07AP02-6
 Wang Q. 06AP02-3
 Wang R. **11AP07-11**
 Wang S.J. 09AP03-11
 Ward E. 13AP01-4
 Warfield Jr. D. 02AP01-6
 Watabe A. 09AP03-12
 Watanabe S. 09AP05-1
 Watanabe Y. 16AP04-9
 Wataru T. 07AP09-4
 Watremez C. 07AP04-9, 07AP06-8, 07AP09-6
 Weber N.C. 07AP05-1
 Weber T.P. 13AP10-1, 13AP10-2
 Weber-Carstens S. 13AP04-3, 14AP03-4
 Wegmann A. 17AP02-7
 Weidinger C. **06AP03-3**
 Weinger C. 04AP03-1
 Weiniger C. 03AP01-4, **04AP02-1**, 04AP03-10, **04AP07-1**
 Weiniger C.F. 04AP01-1, 04AP01-3
 Weinmann C. 08AP02-7, 08AP02-8
 Weinstein J. **16AP01-11**
 Weiss B. 15AP01-1
 Weiss M. 05AP06-1
 Weissman C. 03AP01-4, 16AP03-3
 Weixing L. 16AP07-9
 Wellstead G. **14AP07-2**
 Wenling Z. 07AP05-11
 Werawatganon T. 16AP03-8
 Wickham A. **14AP06-6**
 Wicks P. 07AP04-6
 Wig J. 01AP09-7
 Wijesuriya S. **11AP02-3**
 Wijnberge M. **01AP10-4**
 Willems A. 05AP01-4
 Willems H. **07AP09-2**
 Williams D. 11AP04-2
 Williams D.J. **01AP10-1**, **03AP09-4**, **11AP07-3**
 Wilson C. 03AP08-1
 Windsor J. 04AP07-7
 Winegar D. 12AP04-2
 Wipf T. 07AP01-6
 Wittmann M. **04AP04-3**
 Wolf B. 01AP14-5, 01AP14-6
 Wolff A. 16AP05-7
 Wollersheim T. **13AP04-3**, **14AP03-4**, 16AP02-4
 Wong H. 13AP08-4
 Wong J. **07AP01-11**, **07AP04-6**, **07AP11-7**
 Wong P. 11AP03-10
 Wong T. 11AP03-10
 Wong T.M. **14AP09-11**
 Wong W.E.J. 13AP04-8, **13AP06-5**
 Wong Y.L. 13AP08-4
 Woo M.-S. 07AP11-1
 Wouters P. 01AP01-11, 01AP03-7
 Wroblewski L. **17AP01-1**
 Wróblewski K. 08AP05-10
 Wu C.-C. 13AP03-2
 Wu C.Y. 06AP03-9, **07AP02-6**, 14AP08-11

Wu C.-Y. 01AP03-8
 Wu R.S.-C. **01AP13-11**
 Wu S.-C. 01AP11-6, 16AP07-1
 Wu S.Z. 16AP07-12
 Wu W. 09AP03-7
 Wu W.Z. 14AP03-9
 Wu Y.-H. 01AP04-3
 Wuethrich P. **01AP15-5, 12AP03-1, 14AP01-2**
 Wyffels P. 01AP01-11, 01AP03-7

X

Xambre F. 16AP04-6
 Xavier J. 03AP10-7
 Xu Z. **16AP07-9**

Y

Yıldırım S. 11AP04-6
 Yılmaz A. 11AP08-10
 Yılmaz C. **01AP11-8**
 Yağar S. **07AP03-10**
 Yabuki-Kawase A. 09AP03-5
 Yagmur Ateser R. **01AP13-9**
 Yahagi M. **01AP04-8**
 Ya-Jung C. 07AP12-8
 Yakirevich N. 04AP07-1
 Yakovlev R. 08AP07-1
 Yalın M.R. 11AP04-3
 Yamada M. 06AP02-7
 Yamaguchi O. 13AP02-3, 13AP07-2
 Yamaguchi S. 09AP02-4
 Yamaguchi Y. 13AP02-3
 Yamak E. 04AP06-7
 Yamakage M. 04AP07-6
 Yamakova Y. 13AP01-9
 Yamamoto N. 07AP02-8, **07AP07-5**
 Yamamoto S. **09AP03-8**
 Yamamoto Y. 05AP01-3
 Yamashita S. 07AP01-8, 07AP07-10, 07AP08-8
 Yamaura K. 07AP03-11
 Yamazaki M. 13AP13-3
 Yan S.H. **14AP08-11**
 Yanik H.S. 01AP13-9
 Yanagita K. 01AP04-2
 Yañez A. 13AP05-9
 Yang G. 01AP16-10
 Yang H. 01AP02-10
 Yang H.S. 01AP02-2, **01AP02-3, 16AP01-10**
 Yang H.-S. 01AP02-4
 Yang J. 01AP13-8, 02AP03-4
 Yang L. 01AP13-8
 Yassen K. **12AP04-7, 14AP04-2, 14AP04-5**

