ISSN 0265-0215

EJA

European Journal of Anaesthesiology

Volume 26 Supplement 45 2009

Euroanaesthesia 2009

The European Anaesthesiology Congress

Abstract Programme

Milan, Italy, June 6 – 9, 2009

European Society of Anaesthesiology

ESA

Wolters Kluwer Health | Lippincott Williams & Wilkins

European Journal of Anaesthesiology
Volume **26**, Supplement 45, 2009

Abstracts and Programme

EUROANAESTHESIA 2009

The European Anaesthesiology Congress

Milan, Italy,
6–9 June 2009

Wolters Kluwer Health | Lippincott Williams & Wilkins

European Journal of Anaesthesiology

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 Lippincott Williams & Wilkins 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 1550, Hagerstown, MD 21741.

Business offices are located at 530 Walnut Street, Philadelphia, PA 19106-3621, USA.

All correspondence should be addressed to the Editorial Office: European Journal of Anaesthesiology, Lippincott Williams & Wilkins, 250 Waterloo Road, London, SE1 8RD, UK
Publisher Ian Burgess
Editorial Coordinator Anna Rutkowska
Production Editor Magda Lewandowska

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

Advertising enquiries Dick Bower, tel: +44 (0) 20 8542 3200; fax: +44 (0) 20 8543 3810; dick.bower@btinternet.com

Commercial reprints enquiries
iain.spray@wolterskluwer.com; ben.franks@wolterskluwer.com

Supplement Enquiries
bridie.reilly@wolterskluwer.com

2009 Subscription rates
Individual $346 (USA); $358 (Rest of the World). Institutional $1,381 (USA); $1,478 (Rest of the World). On-line only subscriptions for Institutions are available through Ovid (www.ovid.com).
Prices do not include 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. Lippincott Williams & Wilkins' GST Identification Number is 130876246.) Prices include packing and postage by accelerated surface post to subscribers outside the UK. Please add $26.00 for Airfreight (airfreight delivery usually occurs within 7 to 21 days). 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, Lippincott Williams & Wilkins, 16522 Hunters Green Parkway, Hagerstown, MD 21740-2116, USA, tel: + 1 301 223 2300; fax: + 1 301 223 2320. In the USA, call toll-free on 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 2009

The European Anaesthesiology Congress

Milan, Italy, 6–9 June 2009

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 and the 'Best Abstracts - Runner-up Session 1 & 2). 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 for 45 minutes before and 30 minutes after their session, to address further questions.

Poster Board location

All posters of regular abstract sessions will be displayed **in Hall A**. Each abstract presentation session is displayed in a different poster board row. Rows are numbered, to easily locate a given session. The first board of each row contains an information board that lists the session reference, date, time and chairperson(s).

Note: all abstract session details in this Supplement are correct at the time of printing. Session data displayed on the information boards, in particular chairperson names, may be more up to date.

Note that the Best Abstract Prize Competition (BAPC), with session reference ESAPC1, takes place in Room Yellow 3, as do the 'Best Abstracts - Runner-up Session 1' and the 'Best Abstracts - Runner-up Session 2'. The posters of these 'best' abstracts, however, will also be on display in Hall A for the duration of the congress.

Locating an abstract

The accepted abstract number format consists of the session reference, followed by a number denoting the order of the abstract within this session: for example, session **6AP1** would be the first (**1**) **A**bstract **P**resentation (**AP**) session for subcommittee **6**). The first abstract to be presented in session 6AP1 will thus be called **6AP1-1**, the second one **6AP1-2** and so on. (There may be omissions in the numbering due to withdrawn abstracts.)

To locate abstract 6AP1-2 or other abstracts for session 6AP1, look for the session reference (6AP1) in the schedule listed below, then browse to the appropriate page number, which always refers to the page number of the first abstract within the specified session.

The number of the poster board row is indicated for each session. To find the poster board for abstract 6AP1-2, go to the poster board row indicated for session 6AP1 (on the day of presentation), then look for the poster board with number two indicated at the top.

Call for abstracts

The ESA solicits the submission of abstracts for the
Euroanaesthesia 2010 Congress
Helsinki, Finland
12-15 June 2010

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

The submission module will be available to submitters from November 1st to December 15th 2009

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)

ESAPC1-1

Anaesthetic technique and breast cancer cellular proliferation, migration and invasion

C. Deegan, D. Murray, P. Doran, D. Moriarty, D. Buggy

Anaesthesia and Intensive care Medicine, Mater Misericordiae University Hospital, Dublin, Ireland

Background and Goal of Study: Breast cancer is the most common malignancy in women, and metastatic recurrence is the main cause of breast cancer-related deaths.[1] Tumour cell proliferation, migration and invasion are crucial steps in the metastatic process.[2] Surgery remains the primary and most effective treatment. However, a number of perioperative factors, including general anaesthesia, opioid analgesia and pain, adversely affect immune function, thereby increasing the risk of metastasis. Regional anaesthesia-analgesia attenuates perioperative immunosuppression. This study investigates the effect of anaesthetic technique on breast cancer cell function *in vitro*.

Materials and Methods: Primary breast cancer surgery patients (n = 22) were randomised to receive either propofol/paravertebral anaesthesia and paravertebral analgesia (Propofol/Paravertebral) (n = 11) or sevoflurane general anaesthesia with opioid analgesia (Sevoflurane/Opioid) (n = 11). The oestrogen-receptor negative MDA-MB-231 cell line was treated with patient serum from both Propofol/Paravertebral and Sevoflurane/Opioid groups, and the effects on cell proliferation (as measured by MTS assay), migration (wound closure assay) and invasion (matrigel invasion assay) were assessed.

Results and Discussion: Treatment groups were well balanced for age, weight, surgical procedure, and cancer pathology. Pain scores were lower at 1 and 2 hrs with paravertebral analgesia than with morphine, but were similar at 24 hours. Total opioid consumption was significantly lower in the Propofol/Paravertebral group. Compared with preoperative values, proliferation of MDA-MB-231 cells treated with postoperative patient serum at 10% concentration from the Propofol/Paravertebral group was significantly reduced compared to the Sevoflurane/Opioid group (–24% vs 73%, p = 0.01). There was no significant change in MDA-MB-231 cell migration or invasion following treatment with patient serum between the two groups.

Conclusion(s): Combined propofol/paravertebral anaesthesia with paravertebral analgesia for primary breast cancer surgery reduces proliferation of MDA-MB-231 cells *in vitro*. By suppressing this crucial step in the metastatic process, regional anaesthesia and analgesia may reduce the risk of metastases and recurrence *in vivo*.

References:

1 Jemal A, Siegel R, Ward E, Murray T, Xu J, Thun MJ: Cancer statistics, 2007. CA Cancer J Clin 2007; 57(1): 43–66.

2 Fidler IJ: The pathogenesis of cancer metastasis: the 'seed and soil' hypothesis revisited. Nature Rev Cancer 2003; 3: 453–458.

ESAPC1-2

Propofol regulates clustering of perinuclear $GABA_A$ receptors in cortical neurons

C. Eintrei, D. Turina, V. Loitto, K. Björnström, T. Sundquist

Anesthesiology and Intensive care, Faculty of Health Sciences, linköping, Sweden

Background and Goal of Study: The molecular mechanism behind clinical anaesthesia has engaged researchers for more than 150 years. We hypothesized that propofol decreases neural activity by moving of the $GABA_A$ receptor from the cell surface inwards and thereby interfering in the signal pathway.

Materials and Methods: In this study, primary cell cultures from newborn rat brains were used. The cell cultures were exposed to propofol in a time response experiment of propofol or the vehicle Intralipid®. The cell cultures were treated with propofol (3 $\mu g \cdot ml^{-1}$) in calcium medium in a time/response study (0.5–35 min) and in a wash out study when propofol was washed away. We used fluorescent-tagged antibodies against $GABA_A$ receptor ß-subunit. The amount of clustering of $GABA_A$ receptors were counted in the perinuclear area using a fluorescent microscope.

Results and Discussion: Propofol caused stimulation of an increase of neurons with perinuclear $GABA_A$ receptor clustering compared to control (39 ± 1% vs.10 ± 2%, $p < 0.01$) after 2 min. This increase persisted for 4 min and returned to the initial state after 20 min. Intralipid® did not cause any change in the distribution of $GABA_A$ receptors. When propofol was washed out by calcium medium, the perinuclear clustering returned to the initial state ($p < 0.05$).

Conclusion(s): Propofol caused a rapid and reversible increase in perinuclerar $GABA_A$ receptors in cortical neurons, as an early step in propofol's intracellular signal pathway. Clustering of $GABA_A$ receptors in the perinuclear area decreases the threshold of action potential of the cell membrane. The $GABA_A$ receptor clustering leads to inhibition of action potentials and the neural transmission also decreases. The effect of this inhibition is the likely mechanism for propofol anaesthesia.

Reference:

1 Petrini EM, et al. Clustering of Extrasynaptic $GABA_A$ Receptors Modulates Tonic Inhibition in Cultured Hippocampal Neurons. J Biol Chem 2004; 279(44): 45833–45843.

ESAPC1-3

Ischemic postconditioning in a rat model of focal cerebral ischemia: Implication of mitochondrial potassium ATP-dependent channel and nitric oxide?

E. Robin, S. Adamczyk, M. Simerabet, B. Vallet, G. Lebuffe

Anesthesiology and Intensive Care Medicine, University Hospital of Lille, Lille, France

Background and Goal of Study: Modulations of reperfusion or postconditioning can protect organ from ischemia-reperfusion. This study was designed to evaluate whether the short interruptions of reperfusion at the onset of reperfusion provides protection in a rat model of focal cerebral ischemia. The second aim was to evaluate the implication of mitochondrial potassium ATP-dependent channel (mKATP) and nitric oxide (NO) in this neuroprotection.

Materials and Methods: Each group contained from 5 to 11 Wistar male rats which were subjected to focal cerebral ischemia for 1 h followed by 24 h of reperfusion (I/R). Postconditioning was performed by 3 cycles of 30 s reperfusion/30 s ischemia immediately at the onset of reperfusion (PostC) or 5 min after the onset of reperfusion (delPostC). Implication of mKATP or NO was assessed by: (1) Intraperitoneal (i.p.) injection of inhibitor such as the selective blocker 5-hydroxydecanoate (5HD, 40 $mg \cdot kg^{-1}$) or the NO synthase inhibitor N (omega)-nitro-L-arginine-methyl ester (L-NAME; 10 $mg \cdot kg^{-1}$) 30 min before reperfusion. (2) The administration of agonist given in place of short episode ischemia such as the mKATP channel opener, diazoxide (10 $mg \cdot kg^{-1}$; i.p.) 30 min before reperfusion, or the NO donor sodium nitroprussiate (SNP) (3 $mg \cdot kg^{-1}$; i.v.) at the onset of reperfusion. The relation between mKATP and NO was evaluated by administration of diazoxide in presence of L-NAME or with SNP in presence of 5HD. Infarct size was evaluated by histomorphometric quantification 24 hours after reperfusion and expressed in mm^3. Results are presented as median [min-max]. Differences were analyzed by the Mann-Whitney or Kruskal-Wallis tests with Bonferonni correction for post hoc analysis.

Results and Discussion: A significant reduction of cerebral infarct size was induced by PostC (102.4[40.7–207.4]) vs I/R (171.0[130.9–283.4]; p = 0.012). The protective effect was lost in delPostC (265.2[147.3–308.1]; p = 0.106). Neuroprotection was abolished by 5HD or L-NAME while diazoxide or SNP alone mimicked short episode ischemia with respectively an infarct volume of 77.7[63.9–125.7] (p = 0.012) and 79.7[13.2–156.0] (p = 0.003). Finally diazoxide- and SNP-induced protections were blocked respectively by L-NAME (137.4[75.4–265.0]) and 5HD (257.8[225.4–284.8).

Conclusion(s): This study demonstrates that ischemic PostC provides neuroprotection via mitoKATP and NO. The signal transduction sequence might involve NO as an activator of mitoKATP then generating NO as a mediator of protection.

ESAPC1-4

Different effects of resiniferatoxin and bupivacaine on spinal microglial changes after spared nerve injury: A-fiber activity is required for microglial proliferation and p38 MAPK activation

M. Suter, Y. Gao, I. Decosterd, R. Ji

Department of Aesthesiology, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts, USA

Background and Goal of Study: After peripheral nerve injury, spontaneous ectopic activity arising from the peripheral axons is important for inducing central sensitization and neuropathic pain. Recent evidences indicate that spinal cord microglia also contribute to the development of neuropathic pain. In particular, activation of p38 mitogen-activated protein kinase (MAPK) in spinal microglia is required for the development of mechanical allodynia. Long-term and selective blockade of nociceptive fibers is attractive and can be achieved by resiniferatoxin (RTX), an ultrapotent agonist for transient receptor potential subtype-1 (TRPV1) that is only expressed in nociceptors. It can provide analgesia without suppressing motor or other sensory functions.

Materials and Methods: To determine whether spontaneous activity generated in the C- or in both A&C-fibers is required for microglial activation, we applied RTX (0.01%) or bupivacaine microspheres to the sciatic nerve of rats

to block the conduction of C-fibers and A&C-fibers, respectively, before spared nerve injury (SNI). Behavior was tested 2 days after SNI, then spinal cord was collected and immunohistochemistry was performed for p38, bromodeoxyuridine (BrdU, marker of proliferation) and Iba1 (microglial marker).

Results and Discussion: On day 2, SNI induced robust mechanical allodynia ($p < 0.01$, $n = 5$) and p38 activation in spinal microglia ($p < 0.001$, $n = 3–4$/group). SNI was also associated with marked cell proliferation in the spinal cord ($p < 0.001$, $n = 3–4$/group) and all the proliferating cells (BrdU+) were co-localized with the microglial marker Iba1. Bupivacaine induced a complete sensory and motor blockade and significantly inhibited p38 activation ($p < 0.01$ $n = 3$/group) and microglial proliferation ($p < 0.05$ $n = 3$/group) in the spinal cord. RTX generated an absence of withdrawal response to noxious stimuli (heat), but motor function and mechanical allodynia were preserved. In contrast to bupivacaine, RTX did not inhibit p38 activation and microglial proliferation.

Conclusion(s): We conclude that (1) blocking peripheral C-fibers input is not sufficient to prevent nerve injury-induced microglial activation in the spinal cord (2) blocking only C-fibers does not impair the development of mechanical allodynia suggesting that microglial activation is important for this neuropathic pain-related symptom (3) peripheral input from large myelinated fibers is also necessary for microglial activation. All together our results suggest specific nociceptive blockade will not prevent the development of persistent pain.

ESAPC1-5

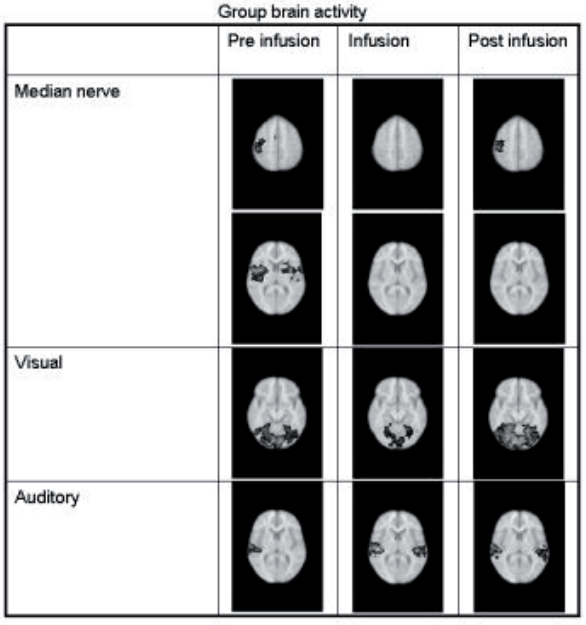
The effects of remifentanil sedation on sensory responses in the human brain measured using functional MRI

A. Jolly, J. Hall, K. Murphy, J. Evans, R. Wise

Department of Anaesthesia and Intensive Care Medicines CUBRIC, School of Psychology, Cardiff University, Cardiff, United Kingdom

Background and Goal of Study: Using Functional MRI (FMRI) we have previously demonstrated reductions in experimental pain-related brain activity with remifentanil analgesia [1]. We investigated the specificity of the effect of remifentanil on FMRI measured brain activity using non-painful sensory stimuli.