Yassien K. 13AP13-8
 Yatabe T. **04AP02-11, 07AP01-2, 14AP03-8**
 Yavuz P. **05AP07-9**
 Yeo S.H.L. 14AP09-11
 Ygropoulou O. 13AP07-5, 13AP12-8, 13AP13-2
 Yi J.-W. 09AP03-10
 Yifat H. **15AP01-2**
 Yildirim Guclu C. 06AP04-4
 Yilmaz C. **01AP06-1, 04AP02-4, 08AP03-9**
 Yin H. 11AP07-11
 Yoji S. 11AP07-9
 Yokoyama M. 04AP02-11, 07AP01-2, 09AP01-1, 14AP03-8
 Yokoyama T. 16AP02-5
 Yon J. **07AP08-10**
 Yong D.W.W. **07AP04-2**
 Yong J.K. **13AP04-8**
 Yong K.J. 13AP06-5
 Yonghai Z. 03AP03-1
 Yoo J.H. 14AP10-9
 Yoon J.P. **09AP05-2**
 Yoon M.H. **09AP03-3**
 Yoon S. 01AP09-4
 Yörükoğlu D. 06AP06-3
 Yorukoglu D. 06AP01-2, 06AP04-4
 Yoshida T. **09AP05-1**
 Yoshimura M. 11AP04-8
 Yoshimura N. **09AP02-4**
 Yoshimura T. 16AP04-9
 Yoshioka Y. 09AP04-4
 Yoshitani K. 07AP03-5
 Yoshiyama Y. 01AP09-8
 Young P. 16AP02-12, **16AP04-8**
 Youssef H. 04AP05-9
 Youssef M. **13AP13-8**
 Yu H. 06AP02-2, 06AP02-3
 Yu S. **07AP05-11**
 Yuan H.-B. **04AP04-5**
 Yuexin Z. 16AP07-9
 Yukiko T. 14AP07-5
 Yuksek N. 08AP04-6
 Yuwappattanawong K. **06AP04-7**

Z

Zaballos J. 11AP01-5
 Zaballos M. 10AP02-2, 11AP01-5, 11AP01-9, 13AP11-9
 Zaballos Garcia M. 13AP06-8
 Zabolotskikh I. **08AP06-4, 13AP11-7, 14AP02-4**
 Zadro R. 12AP05-7
 Zagorulko O. 07AP06-6, 09AP04-1, **09AP04-5, 09AP05-9**
 Zahn P.K. 01AP14-5, 01AP14-6, 03AP07-6
 Zaimi D. 03AP09-9
 Zancajo Torrecillas J.J. 10AP01-4
 Zanello M. 06AP03-11, 06AP04-9, 06AP06-9
 Zangari R. 10AP01-6
 Zangrillo A. 07AP02-4
 Zapatero S. 01AP15-7
 Zarzava E. 08AP07-7
 Zarzuela Nuñez E. 04AP06-8
 Zavackiene A. 04AP03-6
 Zavridis P. **14AP09-12**
 Zekri M.-L. 02AP03-9
 Zeng L.A. 01AP06-5
 Zgaia A.O. **08AP01-11**
 Zhang K. 04AP08-1
 Zhang S. BAPC-6
 Zhang W. 01AP13-8
 Zhang W.S. 03AP03-5
 Zhang X. 13AP07-4
 Zhao W. **01AP13-8**
 Zhao W.L. **03AP03-5**
 Zheng M. 14AP03-9
 Zheng Z. 14AP03-9
 Zhidkov I. 09AP02-2
 Zhikharev V. **07AP07-8**
 Zhou C. 09AP03-2
 Zhou J. 14AP04-9
 Zhu J. 14AP03-9
 Zhu T. 06AP02-2
 Zhurda T. **03AP01-5**
 Zimlichman E. 16AP01-11
 Zitta K. **06AP02-5**
 Zivanovic-Posilovic G. **03AP03-3**
 Zmajević Schonwald M. 06AP05-3, 06AP05-10
 Zotos N. 13AP12-8, 13AP13-2
 Zubek L. 10AP02-5
 Zubizarreta N. 14AP07-7
 Zugaro A. 13AP07-9
 Zupancic Salek S. 12AP05-7
 Zurera Plaza N. 04AP06-8
 Zurita S. 09AP05-4, 12AP03-7
 Zuurbier C.J. 07AP05-10
 Zwisler S. 10AP03-9
 Zyzak K. 08AP05-10

02 - 04 June
Copenhagen,
Denmark



2018
Euroanaesthesia
Where Anaesthesiologists Meet