Materials and Methods: 13 healthy volunteers (mean age ± SD 27 ± 5 years) underwent functional MRI at 3T (T2* weighted, TE = 35ms, TR = 3s, 3.2 mm isotropic resolution) over 8 mins. They were randomly presented with a visual checkerboard (4 Hz), auditory (1 kHz tone) and non-painful median nerve stimulation (20 Hz). FMRI was performed before remifentanil infusion, during steady-state target-controlled infusion at 1.5 ng/ml and 20 mins after infusion. Volunteers remained awake and gave a subjective report of sedation (0 = alert,10 = very drowsy). FMRI data was analysed within the general linear modelling framework using FSL tools to produce group average maps of brain activity in response to the stimuli and to identify the significant differences in stimulus-related activity between the drug states.



Results and Discussion: Sedation scores (mean ± SE): preinfusion 3.3 ± 0.5, infusion 7.3 ± 0.5, postinfusion 2.3 ± 0.5. The infusion period sedation scores were significantly greater than before and after infusion ($P > 0.01$ paired t-test). Preinfusion, median nerve stimulation elicited activity in the contralateral primary sensorimotor cortex, bilateral insula, S2 and anterior cingulate. This was significantly reduced during infusion, particularly in the contralateral insula. Primary sensorimotor cortical responses were preserved post infusion but insula and S2 responses remained depressed. Visual cortical responses were significantly reduced during infusion. Auditory cortical responses were not significantly reduced during infusion compared to pre and post-infusion periods.

Conclusion(s): The selective reduction in sensorimotor and visual activity and the preservation of auditory activity is consistent with previous studies [2]. This suggests that auditory activity is maintained beyond that of other sensory modalities during sedation.

References:

1 RG Wise et al. Neuropsychopharm. 2004; 29: 626–35.
2 MH Dueck et al. Acta Anaesth. Scand. 2005; 49: 784–791.

ESAPC1-6

The functional affinity for propofol is dramatically decreased in human α1β2(N290M)γ2 and α2β3(N290M)γ2 mutant $GABA_A$ receptors

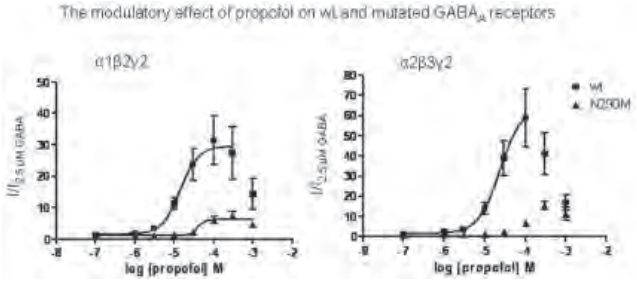
M. Jonsson Fagerlund, J. Sjödin, J. Krupp, M. Dabrowski

Karolinska University Hospital, Karolinska Institutet, Stockholm, Sweden

Background and Goal of Study: Although the mechanism(s) behind general anesthesia is not fully known, animal studies have revealed that the β subunit in the $GABA_A$ receptor is an important target for the effects of propofol. The N265M point mutation in the rat β2 and β3 $GABA_A$ receptor subunits resulted in a marked decrease in the modulatory and direct effect of propofol at α1β2(N265M)γ2 and α2β3(N265M)γ2 $GABA_A$ receptors[1,2]. The aim of this study was to investigate the effect of propofol on the corresponding point mutations in the *human* β2 and β3 $GABA_A$ subunits in comparison with the wild-type receptors.

Materials and Methods: A methionine was inserted instead of an asparagine at aminoacid position 290 (N290M) in the second TM region in the human β2 and β3 $GABA_A$ receptor subunits by site directed mutagenesis. Thereafter, subunits for the human α1β2γ2, α2β3γ2, α1β2(N290M)γ2 and α2β3(N290M)γ2 $GABA_A$ receptor subtypes were introduced into *Xenopus* oocytes and studied with two-electrode voltage-clamp.

Results and Discussion: Both mutated human receptors were functional. The modulatory as well as the direct effect of propofol at the mutated receptor subtypes were strongly reduced.



	Modulatory effect of propofol on 2,5 μM GABA		Direct effect of propofol	
	EC50 (μM)	Imax (%)	EC50 (μM)	Imax (%)
α1β2γ2	14 (6–32)	186 ± 48	123 (100–153)	60 ± 12
α1β2γ2	24 (10–58)	73 ± 9	102 (85–124)	38 ± 4
α1β2(N290M)γ2	38 (8–191)***	57 ± 6*	869 (276–2729)**	12 ± 4**
α2β3(N290M)γ2	56 (32–98)**	31 ± 4**	708 (214–2336)***	3 ± 0.3***

Imax=maximal response elicited by propofol as percentage of a 1mM GABA response. EC50 and Imax for wt and the corresponding mutant receptors were compared using unpaired two-tailed Student´s t-test, * $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$

Conclusion(s): We demonstrate for the first time that a mutation in *human* $GABA_A$ receptor subtypes, α1β2(N290M)γ2 and α2β3(N290M)γ2, reduce both the potentiation of GABA-induced currents as well as the direct effect of propofol compared to the wild-type receptors. This confirms earlier findings of point mutations in the same regions in animal material.

References:

1 Siegwart R, Jurd R, Rudolph U. J Neurochem 2002; 80: 140–148.
2 Siegwart R, Krahenbuhl K, Lambert S et al. BMC Pharmacol 2003; 3: 13.

Best Abstracts – Runner-up Session 1

ESAAP1-1

Dexmedetomidine prevents delirium after cardiac surgery

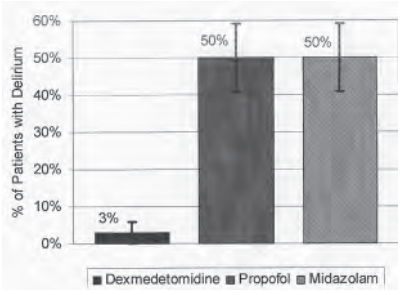
P. Van der Starre, J. Maldonado, A. Wysong, C. Miller, B. Reitz

Anesthesia, Stanford University School of Medicine, Stanford, California, USA

Background and Goal of Study: Delirium is the most common psychiatric syndrome found in the general hospital setting. Postoperative delirium is reported in 32–80% of cardiac surgical patients, which may increase morbidity and mortality, and prolong ICU and hospital stay[1]. We performed a study to assess if dexmedetomidine, a selective a_2–adrenergic receptor agonist, may be an attractive alternative compared with conventional sedation to lower the incidence of postoperative delirium[2].

Materials and Methods: In a prospective, randomized study 90 open-heart surgical patients, including valve replacements and aortic surgery, were assigned to Dexmedetomidine (loading dose 0.4 µg/kg, followed by 0.2–0.7 µg/kg/hr), Propofol (25–50 µg/kg/min), or Fentanyl/midazolam (50–150 µg/hr and 0.5–2 mg/hr respectively), started intraoperatively at sternal closure and continued postoperatively in the ICU. All patients underwent standard neuropsychiatric tests prior to surgery, and minimally three days postoperatively, particularly aiming at signs of delirium (DSM-IV criteria, Delirium Rating Scale). Duration of ICU and hospital stay were recorded as well.

Results and Discussion: The incidence of delirium was significantly lower (3%) in the Dexmedetomidine group than in the Propofol group and the Fentanyl/midazolam group (both 50%). Patients who developed delirium experienced a significantly longer ICU stay (4.1 vs 1.9 days) and hospital stay (10.0 vs 7.1 days) than non-delirious patients. The results show that postoperative sedation with dexmedetomidine almost completed prevented postoperative delirium and its detrimental consequences in cardiac surgical patients. This effect may be attributed to its specific pharmacological profile, including its action on a single receptor type with potential neuroprotective properties[3].



Conclusion(s): Dexmedetomidine is the postoperative sedative agent of choice to prevent delirium in cardiac surgery patients at risk for developing delirium.

References:

1 Ely EW, Shintani A, Truman B, et al. JAMA 2004; 291:1753–62.
2 Venn R, Newman PJ, Grounds RM. Intensive Care Med 2003; 29:201–7.
3 Scholz J, Tonner PH. Curr Opinion Anesthesiol 2000; 13:437–42.

ESAAP1-3

Spinal cord protection from aortic occlusion-related ischemia by minocycline

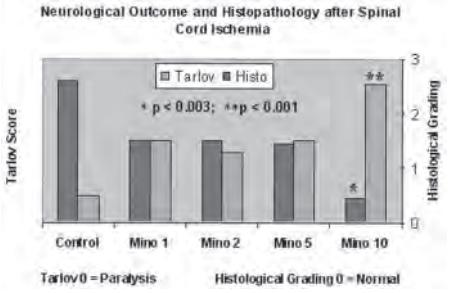
B. Drenger, D. Ben David, B. Mintz, Y. Fellig, Y. Barzilai

Anesthesiology and CCM, Hadassah University Hospital, Jerusalem, Israel

Background and Goal of Study: Ischemic injury to the spinal cord and paraplegia are known complications in descending thoracic aorta surgery. As subsequent effects of spinal cord ischemia are similar to those observed following traumatic spinal injury, we examined the role of minocycline, a 2nd-generation tetracycline, known to ameliorate secondary events of spinal cord injury, such as apoptosis and inflammation. We investigated the protective role of minocycline in attenuating the histopathological changes in the spinal cord following a period of aortic occlusion-related ischemia in the rabbit.

Materials and Methods: Aortic occlusion was achieved in anesthetized NZ albino rabbits by using a 3F Fogerty catheter, introduced through femoral incision to the L2 level (pulse oximeter, Doppler and fluoroscopic confirmation). Increasing I.V. doses of minocycline were given (1, 2, 5, and 10mg/kg; n = 10–12 animals in each dose group) thirty minutes prior to aortic occlusion of 25 min. The modified motor Tarlov scoring (0-complete paraplegia to 3-normal movements on days 0 to 2) was correlated to histological injury in the different regions (L4 to L6) of the cord. A histopathological grading of the degree of hypoxic/ischemic damage (0- normal to 4- marked) of H&E stained sections was determined according to the degree of ventral horn disruption and the number of intact motoneurons. Statistical analysis was performed using Spearman Correlation and Chi Square test.

Results and Discussion: Spinal cord ischemia for 25 minutes resulted in high-grade paraplegia in the control group. Minocycline administration produced a dose-dependent, significant improvement in the post-ischemic neurological deficit (10mg/kg; $p < 0.001$). The severity of histopathological damage was inversely related to the neurological deficit scores, with a clear reduction after minocycline administration ($p < 0.003$).



Conclusion(s): Minocycline demonstrated dose-dependent neuroprotection against temporary ischemia to the spinal cord, with significant sparing of motoneurons. With the high safety profile of the drug, the functional recovery achieved with minocycline has the potential for clinical applicability.

Acknowledgements: Supported by the European Society of Anaesthesiology Research Award.

ESAAP1-4

The effect of epidural anesthesia on anastomotic leakage in colonic surgery: An experimental study

T. Adanir, M. Aksun, G. Yilmaz, O. Nazli, M. Koseoglu

Anesthesiology and Reanimation, Ataturk Training and Research Hospital, Izmir, Turkey

Background and Goal of Study: Epidural anesthesia is believed to benefit colorectal anastomotic blood flow because of the sympathetic blockade it produces. On the other hand, continuous infusion of epidural local anesthetic may lead to an increased incidence of anastomotic leakage due to stimulatory effect. Therefore, we examined the association between continuous epidural local anesthetic and anastomotic leakage.

Materials and Methods: Fourteen white New Zeeland rabbits were included in the study. All animals were anesthetized with intramuscular ketamine (20 mg kg^{-1}) and xsilasin (8 mg kg^{-1}). Into all experimental animals, right colon resection + colo-colonic anastomosis were performed under the general anesthesia. While group 1 was applied continue epidural saline (0.9% NaCl 0.4 ml kg^{-1} bolus and 0.2 ml kg^{-1} h^{-1} infusion), group 2 continue epidural anesthesia (lidocaine 1%, 0.4 ml kg^{-1} bolus and 0.2 ml kg^{-1} h^{-1} infusion). Application of epidural lidocaine or saline was started with the beginning of operation until 6 hours postoperative period. In postoperative 4th day, relaparotomy was applied under the general anesthesia. The burst pressures of anastomosis were measured in situ, then the lines of the anastomosis were excised. The levels of hydroxyproline and collagen were studied in this tissue.

Results and Discussion: When we compared the groups, anastomosis bursting pressures were statistically higher in group 2 (231 ± 61 mm Hg) than in group 1 (119 ± 45 mm Hg) ($p = 0.012$). There was no difference between the groups in terms of hydroxyproline and collagen levels in tissue samples taken from anastomosis line ($p > 0.05$). Long term epidural blockage with lidocaine increases the anastomotic burst pressure.

Conclusion(s): Although amount of collagen and hydroxyproline were similar in the both groups, the significantly higher anastomotic burst pressure may support that leakage of colonic anastomosis is diminished rather than improved by epidural blockage.

ESAAP1-5

Facilitation of glutamate release from rat cerebral cortex nerve terminal by subanesthetic concentration propofol

C. Lu, T. Lin, C. Wu, S. Wang

Department of Anesthesia, Far-Eastern Memorial Hospital, Taipei County, Taiwan

Background and Goal of Study: Propofol is now the most common used intravenous anesthetics for general anesthesia and sedation due to its rapid onset and recovery. Besides the well-known adverse effects of cardiovascular and respiratory depression, recent studies indicate that propofol may cause excitatory phenomena such as myoclonus, opisthotonus, and even seizure. However, the mechanisms of theses excitatory effects of propofol have not been elucidated. Considering glutamate is the principle excitatory neurotransmitter in the central nervous system (CNS) and excessive glutamatergic synaptic transmission can cause seizure, we hypothesize that propofol may influence the release of glutamate from CNS.
Materials and Methods: Isolated nerve terminals (synaptosomes) purified from Sprague-Dawley rat cerebral cortex were used to determine the effect of propofol on glutamate release. Release of glutamate evoked by 4-aminopyridine (Na^+ channel dependent), KCl (Na^+ channel independent and Ca^{2+} channel dependent), and ionomycin (downstream of Ca^{2+} channel) was measured by on-line enzyme-coupled fluorometric assay. The effect of propofol on the synaptosomal plasma membrane excitability was also examined with the membrane potential dye $DiSC_3(5)$.
Results and Discussion: Subanesthetic concentrations of propofol (< 10μM) facilitated 4-aminopyridine (4-AP) but not KCl- or ionomycin-evoked glutamate release from nerve terminals. The facilitation of 4-AP-evoked glutamate release by propofol also occurred in the calcium chelation and attenuated by glutamate transporter inhibitors, DL-TBOA and L-trans-PDC. In addition, propofol increased 4-AP-evoked depolarization of the plasma membrane potential. Furthermore, protein kinase C (PKC) inhibition suppressed propofol-mediated facilitation of glutamate release. These results suggest that subanesthetic concentration propofol facilitates glutamate release from rat cerebrocortical glutamatergic terminals by increasing nerve terminal excitability, likely through the activation of PKC pathway.
Conclusion(s): Propofol induced seizure-like phenomena occur exclusively during the induction and emergence of anesthesia, while the concentration of propofol is lower than clinically effective concentration. Our results may provide an explanation for subanesthetic propofol induced excitatory phenomena.

ESAAP1-6

Continuous perioperative aspirin has not been associated with postoperative adverse events in noncardiac surgery

P. Sierra, J. Castillo, S. Sabaté, N. Estanyol, P. Paniagua

Anesthesiology, Fundació Puigvert, Barcelona, Spain

Background and Goal of Study: To study morbidity and mortality related to antiplatelet therapy during perioperative period in noncardiac surgery. We compare patients with continuous aspirin treatment matched with patients without antiplatelet treatment.
Materials and Methods: A prospective multicentre cohort study (ANESCARDIOCAT study) was performed in 23 hospitals during 6 randomized weeks in 2007–8. Eligible subjets were patients aged ≥40 yr undergoing intermediate-high surgery-specific risk of noncardiac (elective or urgent) surgery, under general o regional anaesthesia. We collected demographic data, preoperative patient' characteristics, type of surgery and anaesthesia (excluding obstetrics), perioperative events and in-hospital mortality. We specifically studied the aspirin use. We created two patients cohorts matched on their propensity to be treated by aspirin therapy. χ^2 test was used to compare qualitative variables and t test to compare quantitative variables.
Results and Discussion: 3387 patients were enrolled in this analysis. 593 (17.5%) patients took antiplatelet therapy, 72.5% aspirin, 17.7% clopidogrel and both 9.8%. Median age was 71.9 yr, 64.2% males. High specific-surgery risk: 25.1%. 243 (56.5%) and 24 (22.8%) patients didn't withdraw aspirin or clopidogrel respectively before surgery. Results are shown in table1.

Table 1. Postoperative cardiac events and in-hospital mortality, Unadjusted and Adjusted for Propensity Score Matching for aspirin use

	Unadjusted			Adjusted		
	Non-treated	Continous aspirin	P	Non-treated	Continous aspirin	P
N	2794	243		140	140	
Cardiac events (%)	3.2	10.3	<0.001	6.4	8.6	NS
Angor (%)	0.4	4.1	<0.001	0.7	1.4	NS
Myocardial infarction (%)	0.8	0.2	NS	0	0	NS
Congestive heart failure (%)	0.9	4.1	<0.001	2.9	2.1	NS
Dysrhytmia (%)	1.5	3.3	0.032	2.9	4.3	NS
Stroke (%)	0.3	0.4	NS	0	0.7	NS
Intra and postoperative bleeding*(ml)	130 (0–1000)	100 (0–680)	NS	100 (0–1000)	175 (0–700)	NS
Blood transfusion (%)	17.8	15.5	NS	20.7	15	NS
Death (cardiac cause) (%)	0.2	0.4	NS	0.7	0	NS
Death (other cause) (%)	1.4	2.9	NS	1.4	1.4	NS

*Median (10th–90th percentile)

Conclusion(s): One out of 6 patients scheduled for major noncardiac surgery are under antiplatelet therapy. When patients are matched for propensity to be treated, no significant differences in morbidity and mortality associated with aspirin treatment were found.

Best Abstracts – Runner-up Session 2

ESAAP2-1

Atrial natriuretic peptide improves pulmonary circulation and function during endotoxemia in pigs

T. Makita, M. Sekino, K. Sumikawa

Anesthesiology, Nagasaki University School of Medicine, Nagasaki, Nagasaki, Japan

Background and Goal of Study: The renin-angiotensin system (RAS) is highly activated during septic shock, and has been suggested to be involved in the pathophysiology of the markedly deteriorated pulmonary circulation seen in septic shock. Recent reports have suggested that carperitide, a synthetic atrial natriuretic peptide, inhibits the RAS. This study was performed to clarify the effects of carperitide on pulmonary circulation during endotoxemia in pigs.
Materials and Methods: All experimental procedures were approved by the Institutional Animal Care Committee. Sixteen pigs (25–35kg) were anesthetized with α-chloralose and fentanyl. Pigs were randomly divided into two groups to receive saline (Ctrl group; n = 8), or carperitide (Carp group; n = 8). Central venous, arterial and pulmonary arterial catheters were inserted through the right jugular vein, the right internal artery and the left jugular vein, respectively. After taking a baseline measurement (T0), the pigs received a continuous infusion (1.7 μg/kg/h) of endotoxin (lipopolysaccharide from Escherichia coli) for 240 minutes. The Carp group received a continuous infusion of carperitide (0.05 μg/kg/min) from 30 minutes prior to endotoxin infusion until the end of the study. Normovolemia was maintained with a continuous infusion and volume challenges of lactated Ringer's solution containing dextran 40. Measurements were performed at 0, 60, 120, 180, 240 minutes after endotoxin infusion (expressed as T0, T60, T120, T180 and T240).
Results and Discussion: In the Ctrl group, mean arterial pressure (MAP) decreased from T60 to T240, and heart rate (HR) and mean pulmonary artery pressure (MPAP) increased significantly from T30 to T240. In the Carp group, MAP decreased from T60 to T120, but returned to T0 level from T150 to T240. MPAP increased significantly compared with T0 value in both groups, whereas it was significantly low in the Carp group compared with the Ctrl group at T30, T120, and from T180 to T240. PaO_2/FIO_2 (P/F) ratio decreased after endotoxin infusion in both groups, but P/F ratio of the Carp group was significantly higher than that of the Ctrl group from T60 to T240 (T60, T120; $p < 0.05$, T180, T240; $p < 0.01$).
Conclusion(s): In this porcine fluid resuscitated endotoxemia model, a low dose of carperitide administered prior to endotoxemia corrected pulmonary hypertension and has lung protective effect. Atrial natriuretic peptide infusion could be a potentially beneficial therapy with respect to pulmonary circulation and function in sepsis.

ESAAP2-2

Dexmedetomidine attenuates isoflurane-induced neurocognitive impairment in neonatal rats

R. Sanders, Y. Shu, A. Fidalgo, D. Ma, M. Maze

Anaesthetics, Intensive Care & Pain Medicine, Imperial College London, London, United Kingdom

Background and Goal of Study: Neuroapoptosis is induced by the administration of anesthetic agents to the young. As α2 adrenoceptor signalling plays a trophic role during development and is neuroprotective in several settings of neuronal injury, we investigated whether dexmedetomidine could provide functional protection against isoflurane-induced injury.
Materials and Methods: Isoflurane-induced injury was provoked in vivo in post-natal day 7 rats by a 6 hour exposure to 0.75% isoflurane. Doses of dexmedetomidine or saline were given 3 times over the 6 hour period. In vivo the α2 adrenoceptor antagonist atipamezole was used to identify if dexmedetomidine neuroprotection involved α2 adrenoceptor activation. Apoptosis was assessed using cleaved caspase-3 immunohistochemistry. Cognitive function was assessed in vivo on post-natal day 40 using fear conditioning.
Results and Discussion: In vivo dexmedetomidine dose-dependently prevented isoflurane-induced injury in the hippocampus, thalamus and cortex; this neuroprotection was attenuated by treatment with atipamezole. While anaesthetic treatment did not affect the acquisition of short term memory, isoflurane induced long-term memory impairment. This neurocognitive deficit was prevented by administration of dexmedetomidine. The percentage freezing time in the contextual fear conditioning experiment was 48 + 5% in controls (air-saline), 45 + 11% with air-dexmedetomidine treated animals and 29 + 7% with isoflurane-saline treated animals. Dexmedetomidine ameliorated the neurocognitive impairment induced by isoflurane; percentage freezing time 46 + 9% with isoflurane-dexmedetomidine treated animals.
Conclusion(s): Dexmedetomidine attenuates isoflurane-induced injury in the developing brain providing neurocognitive protection. If isoflurane-induced neuroapoptosis proves to be a clinical problem, administration of dexmedetomidine may be an important adjunct to prevent isoflurane-induced neurotoxicity.
Acknowledgements: This work was supported by Chelsea and Westminster Healthcare NHS Trust, London, United Kingdom and the Westminster Medical School Research Trust, London, United Kingdom.

ESAAP2-3

Statins decrease the constitutive expression of monocyte HLA-DR and of its chaperone CD74 independent of apoptosis

S. Weber, L. Lehmann, M. Kobilay, A. Hoeft, F. Stüber

Anesthesiology and Intensive Care Medicine, University of Bonn Medical Center, Bonn, Germany

Background and Goal of Study: Reduced monocyte HLA-DR is a hallmark of immunoparalysis in sepsis. Statins exert pleiotropic anti-inflammatory effects and may prevent sepsis, as shown in large observational studies. Apart of lowering cholesterol by inhibition of 3-hydroxy-3-methylglutaryl-coenzym-A (HMG-CoA) reductase they have been shown to inhibit the interferon-gamma induced up-regulation of MHC II (HLA-DR). In Sepsis however, serum interferon-gamma is relatively low. Therefore, the aims of the study were to investigate effect of statins on the constitutive expression of HLA-DR and to further analyze possible mechanisms involved.
Materials and Methods: Monocytes of healthy subjects (with approval of the ethics committee) and the monocyte cell line Mono Mac 6 (MM6) were incubated with statins and their influence on protein expression, enzyme activity and DNA-fragmentation was observed by flow cytometry after 24h. mRNA expression was quantified by real-time rtPCR. ANOVA was used for statistical analysis.
Results and Discussion: Monocyte HLA-DR was downregulated by simvastatin at 500 nM with increasing potency up to 20 µM (– 26.86 ± 8.35%, $p < 0.01$). Mevastatin, pravastatin, lovastatin and fluvastatin downregulated HLA-DR as well ($p < 0.05$). The expression of MHC class I instead was not affected. Mevalonate, the product of HMG-CoA reductase bypasses the inhibition of the pathway. In the presence of mevalonate, simvastatin did not affect HLA-DR expression. Investigating possible mechanisms we analyzed induction of apoptosis by statins. While statins indeed induced apoptosis in MM6 cells, as confirmed by annexin V and caspase-3 staining, HLA-DR downregulation could be observed in the both the apoptotic and the non-apoptotic annexin V and caspase-3 negative populations with intact DNA. Statins did not induce IL-10 production nor did it change IL-10 receptor expression. mRNA expression of HLA-DR was not inhibited by statins. Therefore, a post transcriptional mechanism was suspected. No change was observed in cathepsin S expression, a processing enzyme. The expression of the HLA-DR chaperon CD74 was markedly decreased by simvastatin (MFI 122.7 ± 4.16 vs. control 163.7 ± 1.52, $p < 0.01$).
Conclusion(s): Statins regulate the constitutive expression of HLA-DR in monocytes. This effect requires HMG-CoA reductase inhibition and is not dependent on apoptosis. Possibly, the downregulation of the chaperon CD74 inhibits the intracellular processing of HLA-DR. Further studies need to investigate whether this statin effect is beneficial in sepsis or not.

ESAAP2-4

Desflurane-induced postconditioning in human type 1 and 2 diabetic myocardium, in vitro

S. Lemoine, M. Fuardo, M. Massetti, J. Gerard, J. Hanouz

Department of Anesthesiology, University Hospital Caen, Caen, France

Background and Goal of Study: The increasing incidence of diabetes mellitus worldwide results in an increase perioperative care of diabetic patients who are at high risk for perioperative ischemia reperfusion injury. Thus developing perioperative cardioprotective strategies are of importance in diabetic patients in cardiovascular surgery. The aim of this study was to investigate if brief administration of desflurane (a volatile halogenated anesthetic) in early reperfusion could protect human myocardium with type 1 and type 2 diabetes mellitus as compared with non diabetic, in vitro.
Materials and Methods: After the approval of local medical ethics committee, right atrial appendages were obtained during cannulation for cardiopulmonary bypass from patients scheduled for routine coronary artery bypass surgery and aortic valve replacement. The force of contraction (34 °C, stimulation frequency 1 Hz) of right atrial trabeculae was recorded during 30 min hypoxia followed by 60 min reoxygenation. Desflurane 3%, 6% and 9% was administered during the first 5 min of reoxygenation. The results are expressed in% of baseline. The force of contraction at the end of 60-min reoxygenation period (FoC60) was compared (mean ± Standard Deviation) between the groups by a variance analysis.
Results and Discussion: In non-diabetic group, Desflurane 3%, 6% and 9% (FoC60:78 ± 10%, 84 ± 4%, 85 ± 12% of baseline) enhanced the recovery of FoC60 as compared to the Control group (53 ± 7% of baseline). In type 1 diabetic group, Desflurane 3% (FoC60: 61 ± 4% of baseline) did not modify the recovery of FoC60 as compared to Control group (FoC60: 54 ± 6% of baseline); Desflurane 6% and 9% (FoC60: 75 ± 11% and 81 ± 8% of baseline) enhanced the recovery of FoC60 on as compared with Control groups ($P < 0.0001$). In type 2 diabetic group, Desflurane 3% (FoC60: 57 ± 5% of baseline) did not modify the recovery of FoC60 as compared to Control group (FoC60: 52 ± 10% of baseline); Desflurane 6% and 9% (FoC60: 80 ± 10% and 79 ± 7% of baseline) enhanced the recovery of FoC60 on as compared with Control group ($P < 0.0001$).
Conclusion(s): In vitro, desflurane postconditions diabetic (both type 1 and 2 diabetes mellitus) human myocardium at 6% and 9%, but not at 3%. These results suggest that desflurane could be used in clinical practice as a cardioprotector agent of diabetic patients.

ESAAP2-5

Prospective randomized controlled multi-centre trial on cuffed versus uncuffed tracheal tubes in small children

M. Weiss, A. Dullenkopf, J. Fischer, A. Schmitz, A. Gerber

Department of Anaesthesia, University Children's Hospital, Zurich, Switzerland

Background and Goal of Study: Cuffed tubes have not been used routinely in children because of fear of airway damage (1). So far only single centre study experience is available (2). The aim of this multi-centre study was to compare tube exchange rate and post-intubation morbidity when using cuffed versus uncuffed tubes in a large population of small children.
Materials and Methods: Patients aged from birth to <5 years requiring general anaesthesia and tracheal intubation were included in 24 European paediatric anaesthesia units. Cuffed tubes sizes (Microcuff PET®) were selected as followed: ID (mm) 3.0: 0 (> 3 kg) – 8 months/ID 3.5: 8–18 months/ID 4.0: 18–36 months/ID 4.5: 36–60 months. Uncuffed tubes sizes (Mallinckrodt®, Portex®, Rüsch®, Sheridan®) were selected according to local institutional guidelines. The number of tube exchanges to find an appropriate tracheal tube with a small air leak at airway pressure of 20 cm H_2O allowing satisfactory ventilation, was noted. Minimum cuff pressure required to seal the airway was noted. Cuff pressure was monitored and limited with a pressure release valve at 20 cm H_2O. Post-extubation stridor was recorded in the child free of secretions and pain by an independent assessor. Data are presented as mean ± sd and were compared using T-Test and chi-squares analysis ($p < 0.05$).
Results and Discussion: 2249 children were studied (1119/1130 cuffed/uncuffed tubes). Children age's was 1.93 ± 1.48 yrs in the cuffed and 1.86 ± 1.45 yrs in the uncuffed study group ($p = 0.31$). Tube exchange rate was 2.1% in the cuffed and 29.9% in the uncuffed study group ($p < 0.0001$, risk ratio 0.07, 95% CI 0.045–0.10). Post-extubation stridor was noted in 4.38% in the cuffed and in 4.69% in the uncuffed study group, but groups differed not significantly. Minimal cuff pressure to seal the trachea was 10.6 ± 4.3 cm H_2O.
Conclusion(s): This large prospective randomized controlled multi-centre trial demonstrates that the Microcuff PET® in combination with cuff pressure monitoring and limitaion can be used in children without increased post-intubation morbidity. Minimum tube exchange rate and a reliable sealed airway at cuff

pressures of <20 cm H_2O are the main benefits compared to uncuffed tracheal tubes.

Acknowledgements: The study was supported by a Grant of the Swiss Society of Anaesthesia and Resuscitation (SGAR).

References:

1 Orliaguet GA, Renaud E, Lejay M, et al. Paediatr Anaesth. 2001;11:277–281.
2 Khine HH, Corddry DH, Kettrick RG et al. Anesthesiology 1997; 86:627–31.

ESAAP2-6

One week impairment of a learning (conditioning) task following etomidate anesthesia in aged, but not young, rats

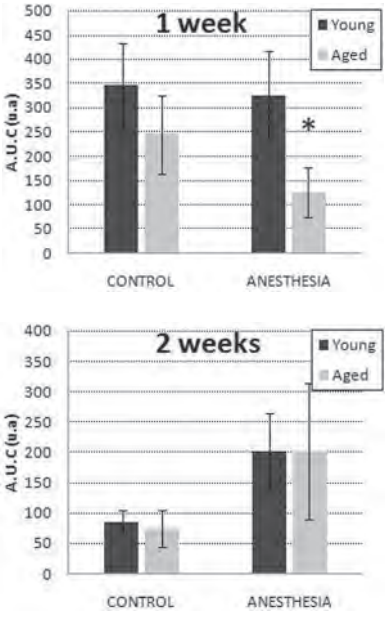
N. Louvet, F. Laalou, M. Rafiq, I. Constant, L. Pain

GRERCA/INSERM U 666/CHU Trousseau, CHRU Strasbourg, Strasbourg, France

Background and Goal of Study: Post-operative cognitive dysfunctions are complications after anesthesia and surgery in elderly patients. Clinical studies have highlighted the increasing age (over 70 years old) as the main risk factor. Only a few animal studies have pointed out the involvement of anesthesia on cognitive dysfunction, however these studies have mainly focused on spatial working memory[1]. The aim of this study was to investigate the role of anesthesia on associative learning dysfunction in young and old rats.

Materials and Methods: 30 young (3–6 months) and 27 aged (18–20 months) naïve female Sprague-Dawley rats were used (6–8 per group). In the anesthesia group, the animals were injected intraperitoneally with Etomidate Lipuro. In the control group, the animals were injected with the lipidic vector. Learning was measured with a contextual conditioning task (no painful electric foot shocks in a specific context) and was assessed as the amount of fear response to the context (A.U.C.) 24 hours after the conditioning session. Depending of the group, animals were tested: 1 week or 2 weeks after anesthesia. Statistical analysis of the amount of conditioning was performed using two way analyses of variance (between factors : age, treatment).

Results and Discussion: At one week, the amount of conditioning (expressed as fear to the context) was decreased in aged animals as compared to young animals, when they were submitted to anesthesia as compared to Lipidic vector (significant effect of age *: p = 0,04). No impairment was observed 2 weeks after anesthesia in aged animals compared to young animals.



Conclusion(s): Anesthesia with Etomidate impairs learning of a newly acquired conditioning task in old rats but not in young rat, one week after the procedure. Two weeks after anesthesia aged rats seems to have recovered from this impairment like young rats.

Reference:

1 Culley et al. Anesthesiology 2004; 100:309–14.

Evidence-Based Practice and Quality Improvement

1AP1-1

Evaluation of antiemetic prophylaxis in a general surgical population receiving general or combined anaesthesia

V. Mazo, P. Vila, S. Sabaté, C. Orrego, J. Canet

Anaesthesiology, Germans Trias i Pujol Hospital, Badalona, Barcelona, Spain

Background and Goal of Study: Postoperative nausea and vomiting (PONV) are common unpleasant side effects following general anaesthesia. Apfel proposed a simplified risk score for predicting PONV with four main factors (female sex, history of motion sickness or PONV, non-smoking and use of postoperative opioids). Aim: Assessment of the incidence of PONV, with and without antiemetic prophylaxis, in a general surgical population stratified by risk groups based on Apfel's factors: low risk (0–1 factors), moderate risk (2 factors), high risk (3–4 factors).

Materials and Methods: An observational prospective multicenter study was designed and 26 hospitals in Catalonia participated. Patients older than 18 years undergoing elective non-cardiac surgery and general or combined anaesthesia were included. Recruitment took place on ten different days during a three-month period. Demographic parameters, type of prophylaxis, risk factors and incidence of PONV (first 24 hours) were recorded in a case file and input to an online database for further analysis. Comparative analyses of incidences were performed between patients with and without prophylaxis for the three risk groups.

Results and Discussion: A total of 1239 patients were included: 643 (51.9%) received prophylaxis (ondansetron 47%, dexamethasone-ondansetron 39%, others 14%). The overall incidence of PONV was 26.1%. The results stratified by risk group were as follows: According to clinical guidelines based on Apfel risk groups, all patients at moderate or high risk and no patients at low risk should have received prophylaxis. At this was not so in usual practice in our hospitals, we were able to compare the PONV differences between patients with and without prophylaxis within the different groups.

Incidence of PONV stratified by risk group

RISK GROUP	N	PONV without prophylaxis	PONV with prophylaxis	p
Low	381 (30.8%)	52/241 (21.6%)	12/140 (8.6%)	<0.002
Moderate	466 (37.6%)	66/211 (31.3%)	45/255 (17.6%)	<0.002
High	392 (31.6%)	67/144 (46.5%)	81/248 (32.7%)	<0.007
Total	1239	185/596 (31.0%)	138/643 (21.5%)	<0.001

PONV: Postoperative nausea and vomiting.

Conclusion(s): 1. In the groups at moderate and high risk, the pharmacological prophylaxis was effective but insufficient. 2. In the group at low risk, the clinical relevance of the PONV incidence in patients without prophylaxis (21.6%) and the significant difference with the low incidence in medicated patients (8.6%), support the argument for universal prophylaxis.

1AP1-2

Prospective, multicentre study of postoperative nausea and vomiting in a surgical population

P. Vila, V. Mazo, S. Sabaté, C. Orrego, J. Canet

Anesthesiology, Hospital Germans Trias i Pujol, Badalona, Barcelona, Spain

Background and Goal of Study: Postoperative nausea and vomiting (PONV) are two of the most unpleasant side effects of surgery and, a cause of increased morbidity following anesthesia. Specific predictors of increased risk for PONV have been studied[(1)]. The incidence of PONV and identification of patient and anesthesia-related risk factors in surgical patients were the main goals of this study.

Materials and Methods: A prospective, multicentre study was designed. Twenty-six academic, public or private hospitals in Catalonia participated. Patients older than 18 yr undergoing elective non-cardiac surgery lasting more

than 1 hour were included. Variables recorded were patient demographic data, smoking habit (yes/no), previous PONV and/or motion sickness (yes/no), intravenous fluid intake (ml), intraoperative nitrous oxide and volatile anesthetics (yes/no), length of surgery (min), surgical procedure and incidence of PONV within 24 h after surgery. Recruitment took place on a random sampling of ten different days during a three-month period. All data were recorded in a case file and input to an online database for further analysis. Bivariate and multivariate analyses were performed. Odds ratios and 95% confident intervals (CI) were calculated.

Results and Discussion: A total of 1983 patients were included (female 54%); 21% were smokers and 20% reported a history of previous PONV or motion sickness. The overall incidence of PONV in the 24 h after surgery was 23.4%; the incidence after general anesthesia was 26.1% and after neuroaxial anesthesia, 19%. Patient risk factors for PONV were gender (29.4% female vs 16.2% male; OR: 1.95 [95% CI: 1.6–2.4]); nonsmoking (24.8% vs 18.0%; OR: 1.49 [95% CI: 1.1–1.9]) and, a history of PONV and/or motion sickness (30.0% vs 21.6%; OR: 1.39 [95% CI: 1.1–1.8]). The two significant anesthesia-related factors were volatile anesthetics (27.0% vs 19.7%; OR: 1.39 [95% CI: 1.1–1.7]) and postoperative opioid consumption (29.7% vs 19.1%; OR: 1.68 [95% CI: 1.3–2.1]).

Conclusion(s): Our results were consistent with previously published data but our study adds volatile anesthetics as an anesthesia-related risk for PONV. Assessment of these factors and applying consensus guidelines for prophylaxis and treatment of PONV[2] will improve the well-being and safety of surgical patients in Catalonia.

References:

1 Apfel CC, Laara E, Koivuranta M et al. Anesthesiology 1999; 91:693–700.
2 Gan TJ, Meyer T, Apfel CC et al. Anesth Analg 2003; 97:62–71.

1AP1-3

Does rate of intraoperative fluid administration influence postoperative outcome?

J. Canet, S. Sabaté, E. Martínez, V. Mazo, L. Gallart

Anaesthesiology, Hospital Universitari Germans Trias i Pujol, Badalona, Barcelona, Spain

Background and Goal of Study: Optimal intraoperative fluid management has not been established based on evidence and restrictive vs. liberal administration is debated. Few studies have assessed the impact of fluid administration on postoperative outcome in a general surgical population. We aimed to analyze the influence of several rates of fluid administration on postoperative morbidity and mortality in the setting of an extensive prospective multicentre study conducted in Catalonia (ARISCAT).

Materials and Methods: We conducted a prospective multicentre cohort study in 59 hospitals during 2006, collecting extensive, structured pre-, intra- and postoperative information until 3 months after surgery. The patients were ≥ 18 yr and undergoing elective or emergent inpatient surgery, excluding obstetrics, under general, neuroaxial or plexus block anaesthesia. Data collection was on a random sample of 7 different days in each hospital. Fluid therapy was administered at criteria of the responsible anaesthesiologist. For each patient we calculated the intraoperative infusion rate and then grouped them in 4 ranges of infusion: 6, > 6 to 9, > 9 to 13 and > 13 $ml \cdot kg^{-1} \cdot h^{-1}$. For each group we calculated respiratory, cardiovascular, wound and renal complications and length of stay and 30-day mortality. We compared qualitative variables with a χ^2 test and with quantitative with a variance analysis. Data are expressed as means ± SD.

Results and Discussion: We included 2448 patients. The table shows the incidence of postoperative complications and mortality according the 4 fluid rate ranges.

Intraoperative fluid therapy rate and postoperative complications and mortality

$ml \cdot kg^{-1} \cdot h^{-1}$	≤6	>6–9	>9–13	>13	P
Number of patients	569	653	608	628	
Respiratory (%)	4.7	5.7	5.3	4.1	NS
Cardiovascular (%)	4.2	4.6	2.6	5.1	NS
Wound (%)	4.9	4.7	5.3	4.1	NS
Renal (%)	0.9	0.8	2.0	1.1	NS
Lenght of stay (d)	6.0 ± 8.8	6.2 ± 10.3	5.9 ± 7.4	5.3 ± 10.3	NS
30-day mortality (%)	0.5	1.4	2.0	1.6	NS

Conclusion(s): Our study demonstrates that in a general surgical population representative of a large geographical area there is no significant effect of the rate of intraoperative fluid administration on postoperative outcome. Investigation of this issue should be addressed only to subgroups of patients.

Acknowledgements: Supported by Fundació La Marató de TV3 (041610).

1AP1-4

Economic analysis of a preanaesthetic clinic in Hong Kong: Interim results

T. Gin, A. Lee, P. Chui, A. Ho, C. Chiu

Anaesthesia and Intensive Care, The Chinese University of Hong Kong, Shatin, NT, Hong Kong

Background and Goal of Study: Outpatient preanaesthetic clinics can potentially improve efficiency, length of stay, and reduce costs but it is not certain that savings will be achieved. We performed a partial economic analysis of an outpatient preanaesthetic clinic compared with a traditional method of assessing patients on the ward before surgery (non-clinic).

Materials and Methods: Data from a prospective study of clinic patients and non-clinic patients were matched by surgical procedure. We measured total cost (clinic and inpatient hospital costs, medications and preoperative laboratory tests), quality of recovery and postoperative health-related quality of life using the EQ-5D instrument (0 = dead to 1 = full health). Matched t-tests were performed to compare clinical outcomes and costs between groups.

Results and Discussion: Age, sex, American Society of Anesthesiologists' Physical Status and cancellation rates were similar between the 106 matched sets of patients. Mean quality of recovery score at 24 hours was similar between clinic (12.9 ± 2.7 sd) and non-clinic (13.1 ± 2.8 sd) patients (P = 0.46). There was no difference in mean postoperative health-related quality of life at 24 hours between clinic (43.2 ± 30.0 sd) and non-clinic (40.0 ± 27.8 sd) patients (P = 0.25). Although clinic patients spent less time in hospital before their surgery than non-clinic patients (P < 0.001), only 39 of 106 clinic patients were admitted on the day of their surgery.

Mean difference in cost (in US dollars) for perioperative care

Variable	Differences (95% CI)	P value
Preoperative medications for optimizing patient's condition	0.00 (–0.19 to 0.18)	0.96
Preoperative laboratory tests	–9.62 (–19.89 to 0.66)	0.07
Outpatient clinic evaluation	90.32	–
Preoperative inpatient bed	–353.50 (–431.69 to –275.31)	<0.001
Postoperative inpatient bed	329.40 (–362.41 to 1021.20)	0.35
Total cost of perioperative care	56.60 (–635.85 to 749.05)	0.87

* Negative implies that clinic is less expensive than non-clinic approach; positive implies that clinic is more expensive than non-clinic approach

Conclusion(s): Clinical outcomes were similar between clinic and non-clinic groups. Cost-savings were not achieved because most clinic patients continued to be admitted the night before surgery to ensure beds were available on the day of surgery.

Acknowledgements: Project No. CUHK4003-PPR-3 was fully supported by a grant from the Central Policy Unit and the Research Grants Council of the HKSAR.

1AP1-5

Preoperative anxiety in a population of general surgery: Is the Amsterdam Preoperative Anxiety Information scale usable?

J. Wattier, O. Barreau, E. Robin, B. Vallet, G. Lebuffe

Clinique d'Anesthésie Réanimation – Hopital Claude Huriez, Centre Hospitalier Regional et Universitaire, Lille, France, Metropolitan

Background and Goal of Study: Anxiety is a common experience for patients before surgical procedure. The first objective was to assess the level of anxiety of patients before surgery by the Spielberger State-Trait Anxiety Inventory (STAI) and by the Amsterdam Preoperative Anxiety Information scale (APAIS). The second aim was to evaluate the relationship between STAI and APAIS.

Materials and Methods: 1800 patients scheduled for general surgery responded to 2 anxiety questionnaires during the anaesthesia consultation. The 2 anxiety scales were the Spielberger State-Trait Anxiety Inventory (40 items) and the 6 items of the APAIS. The APAIS allowed to calculate 3 scores on 10 points, estimating respectively the anxiety about anaesthesia (APAIS-anaesth), surgery (APAIS-surg), the need of information (APAIS-info) and a global value of anxiety on twenty points (APAIS-anx). Results are presented as mean ± SD. Differences were analyzed with the chi(2) test and the Student t test (* P < 0.05 considered as significant). The correlation between the 2 scales was estimated by the Pearson coefficient (r). P < 0.001 considered as significant.

Results and Discussion: Of the 1800 questionnaires, 1404 were usable. There were 50.2% of women aged 50.8 ± 15.2 years and 49.7% of men aged 55.7 ± 15.7 years. Women appeared more anxious than men. The STAI

state was significantly correlated with APAIS-anx (r = 0.675), APAIS-anaesth (r = 0.569) and with APAIS-chir (r = 0.648). No correlation was observed between STAI state and APAIS-info (r = 0.252).

Anxiety scale

Anxiety Scale	Women	Man
STAI state	41.1 ± 13.6*	36.71 ± 13.08*
APAIS-anx	9.6/20 ± 4.57*	8.3/20 ± 4.06*
APAIS-anaesth	4.1/10 ± 2.34*	3.5/10 ± 2.02*
APAIS-surg	5.5/10 ± 2.7*	4.7/10 ± 2.5*
APAIS-info	6.3/10 ± 2.7*	6.0/10 ± 2.7*

Conclusion(s): In a general population surgery, preoperative anxiety was moderate but significantly higher in females. APAIS appears as a useful instrument to measure anxiety and to detect the need for information in patients before surgery.

1AP1-6

Benefits of implementation of a protocol for preoperative chronic alcohol abusers identification and alcohol withdrawal syndrome prevention

O. Avram, I. Grecu, R. Macovei, O. Marinescu, I. Grintescu

Toxicology Intensive Care Unit, Anesthesiology and ICU, Clinical Emergency Hospital of Bucharest, Bucharest, Romania

Background and Goal of Study: Alcohol abuse and dependence are common problems in the perioperative setting, which are oftenly misdiagnosed, until alcohol withdrawal syndrome (AWS) occurs. The latter increases perioperative morbidity and length of hospital stay (LOS) and therefore its prophylaxis is important. Our trial aimed to demonstrate the benefits of implementing a protocol for identification of chronic alcohol abusers, together with AWS prophylaxis in patients scheduled for lower limb orthopedic surgery.
Materials and Methods: After IEB approval and patient informed consent, all patients scheduled for lower limb orthopedic surgery between September 2007 – August 2008 were screened on admission for chronic alcohol abuse using a questionnaire and serum CDT (carbohydrate deficient transferrin) measurement. Patients having negative CDT were allocated to group A. Patients having positive CDT ± questionnaires were randomized to receive 20 mg i.m. diazepam daily – group B, or control (same volume i.m. saline) – group C, for at least 5 perioperative days. All patients developing AWS received treatment with diazepam, haloperidol and clonidine. Major endpoints were incidence of AWS, complications (infectious and non-infectious), length of stay and mortality. Statistics was done with SPSS 13.0 ($p < 0.05$)
Results and Discussion: Eight hundred and sixty-five patients were enrolled in the study (757 in group A, 53 in group B and 55 in group C). Demographic data was similar between groups and also mortality rate. Three patients in group A, 9 patients in group B and 29 patients in group C developed AWS ($p = 0.001$ group C vs B). Total complications rate was 6.60% in group A, 11.32% in group B and 25.45% in group C ($p < 0.05$ in group C vs B and C vs A, respectively). LOS was longer in group C vs A and B (16.46 ± 7.90 vs 9.34 ± 3.56 and 7.68 ± 3.74 days, $p < 0.05$).
Conclusion(s): More than 12% of patients scheduled for major orthopedic surgery are chronic alcohol abusers and at risk of developing perioperative AWS. Preoperative identification and prophylaxis of AWS decreases postoperative complications and length of stay in these patients.

1AP1-7

Audit of anaesthetic referrals in preoperative assessment clinic

S. Setty, M. Chapman

Anaesthetics, UCLH, London, United Kingdom

Background and Goal of Study: Pre-operative assessment clinic has improved peri-operative care and there is evidence to support this. NHS modernisation agency has produced guidelines on preoperative assessment for inpatients. The aim of the study was to evaluate the preassessment clinic in terms of workload, quality of care and efficiency.
Materials and Methods: This audit was a retrospective analysis of 6 months from January to June 2008. We analysed the anaesthetic referral document for the indications of patient referrals, evaluation and management. All patients are first evaluated by a trained nurse and then if needed are referred as per guidelines to the consultant.
Results and Discussion: A total of 468 patients were referred for consultation. The referral indications were investigation (241 pts–51.5%), clinical (163 pts–34.8%) and combination of clinical & investigation (64 pts–13.7%). The most common reason for referral in the investigation group was ECG followed by bloods. Amongst clinical reasons, 89 patients had multisystem co-morbidities, 53 had cardiac diseases and 21 had other concerns like airway and high BMI. Patient evaluation–The ratio of notes reviewed to patients examined was 2.8:1. On further analysis, 3% of patients were seen by an anaesthetist in the investigation group, where as 52% and 43% of the patients were seen in the clinical and the combination group respectively. This is explained by the co-morbidities requiring detailed assessment. Management of referred patients–69.7% of the referred patients had surgery as planned. 23.5% underwent surgery as planned but following some intervention. 6.8% had their surgery postponed. The interventions included optimisation, informing the concerned anaesthetist, involving pain team, admitting the patient, booking ITU/HDU bed, & advice to undergo the procedure under Local Anaesthesia. The reasons for postponement were significant co-morbidities needing more time for optimisation, newly diagnosed cardiac disease and active source of infection.
Conclusion(s): The workload is variable and there is systematic approach in managing the referred patients. The peri-operative interventions ensured improved patient care and optimum utilisation of available resources. For every 100 patients referred, 6–7 patients had their surgery postponed. Early recognition of unfit patients ensured proper planning, patient safety & re-organization of theatre list.

1AP1-8

Comparison of different anesthetic techniques for inguinal hernia repair surgery in Spain: TACHI multicenter study

J. Zaballos, S. Lopez, M. Zaballos, J. Gómez, J. de la Pinta

Anesthesiology, Policlinica Guipúzcoa, San Sebastian, Guipúzcoa, Spain

Background and Goal of Study: Inguinal hernia is a very common elective procedure entailing low risk. The choice of the anesthetic technique and the postoperative protocols are decisive in order to effectively discharge the patient home. The goal of the study was to evaluate if a relationship exists between the anesthetic technique and the patient condition, the presence of Major Outpatient Surgery (MOS) Units and the postoperative period data.
Materials and Methods: A prospective, multicenter, epidemiological study was carried out in 20 anesthesia units belonging to hospital centers or associated to MOS Units. Each investigator recruited 12 patients undergoing inguinal hernia repair surgery and after a case report form was completed.
Results and Discussion: 238 of 240 recruited patients (pt) were evaluated for comparison among the different anesthetic techniques, 27.3% underwent general anesthesia (GA), 60.1% regional anesthesia (RA) and 12.6% local infiltration anesthesia (LIA). Significant differences were obtained regarding the type of hospitalization: GA was used in 54% of the pt when ambulatory surgery was performed, 22.2% in short stay surgery and 23.8% in surgery admission, RA was used in 35.7% of the pt in ambulatory surgery, 30.1% in short stay surgery and 34.3% in surgery admission. LIA was used in 80% of the pt in ambulatory surgery, 16.7% in short stay surgery and 3.3% in surgery admission. There were not any differences related to pt sex, but differences were found between the use of GA and RA in the groups of age younger than 30 years old and older than 30 years old. Co-existing diseases did not affect the choice of the anesthetic technique. Regarding post-anesthetic data, PACU stay, adverse events and surgeons satisfaction degree, there were no differences among GA, RA and LIA. When the pt was treated in MOS Unit there were significant differences regarding time between the end of surgery and discharge, most of the pt who underwent GA (94.1%) and LIA (100%) were finally discharged before 6 hours while only 68% of pt who underwent RA were discharged in this range of time. Finally the majority of anesthesiologists would repeat the same anesthesia technique (range 95.8%–100%) in MOS Units.
Conclusion(s): 1. GA is most frequently used when surgery is performed in the ambulatory setting. 2. GA and LIA provide a shorter discharge time, from the end of surgery, than spinal anesthesia. 3. Delayed discharge after surgery with spinal anesthesia may be due to the use of long acting local anesthetics.

1AP2-1

Patients' knowledge and concerns about anaesthesia

E. Tecoult, I. Abo Ebeid

Department of Anaesthesia, West Middlesex University Hospital, Isleworth, Middlesex, United Kingdom

Background and Goal of Study: Patients can receive a vast amount of medical information from various sources. However, this information is not always

accurate. Some of them also use complementary medecines with the belief that they are harmless. We decided to assess their level of knowledge of anaesthesia, their fears, expectations as well as their use of complementary medecines.
Materials and Methods: In this prospective study, a questionnaire was given to 112 consecutive ambulatory and orthopaedic patients before the surgery. The questions related to their use of complementary medicines, their concerns and desire for information.
Results and Discussion: 20% of patients used herbal medicine. Their three biggest concerns were pain (59%), hospital acquired infection (28%) and awareness during general anaesthesia (28%). 16% were concerned about the risk of death. However, 9% reported they had no concerns at all. Half-way through the study, two independent events happened within two weeks:–A real case of awareness during general anaesthesia was reported in a local newspaper–The release of the movie "Awake" also depicting a case of awareness under general anaesthesia. The rate of patients reporting awareness as one of their concerns rose from 24% before the two events to 33% ($p < 0.05$). 53% of patients wanted to always know if there was a risk of death, no matter how small. On the other hand, 17% declared never wanting to know if this risk existed, no matter how high. The other patients answered they wanted to be informed if the risk was above a certain threshold (1 in 10 to 1 in 100 000).
Conclusion(s): The rate of patients taking herbal medicine was higher than previously reported in the UK (1), but might reflect the habits of our local population. Since some plant extracts seem to interfere with anaesthetics, it is important to specifically enquire about their use during preassessment. Patients' concerns depend on such factors as age, sex and social background (2). Our results show that they are also influenced by the media. Most patients have expressed the wish to know about the risk of death event when it was small. Therefore this information needs to be more explicitly given.
References:
1 Skinner CM, Rangasami J. Preoperative use of herbal medicines: a patient survey. Br J Anaesth. 2002 Nov; 89(5):792–5.
2 Bugge K, Bertelsen F, Bendtsen A. Patients' desire for information about anaesthesia: Danish attitudes. Acta Anaesthesiol Scand. 1998 Jan; 42(1):91–6.

1AP2-2

Patient education and anaesthesia: Effect of a patient information leaflet on perceived information gain, anxiety, and patient satisfaction

N. Smart, D. Varveris

Dept of Anaesthesia, Victoria Infirmary, Glasgow, United Kingdom

Background and Goal of Study: Preoperative patient education aims to decrease anxiety [1] and increase knowledge for informed consent [2]. If much of this information can be provided before the preoperative consultation, anaesthetists can focus on the specific needs of the individual. The aim of this study was to investigate the effect of a patient information leaflet on anxiety, perceived information gain and patient satisfaction.
Materials and Methods: With consent,107 patients were recruited in a one month period. After measuring baseline anxiety (100mm visual analogue scale), patients were asked to read an information leaflet [3]. The VAS anxiety rating was repeated, and patients were asked to complete and return a piloted questionnaire examining three domains using 5 point Likert scales: effect on anxiety, perceived information gain about risk and processes, and overall satisfaction with the information provided. Results calculated as percentages and compared by Chi square analysis where appropriate ($p < 0.05$ significant).
Results and Discussion: Complete data sets for 66 patients were obtained (response rate 62%). Mean age was 39 ± 14 years, and 64% were female. Anxiety was not significantly different before and after reading the leaflet ($p < 0.05$) and this was supported by Likert scale data with 52 (79%) finding the leaflet neither helpful nor unhelpful. In contrast, 45 (68%) considered the anaesthetic consultation to be an effective intervention in reducing anxiety. With regard to information gain, 54 (82%) indicated that the leaflet answered most or all of their questions, 58 (88%) believed that the leaflet contained enough information, and 51 (77%) found the information easy to understand. Overall, 49 (74%) respondents perceived the leaflet to be of value in educating them about the anaesthetic. Sixty (91%) were quite or very satisfied with the information provided by the leaflet.
Conclusion(s): Reducing patient anxiety is one of the main purposes of the preanaesthetic consultation. This study found no significant reduction in anxiety attributable to reading the patient information leaflet, although anxiety was reduced in the majority by talking with the anaesthetist. The main benefit was an increased level of perceived knowledge about risk and process. As such, the information leaflet contributes to patient centred care, helping patients to make informed choices and strengthening the process of consent.
References:
1 Capuzzo M et al. *Anes Analg* 2007; 105:435–442.
2 Thoms G et al *Br J Anaes* 2002; 89:917–9.
3 www.rcoa.ac.uk/docs/section4-ifp.pdf (accessed 07 12 08).

1AP2-3

Are anesthesiologists prone to burnout?

R. Stefanovic, N. Petrovic Stefanovic, I. Perunicic, D. Lecic Tosevski

School of Medicine, Institute of Mental Health, Belgrade, Serbia

Background and Goal of Study: Burnout syndrome, characterized by emotional exhaustion, depersonalization, and lowered sense of professional accomplishment, is a frequent consequence of chronic stress. Few studies have been published on burnout in anesthesiology even though this specialty is considered particularly stressful. The implication of anaesthetists responsibility in accident investigation increases these inherently stressful working conditions. The goal of this studie is to assess the prevalence of burnout syndrome in anesthesiologists.
Materials and Methods: The sample consisted of 50 anesthesiologists from a University hospital in Belgrade. The burnout was assessed using Maslach Burnout Inventory, which addresses three general scales–emotional exhaustion, depersonalization, and reduced personal accomplishment.
Results and Discussion: Our results indicate that burnout is highly prevalent among anesthesiologists. We detected high levels of emotional exhaustion in 65.6% of them and of depersonalization in 37%. The scores reflecting low levels of sense of personal accomplishment were recorded for 100% of the sample.
Conclusion(s): Our findings indicate that burnout is highly prevalent among anesthesiologists and are in accordance to other authors. The study underscores the significant problem of stress among physicians and indicates the need for supporting health professionals in order to improve their psychological well-being and, possibly, the quality of their relationship with the patients. So, preventing burnout is a challenge for the medical profession, for individual physicians as well as for institutions in which they work.
References:
1 Barnett R C & Brennan R T. The relationship between job experiences and psychological distress: A structural equation approach. Journal of Organizational Behavior 1995; 16:259–276.
2 Maslach C, Schaufeli WB, Leiter MP. Job burnout. Annu Rev Psychol 2001; 52:397–422.
3 Maslach C. & Jackson S. E. (1986). Maslach Burnout Inventory. Manual Research Edition. Consulting Psychologists Press: Palo Alto Ca.
4 Nissen AS, Hansez I, Baele P, Lamy M, De-Keyser V. Occupational stress and burn out in anesthesia. Br J Anaesth 2003; 90:333–7.
5 Demeoruti E, Bakker AB, de Jonge J, Janssen PP, Schaufeli WB. Burnout and engagement at work as a function of demands and control. Scand J Work Environ Health 2001; 27:279–86.

1AP2-4

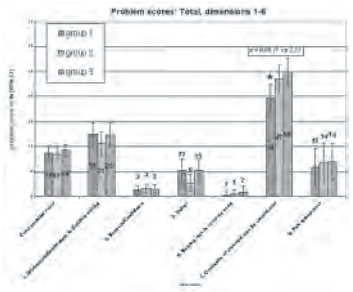
Continuity in anaesthesia – Perception of personal continuity of anaesthesia care and influence on patient satisfaction

D. Saal, R. Germann, M. Nuebling, T. Heidegger

Anaesthesia and Intensive Care, Landeskrankenhaus, Feldkirch, Austria

Background and Goal of Study: Information and continuity are mainly responsible for patient satisfaction (1,2). With the invention of the preoperative assessment clinic at our tertiary care hospital information greatly improved whereas continuity deteriorated because of the lack of personal continuity (2). Most patients face various anaesthetists during the perioperative period. We wanted to find out if personal continuity for the postoperative visit improves perception of continuity and thus patient satisfaction in general.
Materials and Methods: We randomly assigned 3 groups of patients (age 16 or more) with 200 participants in each group. Group 1 had a postoperative visit by the same anaesthetist who led their anaesthesia. Group 2 was visited by an anaesthetic nurse. Group 3 (control group) didn't receive a postoperative visit. A standardized questionnaire was sent to all participants within 2 weeks after discharge from hospital (1). We allowed one identical reminder to enhance response rate. We measured response rate, the total mean problem score and the mean problem scores of the 6 underlying dimensions. The higher the score the less patients are satisfied with the dimension concerned. Data are presented as means in% (95% confidence interval). *$p < 0,05$ for the comparison of the means was considered significant.
Results and Discussion: Randomized groups did not differ in sociodemographic parameters. Response rate wasn't significantly different between groups 1,2 and 3 (60%, 64% and 59%). Continuity of personal care (dimension 5) showed a significantly lower problem score for group 1 versus 2 and 3 (40%

versus 47% and 50%). Total mean problem score and the scores of the other dimensions did not differ significantly between groups.



Conclusion(s): The postoperative visit by the same anaesthetist who led the anaesthesia improves the perception of continuity. Patient satisfaction with anaesthesia care in general is not affected though.

Acknowledgements: We thank the Picker Institute for the provision of their anaesthesia questionnaire.

References:

1 Heidegger T, Husemann Y, Nuebling M, et al. Br J Anaesth. 2002; 89:863–72.
2 Heidegger T, Nuebling M, Germann R, et al. Can J Anaesth. 2004; 51:801–5.

1AP2-5

Humans or machines? Influence of anesthesia on the satisfaction of the patients

B. Martinez Tasis, J. Casielles Garcia, E. Ramos Martinez, B. Fernandez Torres, M. De las Mulas Bejar

Anesthesiology, Virgen Macarena Hospital, Seville, Spain

Background and Goal of Study: New technologies and scientific advances have improved daily labor of sanitary personal, but they also have determined a cold treatment to the patients. Work conditions and welfare pressure in public hospitals of our country cause that communication with the patient is limited in some moments. This situation produces discomfort and restlessness in some patients. With this study we want to determinate which are patients' feelings before come to the operating room, their expectative, relation established with sanitary personal and their degree of satisfaction about anesthesia techniques.

Materials and Methods: For three months of 2008 we have realized 420 postoperative surveys to patients belonged to the area of Virgen Macarena Hospital, in Seville. We value age, sex, level of studies, type of anesthesia, anxiety before come to operating room, sensations after the reversion of anesthesia and the global satisfaction with the process. There are excluded from the study those patients who present a low capacity for relation or low conscience (neurological affectation, children). There is realized a questionnaire consisted of 16 simple questions, 14 closed answer and 2 free answer. There is realized chi square test to establish the level of statistical significance $p < 0.05$.

Results and Discussion: The middle age is 50.8 ± 18 years, 51.1% of the interventions carries out in women. Only 12.8% of the patients have university studies. 46% feel nervous and/or worried before come in the operating room in spite of the premedication. In 44% of the cases they say that they spoke with the anesthesiologist before come in the operating room, and they felt less nervous ($p = 0.0001$). Sensation in Post-Anesthesia Care Unit have been well-being in 67.8% of the cases ($p = 0.001$). 83.9% of the patients indicated that the process have worked out better than they were waiting ($p = 0.0001$). 98.2% affirm to be "satisfied" or "very satisfied" by anesthetic treatment received.

Conclusion(s): We think that knowing satisfaction of the patients in relation to the anesthetic process is interesting to determinate the quality of our labor. Our survey has revealed us that is important to speak and to explain the process of the anesthesia to the patient in order to transmit confidence and safety. 82.4% of the patient report a conversation with sanitary personal before come in the operating room, which made them feel better, giving humanity to the surgery process. More than 50% of this sanitary personal have been identified like the anesthesiologist.

1AP2-6

Stress and fatigue among Lithuanian anaesthesiologists

D. Bilskiene, A. Kolciniene, A. Macas, A. Karbonskiene

Anaesthesiology, Kaunas University of Medicine, Kaunas, Lithuania

Background and Goal of Study: Evidence shows that anaesthesia is a stressful occupation and it may have an impact on anaesthetist's well-being. Goal of the study: to evaluate stress and fatigue and their correlation with working conditions among anaesthesiologists employed in Kaunas city (Lithuania) hospitals.

Materials and Methods: 142 doctors of anaesthesia and intensive care departments were interviewed using standard questionnaire in the year 2008. It consisted of three parts: first part covered demographic and social situation, second – stress experienced during work, third – risk of fatigue.

Results and Discussion: Response rate was 71%. Average age of respondents was 41 yrs, 66.2% them were female. 25.4% had working experience <5 yrs and 23.2% – 11–15 yrs. Work load of 49.3% of respondents was 37–54 hours per week (mean number of on-call nights per month – 6.5; 15.3% of respondents had >9 on-call night shifts. Often and very often stress was experienced by 24.6% of doctors; symptoms of fatigue demonstrated 57% of respondents. Respondents older than 55 yrs emphasized increased blood pressure, while younger – up to 34 yrs – inability to concentrate, decreased objectiveness, unstable mood, difficulty in making decisions. Respondents living without partners experienced chest pain, anger and nuisance. Doctors experience less stress if are satisfied with their work and if workload is adequate, while increasing pressure by hospital administration to decrease costs of care increased risk of fatigue. If doctor is employed for more 40 hours per week he faces difficulties to concentrate, while more than 60 hours per week causes interference with home life.

Conclusion(s): Every fourth anaesthesiologist experienced stress during work, while more than a half had symptoms of moderate fatigue. Growing workload increased doctor's stress. Pressures by hospital administration, limited freedom in decisions increased incidence of fatigue. Work satisfaction reduced risk of stress and fatigue. Stress and fatigue significantly correlated with state of physical health.

1AP2-7

Physical complaints of anaesthesiologists: What is the main reason?

V. Mazurok, K. Lebedinskiy

Anaesthesiology and Reanimatology, Medical Academy of Postgraduate Studies, St. Petersburg, Russian Federation

Background and Goal of Study: Anaesthesiologists are well known to be at high risk of physical and psychological disturbances [1, 2]. Effective risk protection requires estimation of main problems and its origins.

Materials and Methods: 311 Russian anaesthesiologists (average age 43 ± 2.7, men/women ratio 2/1), involved in our refresher courses were asked about their physical complaints and chronic diseases.

Results and Discussion: The most common physical complaint was back pain (74%); headache tortured up to half of audience (47.4%); the third place was taken by upper abdomen pain (29.5%). Back and upper abdomen pain together had 23.7%, overweight and high blood pressure – 22% and 15% colleagues, respectively. History of gastric ulcer had 12.7%. Having analyzed these data we believe that practically all complaints and diseases are well known to be connected with lifestyle and psychological condition. Headache is often connected with daily psychological load that inevitably presents in anaesthesiologists' professional work. Abdominal pain is connected not only with gastritis or ulcers [3] but seems to be a manifestation of so-called "irritated stomach". As to the back pain, obvious cause is heavy patients handling without proper assist devices.

Conclusion(s): Health problems among colleagues are connected with occupational hazards and profession-related stress. To alleviate the level of health damage special education courses should be provided during both residency and life-long learning.

References:

1 Beilin B et al. Acta Anaesth Scand 2006; 50(10):1223–1228.
2 Berry AJ, Fleisher LA Anesthesiology 2000; 93(4):919–921.
3 Shelley KH, Haddadin AS Anesth Analg 1998; 87:973–974.

1AP2-8

Patient satisfaction with anaesthesia care: Evidence from tertiary care centre in Lithuania

A. Karbonskiene, G. Zinkeviciute, A. Zarskus

Clinic of Anaesthesiology, Kaunas University of Medicine, Kaunas, Lithuania

Background and Goal of Study: patient satisfaction can be defined as indicator of the quality of anesthesia from patient's point of view. It depends on subjective patient's values and is the result of the comparison between expectations and perceived outcome. Knowing what is important for patients offers a space for continuous improvement of care.

Materials and Methods: a cross sectional study carried out at a major tertiary care hospital in Kaunas, Lithuania, in January of 2008. A standardized

questionaire (34 questions) covering all three (pre-, intra- and postanaesthetic) phases of care were presented to adult (excluding obstetric, cardiothoracic, neurosurgical) patients on the third postoperative day after informed written consent. The occurrence and severity of anaesthesia outcomes (pain, sore throat, thirst, etc.) were calculated as well as their prevalences. Spearman rank correlations were calculated for the different anaesthesia outcomes and the dimensions of the questionnaire. $P \leq 0.05$ was considered statistically significant.

Results and Discussion: a total of 308 (120 male and 188 female) patients having received general anaesthesia filled the questionnaire (response rate: 86,27%). Feeling unconfortable before induction of anaesthesia ($p = 0,035$) and pain during emergence ($p = 0,001$) negatively influenced overall satisfaction with anaesthesia care. Patients experiencing adequate respect during anaesthetic care were less prone to pay attention to painful procedures ($p = 0,037$) or discomfort ($p = 0,019$) in the operating room. There was no correlation between presence of painful procedures and perceived competence of anaesthetist. Younger age was associated with higher perceived respect during care ($p = 0,05$) and tendency to recommend the anaesthetist for patient's family ($p = 0,046$).

Conclusion(s): gender, education and age did not influence overall satisfaction with anaesthesia care. Adequate respect during care increased patient's comfort and satisfaction with anaesthesia services. Satisfaction with anaesthesia care directly depended on perioperative comfort.

1AP2-9

Does sevoflurane offer advantages over intravenous anaesthetic agents in morbid obese patients undergoing major surgery?

A. Siampalioti, A. Aretha, G. Monantera, A. Athanassopoulou, K. Filos

Anaesthesiology and Critical Care Medicine, University of Patras School of Medicine, Rion – Patras, Greece

Background and Goal of Study: Anaesthesia for patients (pts) with a body mass index (BMI) >50 constitutes an anaesthesia challenge. In this patient population, to date no study demonstrates clear cut clinical or cost differences between sevoflurane (SEVO) vs propofol (PROPO) – remifentanyl (REMI) titrated either with or without use of the bispectral index (BIS) in pts undergoing major surgery.

Materials and Methods: In a prospective, randomized study, 100 pts were assigned to one of 4 groups (grs): (1) SEVO (n = 25), guided by a target end tidal concentration 1–2 MAC and modified according to the haemodynamics (BP, HR) of the pts using a bolus inhalation (4 MAC), (2) SEVO-BIS (n = 25), using SEVO to a target BIS of 40–50, (3) PROPO-REMI (n = 25) and (4) PROPO-REMI-BIS (n = 25) accordingly. In grs 1 and 2, anaesthesia was induced with IV PROPO (2 mg/kg TW [= ideal body weight, IBW + 0.4 * difference to the excess weight]), REMI (1 μg/kg IBW) and succinylcholine (1mg/kg IBW). In grs 3, 4 anaesthesia was induced with a continuous IV PROPO infusion (21mg/kg TW/h for 5 min, 12 mg/kg TW/h for 10 min and then 6 mg/kg TW/h), followed by an IV bolus of REMI and succinylcholine as above. Every rise of BP or HR > 15% of baseline was followed by a bolus SEVO inhalation in grs 1 and 2 or REMI bolus IV (1 μg/kg IBW) and increase in the cont.infusion rate of REMI from 0.1 to 1.0 μg/kg/min in grs 3 and 4. An epidural catheter was placed prior to induction, only for postoperative analgesia. Intraop. BP and HR, anaesthetic consumption, recovery scores (Aldrete, Chung, White) and anaesthesia cost were evaluated. Statistics was by ANOVA and χ^2 test.

Results and Discussion: All grs were comparable in baseline characteristics. BMI was between 57.2 and 63.3 in all grs.

Conclusion(s): Time to eye opening and extubation were significantly higher in the SEVO grs (1,2). However, compared to grs 3,4, overall recovery times in the SEVO grs were not prolonged. Considering the lower cost, SEVO seems to have significant advantages in this patient population.

1AP2-10

Perioperative management of morbid obese patients (BMI > 40) versus super obese patients (BMI > 70): Is there any difference in the anesthesiological approach?

G. Monantera, A. Zotou, A. Siampalioti, P. Tagari, K. Filos

Department of Anaesthesiology and Critical Care Medicine, University of Patras School of Medicine, Rion – Patras, Achaia, Greece

Background and Goal of Study: Up to date, not sufficient epidemiological data exist regarding the anaesthesiological management of super obese patients (BMI > 70), indicating potential problems which might affect the perioperative morbidity. The present study evaluated the approach of patients with a BMI between 45–70 compared to those with a BMI > 70, who underwent biliopancreatic diversion with Roux-en -Y gastric by-pass (BPD-RYGBP).

Materials and Methods: A total of 109 morbid obese patients (BMI > 40) were included, which were divided according to their preoperative BMI in four groups: (1) BMI 40–50, (2) BMI 50–60, (3) BMI 60–70 and (4) BMI > 70. Preoperatively, in all patients an epidural catheter was placed. Anesthesia was induced after 5 minutes of preoxygenation using a bolus dose of propofol (2mg/kg of ideal weight + 0.4 of the difference with the excess weight), remifentanyl (1μg/kg of ideal weight) and succinylcholine (1mg/kg of ideal weight). Cis-atracurium was administered according to neurostimulator response, in order to achieve adequate muscle relaxation ($T_4/T_1 < 5\%$). The following variables were recorded: (a) factors of morbidity, (b) factors indicative of difficult endotracheal intubation, (c) anaesthetic agents consumption, (d) time and recovery index and (e) postoperative complications (table 1). Statistics was by ANOVA and Chi-square test.

Results and Discussion: No patient was admitted in the ICU postoperatively (table).

Conclusion(s): Even though the appearance of morbid obese patients with BMI > 70 is often imposing and the morbidity is increased, except of extubation or recovery times, other anesthesiological problems such as difficulty of intubation or drug dosing do not significantly vary between obese and super obese patients with a BMI > 70.

1AP3-1

A structured program for evaluation of medical technology in the OR of the future

W. Sandberg, A. Seim

Anesthesia & Critical Care, Massachusetts General Hospital, Boston, Massachusetts, USA

Background and Goal of Study: There is no systematic basis for selection, integration or outcome-evaluation of new OR technology. New technologies are selected and introduced largely at the behest of strong-willed clinical champions. Some technologies have strong clinical champions, while other necessary infrastructure technologies lack champions, thus languishing without support. After introduction, there is no way to evaluate whether new technology has met its goals.

Abstract 1AP2-9 – Patient characteristics, recovery data and anaesthesia cost

Groups	Eye opening (min)	Extubation (min)	Time to Aldrete > 8 (min)	Time to White > 12 (min)	Anesthetic Cost (€)
SEVO	13.9 ± 8.7	27.7 ± 14.1	2.1 ± 0.7	22.6 ± 19.6	49.8 ± 12.1
SEVO-BIS	15.0 ± 8.9	24.5 ± 11.9	2.6 ± 2.0	21.6 ± 20.9	48.2 ± 8.1
PROPO-REMI	3.51 ± 2.8*$	11.3 ± 4.4*$	3.8 ± 3.5	23.7 ± 15.3	69.9 ± 15.6*$
PROPO-REMI BIS	4.0 ± 2.6*$	11.5 ± 5.7*$	4.5 ± 6.5	23.6 ± 14.9	78.8 ± 21.6*$

Values are mean ± SD. *$: $P < 0.001$ for comparisons between grs 1 or 2 vs grs 3, 4 respectively.

Abstract 1AP2-10 – Patient characteristics, laryngoscopy and recovery data

	Group 1 (BMI 40–50, n = 12)	Group 2 (BMI 50–60, n = 54)	Group 3 (BMI 60–70, n = 25)	Group 4 (BMI > 70, n = 18)
Weight (kg)	129,3 ± 14,6	150,1 ± 18,9***	180,5 ± 19,8***	208,1 ± 28,1***
OP time (min)	172,6 ± 64,5	173,8 ± 58,5	180,5 ± 75,2	199,1 ± 65,9
Mallampati score (I/II/III/IV)	67%/33%/0%/0%	46%/50%/4%/0%	28%/60%/12%/0%	29%/59%/12%/0%
Cormack Lehane view (I/II/III)	75%/25%/0%	46%/46%/8%	36%/60%/4%	18%/82%/0%**
Extubation time (min)	16,5 ± 11	19,6 ± 12,8	25,2 ± 21,4	27,9 ± 19,5*
Chung score:45 min postop	8,75 ± 1,1	9,2 ± 0,9**	9,4 ± 0,8*	9,6 ± 0,5**

*P < 0.05, **P < 0,01, ***P < 0,001 for comparison between gr. 1 vs gr.2, 3 and 4 respectively.

Materials and Methods: We constructed a working OR within our suite to champion, implement and evaluate new infrastructure technology. Small teams comprising volunteer clinicians, members of OR administration and senior management perform the work. Individual & grouped technology assessments last approximately one year from concept to conclusion. We measure the effect of prolonged technology testing in live OR environments in terms of (1) problems found with a given technology [either in isolation or in combination with other technologies], (2) whether or not the technology met its goals, (3) whether the technology was selected for further implementation, and (4) the extent to which it was subsequently implemented.
Results and Discussion: The project evaluated 13 new technologies in its first 2 years of implementation, including OR tables, flat and touchscreen video displays, automatic-inventory supply cabinets, integrated endosurgical systems, and ceiling booms. Five technologies were judged unready for wide deployment or unsuited to our OR environment, four achieved limited adoption in environments where added value justified the cost, and four were deployed widely after evaluation. The institution developed and adopted a culture of measurement wherein new technologies were required to demonstrate cost savings, value added to patient care, or both. The number of avenues for technology entry into the OR did not change, but the expectation of rigorous value analysis was established widely. There was a stated goal of cycling through multiple projects, but staff felt a lack of technology 'stability', despite the prolonged trials and the teams comprised of volunteers.
Conclusion(s): Our 'Living Laboratory' OR facilitates prolonged testing of constellations of patient care infrastructure in an organizationally and physically circumscribed, yet 'live' clinical environment within the OR suite. This allows us to discover benefits and problems that only become apparent with co-deployment and prolonged use, and informed the design of a new OR building under construction.

1AP3-2

Patient-controlled versus anesthesiologist-controlled sedation with midazolam for port placement in interventional radiology unit

I. Erden, A. Pamuk, S. Akinci, M. Celik, U. Aypar

Anaesthesiology and Reanimation, Hacettepe University, Ankara, Turkey

Background and Goal of Study: Our purpose for this study was to compare patients' satisfaction and the clinical efficacy using midazolam either patient-controlled or anesthesiologist-administered (usual sedation regimen in our hospital) conscious sedation during port placement.
Materials and Methods: One hundred adult patients (ASA I to III) scheduled for port placement were recruited according to a randomized, institutional review board approved protocol. Anesthesiologist-controlled group received iv midazolam 0.03 mg/kg and fentanil 1 µg/kg, 1 minute before commencement of the procedure. During the port placement an anesthetist administered further bolus doses of 1 mg midazolam when the patient expressed discomfort. At patient-controlled group also patients were given the same drugs before the procedure. Than during the intervention patients were allowed to press demand button of the pump until they felt adequately sedated.
Results and Discussion: There were no differences between groups for age, weight, gender and ASA status. Sedation scores at 3, 5, 10 and 15th minutes were significantly higher in the group P. The median satisfaction scores for anesthesiologist-controlled group (0 = unsatisfied; 10 = completely satisfied) by radiologists was 10 (range 7 to 10), by the patients was 9 (range 6 to 10). The corresponding value for Group P, by radiologist was 10 (range 7 to 10), by patients was 10 (range 6 to 10).
Conclusion(s): PCS was associated with modestly greater patient satisfaction during port placement, compared with ACS. Patient-controlled sedation for port placement may be an effective option for sedation that is associated with higher patient satisfaction.

1AP3-3

Impact of a quality insurance program on quality of care after major orthopaedic surgery

N. Donat, S. Ausset, G. Pelee de Saint Maurice, E. Batjom, J. Schaal

Anesthésie Réanimation, Hôpital d'Instruction des Armées Percy, Clamart, France, Metropolitan

Background and Goal of Study: In order to assess the impact of quality of care on patient's outcome after major orthopedic surgery, a specific care program was introduced. In a previous study, its positive impact on long term cardiac outcome has been assessed with decreased incidences of both postoperative myocardial ischemia (MI) and long term major adverse cardiac event (MACE)–respectively 9.2% vs 2.9% (p = 0.017) and 8.6% vs 1% (p = 0.001). The aim of the present study was to assess the actual impact of this quality insurance program on patient's monitoring and therapeutic interventions.
Materials and Methods: During 3 years, quality of both prescripted and achieved postoperative cares after major orthopaedic surgery in a multidisciplinary hospital has been assessed. Numbers of measurements of pulse oxymetry, blood pressure, capillar glycemia prescripted and achieved during the first 4 postoperative days were measured to assess the quality of monitoring. The quality of therapeutic interventions was assessed through the frequency of oxygen or insulin administration and the amount of fluid therapy both prescribed and given. During the first part of the study (P1), postoperative cares were let at the discretion of every attending anesthesiologist. After 16 month of study, postoperative cares were improved through the implementation of standardized prescriptions according to a failure modes, effects and criticality analysis of the postoperative process (P2). Quality of care was compared between P1 and P2.
Results and Discussion: 387 patients were included, 130 for P1, 257 for P2. There were no statistically significant differences between the two phases neither in population characteristics nor in type of surgery. As expected, intensity of monitoring increased from P1 to P2 for mean number of pulse oxymetry (p = 0.008) and blood pressure measurements (p = 0.014). More patients received insulin or oxygen in P2 than in P1: respectively 26.4% vs 6.4% (p = 0.001) and 90% vs 79% (p = 0.047). There were no statistical differences neither in capillary glycemia mesurements nor in fluid resuscitation, nor between the two phases for the incidence of postoperative hypoxemia and hypotensions.
Conclusion(s): The implementation of a quality insurance program focused on postoperative anaesthesiologist prescriptions leaded to increase the intensity of both monitoring and therapeutic interventions during the four postoperative days. This improvement was correlated with a decreased risk of MI and long term MACE.
Reference:
1 Ausset S, et al. Eur J of Anaesthesiol 2008;25:12.

1AP3-4

Prevalence of anaesthesia information management systems in university-affiliated hospitals in Europe

J. Balust, G. Martinez-Palli, I. Merino, C. Egger-Halbeis, A. Macario

Anesthesia, Hospital Clinic Barcelona, Barcelona, Spain

Background and Goal of Study: An increasing number of studies suggest that Anaesthesia Information Management Systems (AIMS) improve clinical care. The purpose of this web survey study was to assess the prevalence of AIMS in European university-affiliated anaesthesia departments, and to identify the motivations for and barriers to adoption.
Materials and Methods: A survey was emailed to 252 academic anaesthesia chairs in 22 European countries, with 41 emails returned as undeliverable, leaving the final sample = 211. Responders provided demographics, the other information technology (IT) systems which were available in their hospitals, and implementation status of AIMS. Adopters were asked about motivations for installing AIMS, while non adopters were asked about barriers to AIMS adoption.
Results and Discussion: Eighty six (41%) of 211 hospitals responded. Forty-four of the 86 departments (51%) were considered AIMS adopters because they were already either using (n = 15), implementing (n = 13) or selecting an AIMS (n = 16). The 42 remaining departments (49%) were considered non-adopters since they were not expecting to install an AIMS due to either lack of funds (n = 27), other reasons (n = 13) such as lack of support from the IT Department, or simply did not have a plan (n = 2). The top ranked motivators for adopting AIMS were improved clinical documentation, improvement of patient care and safety, and convenience for anaesthesiologists. Adopters reported already having more IT systems deployed throughout the hospital.
Conclusion(s): At least 44 (or 21%) of the 211 University-affiliated departments surveyed in this study have already implemented, are implementing, or are currently selecting an AIMS. The main barrier identified by AIMS non-adopters is lack of funds.

1AP3-5

Anesthesia in Steinert's disease: Ten years' follow up

I. Chocrón, M. de Nadal, M. de Miguel, O. Martínez, J. Gámez

Departments of Anesthesiology and Neurology, Vall d'Hebron University Hospital, Barcelona, Spain

Background and Goal of Study: Steinert's disease or myotonic dystrophy (MD) is a severe multisystemic disorder and the most frequently autosomal dominant inherited neuromuscular disease. Some case reports (1) and

series of MD patients undergoing general anesthesia (2,3) are reported in the literature. The goal of our study was to describe the incidence of postoperative complications in patients with MD undergoing general, regional and local anesthesia.

Materials and Methods: 103 adult patients with confirmed diagnosis of MD were retrospectively studied over a ten years' period (1995–2005). Sex, age, type of surgery and anesthesia and drug's choice were recorded for every patient undergoing surgery. Postoperative complications, defined as acute respiratory failure (ARF), cardiac arrhythmia, bleeding and death in the first 48 hours after surgery, were recorded. Results are expressed in mean ± SD.

Results and Discussion: Of the 103 patients reviewed (42 men, mean age 39 ± 1,5 years), 73 (70, 8%) underwent surgery in the study period (Table 1). Anesthetic techniques are summarized in Table 2, being general anesthesia the most employed (45,5%). Five postoperative complications were recorded (6,8%), four of them involving ARF after general anesthesia and another case of bleeding after cesarean section under epidural anesthesia.

Table 1

	n (%)
Abdominal	24 (32.8)
Ocular	19 (26)
Plastic/Trauma	13 (17.8)
Gyne/Uro	8 (10.8)
Other	9 (12.6)

Table 2

	n (%)
General	33 (45.5)
Local ± sedation	23 (31.8)
Regional ± sedation	11 (15.1)
Conscious sedation	6 (7.6)

Conclusion(s): Patients with Steinert's disease present a high incidence of surgical events. Anesthesia is challenging in these patients as it may trigger myotonic/weakness crisis and may aggravate cardiac, respiratory and endocrine symptoms. Anesthetic technique has to be carefully selected to prevent postoperative complications.

References:

1 Catena V et al. Minerva Anesthesiology 2007; 73: 475–9.
2 Mathieu J et al. Neurology 1997;49:1646–1650.
3 Imison AR. Anaesth Intensive Care 2001;29:34–7.

1AP3-6

Elective surgery cancellations in Czech university hospitals: A prospective survey

J. Striteska, P. Stourac, K. Beranova, V. Cerny, J. Schreiberova

Department of Anaesthesiology and Intensive Care, Charles University in Prague, Faculty of Medicine in Hradec Kralove, Hradec Kralove, Czech Republic

Background and Goal of Study: Cancellation of scheduled surgery may have negative impact on the every hospital's economy. It leads to prolongation of hospital stay and increasing costs. Patients' satisfaction and economical situation are also influenced in a negative way. The aim of the study was to record the rate and the main causes of elective surgery cancellations in three tertiary care hospitals in the Czech Republic.

Materials and Methods: A prospective survey was made in three Czech university hospitals in the period of 1/2008–6/2008. Every case of pre-scheduled surgery cancellation was recorded in the predefined form by the anaesthesiologist. The forms included the formulation of the main cause leading to surgery cancellation. The obtained data were analysed using the methods of descriptive statistics. The results are presented as absolute figures and percentages.

Results and Discussion: During study period 36 634 elective procedures under anaesthesia were scheduled in general. The cancellation rate was 2,31% (846 cases). The causes were divided into 3 main categories: Organizational reasons (58,04%), Medical reasons (35,22%), Others (usually patient refusal to undergo surgery) (6,74%). The most frequent cause was the lack of theatre time due to over-run of previous surgery (27,78%). Detailed data are shown in table 1. Most of the organizational reasons were considered to be potentially avoidable. The percentage of the cancelled surgical procedures in all three hospitals is smaller in comparison with the results of other studies[1,2,3] (4–14%). Differences among these hospitals may be explained by different structure and capacity of particular hospitals.

Table 1: Rate and reasons of elective surgery cancellations

	Hradec Kralove	Brno	Praha	Total
Cancelled/Scheduled	263/8739	291/14908	292/12987	846/36634
Cancelled in%	3,01%	1,95%	2,25%	2,31%
Organizational reasons	147	190	154	491
Medical reasons	100	95	103	298
Others	16	6	35	57

Conclusion(s): Organizational reasons were the most frequent cause of surgery cancellation in all three hospitals. Despite the small number of cancelled cases, the majority of them should be considered as probably avoidable by better organizational management.

References:

1 Schofield WN, Rubin GL, Piza M, et al. Med J Aust. 2005;182(12):612–615.
2 van Klei WA, Moons KGM, Rutten CLG, et al. Anesth Analg 2002;94:644–649.
3 Sanjay P, et al. J Health Organ Manag 2007;21(1):54–58.

1AP3-7

Effect of a nurse-driven fast track program in uncomplicated patients on length of stay in the postanaesthesia care unit

A. Eichenberger, G. Haller, V. Lechappe, P. Garnerin, B. Walder

Anesthesiology, Pharmacology and Intensive Care, Hopitaux Universitaires de Genève, Geneva, Switzerland

Background and Goal of Study: The purpose of this study was to assess the impact of a fast track program (FTP) in ASA1-2 patients on length of stay in the postanaesthesia care unit (PACU-LOS) by comparing the period before and after the introduction of this program.

Materials and Methods: The investigated PACU has a 15 adult beds capacity for 7500 patients/year. Patients from general, orthopaedic, thoracic, vascular surgery and radiological, pneumological, gastro-intestinal procedures are admitted to this unit after intervention. Patients with monitored-anaesthesia care, peripheral neural block or outpatients are admitted to other units. The institution has no surgical intermediate care. In November 2007, we implemented a nurse-driven FTP for ASA1-2 patients after minor procedures; the program included the systematic use of a discharge scale (Aldrete Score) to estimate readiness for discharge and no validation for discharge by anaesthesiologists. Discharge criterion was a result ≥ 8 on the Aldrete Score (maximum 10). We performed a retrospective cohort study using anaesthetic electronic patient record and compared two similar periods: one in 2007, before program implementation (1 January–31 July) and one in 2008 (1 January–31 July), after implementation. Statistical analysis was performed using the Student-t test, Chi-square, Wilcoxon-rank and linear regression. PACU-LOS was statistically adjusted for confounding factors. A $P < 0.05$ was considered significant.

Results and Discussion: Patients characteristics, ASA score, type of anesthesia and surgery were similar between the two periods; only the number of elective procedures performed differed. Median PACU-LOS decreased from 152 to 135 min ($P < 0.001$) in ASA 1–2 patients after implementation of the FTP (Table 1). ASA 3–5 patients who did not benefit from the FTP, did not show any reduction of their LOS in the PACU ($P = 0.745$).

Comparison before and after FTP implementation in a multivariate analysis

LOS (median; IQR)	2007	2008	P*
All	163 (107–291)	148 (96–270)	< 0.001
ASA 1–2	152 (102–249)	135 (90–227)	< 0.001
ASA 3–5	203 (125–464)	197 (117–481)	0.758

*Adjusted in multivariate regression analysis for age, gender, type of surgery, type of anesthesia and emergency status

Conclusion(s): We observed a significant reduction of PACU-LOS in uncomplicated patients following implementation of the FTP. This FTP may improve operating theatre functioning. Impact of the FTP on patient's long term outcome needs to be determined.

1AP3-8

Delay on the first cut of the day – Who is responsible: The anesthesist or the surgeon

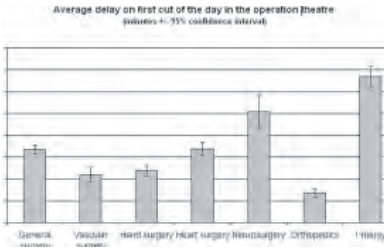
T. Kaufmann, M. Wöss, G. Schüpfer, C. Konrad

Anesthesiology and Intensive Care, Kantonsspital, Luzern, Switzerland

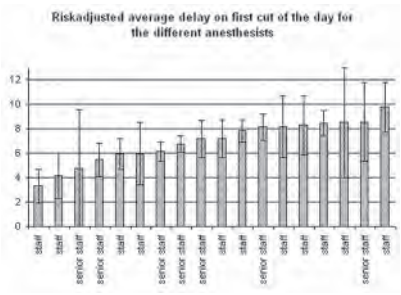
Background and Goal of Study: Most team members are angry about waiting for the first cut of the day. Waiting costs a lot of money: one minute from 30 to 50 dollars. While the waiting time the patient is narcotized and so in the most

unstable condition for the whole stay in hospital. Can the anaesthesiologist the time of the first cut positively influence?

Materials and Methods: The date form the process management tool was mapped with clinical data system over 4 years. The descriptive analysis showed significant differences between the different specialities (figure 1) and also between the different surgeons. Therefore this parameter was risk adjusted. So it was possible to find out, if the anaesthesiologist have an influence on the first cut. To reach statistical significance each surgeons with less than 10 procedures was excluded. Likewise delays of more than 40 minutes were excluded.



Results and Discussion: Within the different surgical subspecialties exist significant differences (n = 4009, average: 6,98 minutes, max: 8,24 min, min: 5,52 min). Although they use the same operations theatres and partially the same paramedical team. The inter individual differences between the surgeons are enormous: Average 6,5 min, max 16,4 min, min 1,7 min. There was no significant correlation of delay between the hierarchical position of the anaesthetist. Also the correlation of the anaesthetist and the surgeons was risk adjusted not significant (figure 2).



Conclusion(s): The delay of the first cut of the day is a cultural phenomena. This is shown in the significance differences between the different surgical subspecialties and the non variable parameters in the operations theatre. The potential of the influence through the anaesthetist is in our organisation very limited. Maybe a guided operations management by the anaesthesiologist change this picture.

1AP3-9

The evolution of operating room management from 2002 to 2007 in Germany

M. Berry, A. Schleppers

Clinic for Anaesthesiology and Operative Intensive Care Medicine, Universitätsklinikum Mannheim, Mannheim, Germany

Background and Goal of Study: As the cost of health care increases in Europe, there is pressure to keep down the cost of health care particularly for expensive segments. One of these segments in the operating room, especially a staffed operating room. It has fallen to many Anaesthesiology Departments to take on the task of re-organizing the operating room organizational structure to provide cost and services transparency with the hope of increasing efficiency. The goal of this study is to evaluate how the development of OR management over a 6 year period by anaesthesiology departments affects cost and service efficiencies in the surgical suite.

Materials and Methods: We used data from 112 German Anaesthesiology Departments for 2002, 2005 and 2007. We develop and tested hypotheses about how operating room management forms have been implemented and the effects of these implementations. Structural and organizational components such as hospital size, personnel, level of care, expanded responsibilities of the anaesthesiology departments (such as pain management, ICU, emergency medicine) were tested as to their influence on the adoption of a formal OR management forms. Cost and service efficiency proxies were defined and tracked for individual hospitals and hospital types, with respect to both the structural components and the OR management forms. Hospitals which had adopted formal OR management forms prior to 2002 were tracked for any changes.

Results and Discussion: There is a clear trend towards adopting formal OR management forms. In 2002, only 33% had a formal OR manager, this increased to 55% by 2005 and 59% by 2007. What has not changed is that about two-thirds of OR managers are only part-time in this position, with most also acting as a senior staff physician. Economies of scale are a significant factor in both cost and service efficiencies in the surgical suite. From 2002 to 2007, there has been an average increase in the number of incision-closing surgical minutes across all hospital sizes and levels of service. The existence of an OR manager is linked to other internal controlling mechanisms (5% vs. 25%). How long an OR management form has been in place is linked positively to increases in cost and service efficiencies.

Conclusion(s): From 2002 to 2007 there is a clear trend for anaesthesiology departments in adopting OR management forms. Our analysis shows that departments with a longer existence of formal OR management forms are better able to meet the increased demand for more surgical time with increasingly limited resources.

1AP3-10

Technologies for coordination support in hospitals – A review

E. Karlsen, A. Seim, A. Faxvaag, W. Sandberg, P. Toussaint

Department of Computer and Information Science, Norwegian University of Science and Technology, Trondheim, Norway

Background and Goal of Study: The dynamic, complex and variable nature of hospital work presents significant coordination challenges. Clinicians spend much time gathering and sharing information in order to coordinate their work, and their means are often ad hoc and interruptive. We hypothesized that technology may have advanced to such a degree that there would be literature reports of successful implementations wherein new technologies had been used to achieve more effective coordination and mitigate the workload it imposes on hospital staff.

Materials and Methods: We did a literature search for novel technologies used for coordination in hospitals in the following electronic databases: PubMed, International Journal of Medical Informatics, ACM Digital library, IEEE Xplore, CiteSeer, and Google Scholar.

Results and Discussion: We identified 13 primary studies and two secondary studies. The degree to which the technologies were realized varied from concept proposals to fully deployed systems. Six of the systems were tested in actual hospital settings. We identified four main strategies used to increase clinicians' situational awareness and support coordination: 1) Location tracking of staff and equipment; 2) visulization of ongoing activities and processes; 3) communication support; and 4) access to and integration with existing hospital information systems. Most of the proposed systems utilized two or more of these modalities. While some of the studies connected their work to established theories for coordination and workflow, most referred to the special challenges presented by hospital work either in general terms or by referring to work place studies, and analysed the requirements for their system accordingly. A few of the studies elaborated on existing theoretical frameworks for coordination, or proposed new frameworks.

Conclusion(s): Several of the technologies and concepts seemed promising and proposed concepts for coordination support which warrant further investigation. However, when evaluations were performed, they tended to focus on the systems' impact on local workflow and usability. Most evaluations were qualitative, and none attempted to measure the system's operational impact. Although such measurements may be hard to perform, without them one cannot conclude that coordination technology as currently realized improves workflow.

1AP4-1

Can the introduction of a practice advisory on preoperative investigations result in cost savings? A prospective audit

K. Venkatachalam, S. Mannion

Department of Anaesthesiology, South Infirmary Victoria University Hospital, Cork, Ireland

Background and Goal of Study: The practice of doing routine preoperative investigations for patients undergoing anaesthesia is common in many institutions. Many of these investigations are unnecessary and do not alter subsequent anaesthesia management (1). Guidelines introduced by both the ASA and NICE, advise that investigations be performed based on the individual patient's medical profile (2,3). We therefore carried out a prospective audit to determine if

the application of guidelines could reduce the number of preoperative investigations ordered and result in potential cost savings.

Materials and Methods: A **prospective audit** of sixty consecutive adult patients, undergoing surgery was performed. For each patient we recorded whether the following investigations were performed: FBC, CXR, ECG, U&E's, Coag, LFT, Random Glucose, routine Urine testing, Pregnancy test. We developed guidelines based on the **ASA practice advisory** (2) and the **NICE guidelines** (3) on preoperative testing. These patient's charts were then reviewed and the new guidelines applied to determine if any investigations done would have been unnecessary.

Results and Discussion: Our data demonstrated that most patients had investigations performed that were not necessary as part of their anaesthesia management. This results in a potential saving of €3180 for these 60 patients, averaging €53 per patient. The average number of adults having surgery is 4500 per annum. This would result in a potential saving of € 238500 per annum for our hospital.

PRACTICE ADVISORY

N = 60 patients	Number of investigations performed (Current Practice)	Number of Investigations required (Practice Advisory)
FBC	56	32
ECG	46	19
CXR	41	2
U&E's	53	12
COAG	41	3
TOTAL COST	4049 euros	869 euros
	Potential Savings	3180 euros

less number of investigations required with practice Advisory

Conclusion(s): Routine preoperative investigations are not recommended. The development of departmental guidelines can reduce the number of unnecessary investigations performed. This may have significant cost saving benefits although we accept that other medical staff may have to order specific investigations as well.

References:

1 Bryson GL. Preoperative testing is inconsistent with published guidelines and rarely changes management. Can J Anesth 2006; 53: 236–241.
2 Practice Advisory for Preanesthesia Evaluation. Anesthesiology 2002; 96:485–96.
3 National Collaborating Centre for Acute Care. Preoperative Tests: The use of routine preoperative tests for elective surgery. http://www.nice.org.uk/nicemedia/pdf/Preop_Fullguideline.pdf.

1AP4-2

Is ignorance bliss? Where are post exposure prophylaxis drugs kept in your hospital?

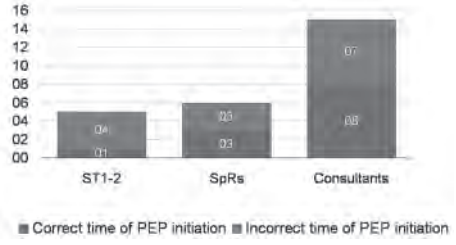
T. Myszewski, E. Traer, T. Aziz

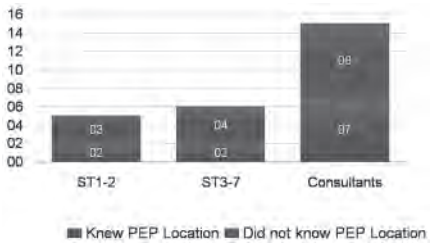
Department of Anaesthetics, Western General Hospital, Edinburgh, United Kingdom

Background and Goal of Study: Do anaesthetists know when to start post exposure prophylaxis following an HIV needlesstick injury? Do they know where the antiretrovirals are kept in their hospital? We hypothesized that there is a lack of knowledge on both the above.

Materials and Methods: The study was carried out using a questionnaire distributed to anaesthetists. Data was collated and results analysed by subdividing into three groups: consultants, senior trainees (ST3-7) and junior trainees (ST1-2). The results obtained are presented as bar-graphs.

Results and Discussion: 26 of 30 questionnaires were returned. Less than 53% of all respondents knew the recommended time for starting PEP. Similarly only half of respondents knew the location of PEP drugs. HIV seroconversion following occupational exposure is a serious complication. Post exposure prophylaxis with antiretrovirals can reduce risk. Guidelines recommend PEP within 1 to 2hrs following exposure. Staff must be aware of how soon they need to start PEP and where they can obtain antiretrovirals.





Conclusion(s): Rationale for post exposure prophylaxis and location is crucial to reduce risk of occupational HIV seroconversion. All at risk staff should know this information. Our study suggests that only half of our consultants are aware when to start PEP and where to find it, with the percentage falling below 50% in the remaining groups. This study has improved staff knowledge regarding PEP use, however further measures may be required to make our anaesthetists knowledgeable about PEP. We believe that this relative lack of knowledge is not unique to our department and ought to be addressed by all healthcare workers who may potentially be exposed to needlestick injury.

Reference:

1 P Diprose et al. Br J Anaesth 2000; 84: 767–71.

1AP4-3

Cardioversions – The Welsh survey

O. Pemberton, S. Balachandran

Anaesthetics and Intensive Care, Cardiff University, Cardiff, Wales, United Kingdom

Background and Goal of Study: Cardioversions are associated with significant side-effects such as burns, new arrhythmias, thrombo-embolism and cardiac arrests. These procedures are often done away from the operating theatre. The Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines for monitoring require the same standards for all anaesthetic procedures, regardless of location[1]. The AAGBI also requires skilled assistance for all anaesthetic procedures[2]. This survey was carried out in order to assess knowledge, attitudes and practice among anaesthetists in Welsh hospitals.

Materials and Methods: Survey questionnaires were sent to the anaesthetic departments of 17 major Welsh hospitals. Anaesthetists were asked about their preferences of drugs[3], airway management and monitoring devices. The locations of elective and emergency cardioversions and the availability of anaesthetic support staff were also sought.

Results and Discussion: 120 replies were received with 14 hospitals (82.4%) represented. Of the respondents 61 were consultants, 13 were non-consultant career grades and 46 were trainees. While elective lists were generally done either in coronary care units or operating theatres, emergency cardioversions took place in a variety of locations. Face mask anaesthesia was used by 81.9% of respondents with 8.5% intubating and 6.4% using the laryngeal mask airway. 46.7% gave postoperative analgesia, usually paracetamol.

Do you have an Operating Department Practitioner when doing cardioversions? (n = 88)

Yes	No	ICU nurse	Anaesthetic nurse	Don't know
79	5	1	1	2
89.8%	5.7%	1.1%	1.1%	2.3%

Monitors used during Cardioversions (n = 86)

ECG	Pulse oximetry	Non-invasive blood pressure	Capnometry	Volatile agents	Others*
86	85	84	60	19	2
100%	98.8%	97.7%	69.8%	22.1%	2.3%

* 1 used invasive arterial monitoring, 1 used 12 lead ECG.

Conclusion(s): The majority of respondents adhered to AAGBI guidelines. In a few cases though AAGBI standards of monitoring were not being met and skilled assistance was not immediately available. Several respondents voiced concerns about the seniority of staff doing the procedures. Guidelines for cardioversions should be devised to improve practice and facilitate future audit.

References:

1 Recommendations for Standards of Monitoring during Anaesthesia and Recovery, 4th Edition. AAGBI, March 2007.
2 The Anaesthesia Team, Revised 2nd Edition. AAGBI, March 2005.
3 Karthikeyan S, Balachandran S, Cort J *et al*. Anaesthesia for cardioversion: a comparison of sevoflurane and propofol. *Anaesthesia* 2002; 57: 1114–1119.

1AP4-4

Remifentanil based anaesthesia provides early emergence and stable haemodynamics in patients undergoing laryngomicrosurgery

J. Yoshino, K. Morikawa, M. Motoyama, H. Setoguchi, H. Tanaka

Anesthesia and Clinical Research Institute, Kyushu Medical Center, Fukuoka, Japan

Background and Goal of Study: Maintaining haemodynamic stability during anaesthesia in laryngomicrosurgery is difficult because of the high level of stress caused by surgical procedures using rigid direct laryngoscopy. Balanced anaesthesia with sevoflurane is widely accepted for general anaesthetic management. We hypothesized that short-acting anaesthetics such as remifentanil may be superior to a standard fentanyl general anaesthetic technique. This study was designed to compare emergence and haemodynamics using propofol/remifentanil vs. sevoflurane/remifentanil vs. sevoflurane/fentanyl in laryngomicrosurgery.
Materials and Methods: Thirty-six adult patients undergoing laryngomicrosurgery were randomly assigned to three groups: maintenance of anaesthesia with propofol/remifentanil (Group A, n = 12), sevoflurane/remifentanil (Group B, n = 12) or anaesthesia with sevoflurane/fentanyl (Group C, n = 12). Exclusion criteria were a history of any disabling central nervous disease, hypersensitivity to opioids or routine use of sedative drugs. Anaesthesia was induced with propofol/remifentanil (Groups A and B) or propofol/fentanyl (Group C). Blood pressure was recorded at three stages: before and after induction of anaesthesia and at the beginning of the operation. Haemodynamic parameters (heart rate and blood pressure) and time to extubation were all recorded. Data were presented as mean ± SD. ANOVA, Scheffe F test and t-test were used to determine significance ($P < 0.05$), as appropriate.
Results and Discussion: Thirty-six patients were enrolled in this study; the groups were similar with respect to age, weight, height, ASA physical status and duration of surgery. Emergence time from anaesthesia in Groups A and B were quicker than in Group C. Time to tracheal extubation was significantly shorter in Groups A and B than in Group C ($p < 0.05$): mean time to extubation were 7.7 ± 3, 11 ± 2 and 20 ± 7 min, respectively. Neither blood pressure nor heart rate changed at the beginning of the operation in Groups A and B ($p = 0.4$), but both increased in Group C ($p < 0.05$). Comparable haemodynamic stability and early emergence suggest that remifentanil-based anaesthesia is a suitable alternative to the standard fentanyl-based general anaesthetic technique in patients undergoing laryngomicrosurgery. Remifentanil would be particularly desirable for short-time but highly stressful surgeries.
Conclusion(s): Remifentanil-based anaesthesia is suitable to patients undergoing laryngomicrosurgery.

1AP4-5

Assessment of the scope and quality of clinical practice guidelines in burn injury

I. Szegesdi, E. Kis, M. Zimányi, L. Vimláti, L. Kemény

Department of Anesthesiology, University of Szeged, Szeged, Hungary

Background and Goal of Study: Study objectives: To provide an evidence-based background for developing the Hungarian Burn Association burn injury guidelines, a systematic review of the literature was performed to identify published guidelines in burn injury and evaluate their quality.
Materials and Methods: A systematic search was performed for relevant literature from MEDLINE, SCOPUS, the Cochrane Library, the websites of several related journals and general medical journals, electronic databases of major guideline development agencies, and reviewing the reference lists of review articles and included guidelines. We also searched for guidelines of several websites of burn associations.
Results and Discussion: Measurement and results: From 546 citations, 21 relevant guidelines were identified. Each guideline was evaluated by tree reviewers using the Appraisal of Guidelines for Research and Evaluation (AGREE) instrument and was coded for clinical topics covered. Clinical topics were identified by reviewing burn practice guidelines. Of the 21 guidelines evaluated, 8 (38%) were evidence-based. The AGREE instrument rates guidelines along six domains. As a group, the guidelines performed well in the scope and purpose domain, with only 3 guidelines (14%) scoring < 50%, and in the clarity and presentation, 1 guideline (5%) scoring < 50%. For the remaining domains, however, the guidelines did not perform as well, as follows: for stakeholder involvement, 17 guidelines (81%) scored < 50%; for rigor of development, 13 guidelines (62%) scored < 50%; for applicability, 20 guidelines (95%) scored < 50%; and for editorial independence, 18 guidelines (86%) scored < 50%. After considering the domain scores, the reviewers recommended 12 of the guidelines (57%).
Conclusion(s): All major burn injury topics are covered by at least one guideline, but no single guideline addresses all areas. Furthermore, although existing guidelines may accurately reflect clinical practice, most performed poorly when evaluated for quality. Future guideline efforts that address each item of the AGREE instrument would add substantially to the literature.

1AP4-6

Evidence-based systematic review: Selective decontamination of the digestive tract – Bacterial resistance and cost effectiveness

B. Milicic, L. Soskic, T. Simic, N. Kostic-Kovacevic, N. Vranjkovic

Institute of Anaesthesia and Reanimation, Clinical Centre of Serbia, Belgrade, Serbia

Background and Goal of Study: In our research synthesis we want evaluate emergency of resistance and cost-effectiveness using selective decontamination of the digestive tract (SDD) as prophylactic method of nosocomial infections. SDD has become both the most criticized and, paradoxically, the best evaluated intervention in intensive care medicine.
Materials and Methods: We searched MEDLINE database for the years 1992 to 2008 using the following key words: selective decontamination of the digestive tract and intensive care units. Also, we reviewed the reference lists of all available review articles and primary studies to identify references in the computerized searches. We used the following criteria to select studies for inclusion: population-adults in an ICU; intervention SDD defined as use oropharyngeal and/or nasogastric nonabsorbable antibiotics, with or without systematic antibiotics; outcomes- bacterial resistance and costs. Methodological quality of the primary studies we evaluated using scoring system as product mix criteria approach. A total of 5964 patients were included in the 25 randomized trials.
Results and Discussion: There are no signs of bacterial resistance increase for Methicilin rezistant Staphylococcus aureus, Vancomycin rezistant enterococci and gram negative bacterie. Only for Methicilin rezistante coagulsa negative Staphylococcus bacterial resistance increase. In our meta-analysis we found lower cost in SDD group.
Conclusion(s): Emergency of resistance was not different in group with SDD. Treatment cost was lower for the SDD group. These data suggest that the use of SDD should be limited to those populations in whom infection contributes notably to adverse outcome. Additional studies are required to further define appropriate indications and limitations of this preventive strategy.
References:

1 Bonten M. J. Selective digestive tract decontamination-will it prevent infection with multidrug-resistant gram-negative pathogens but still be applicable in institutions where methicillin-resistant Staphylococcus aureus and vancomycin-resistant enterococci are endemic? Clinical Infectious Disease 2006; 43 Suppl 2:S70-4.
2 de la Cal M. A., Cerda E., van Saene H.K.F., Garcia-Hierro P., Negro E., Parra M. L., Arias S., Ballesteros D. Effectiveness and safety of enternal vancomycin to control endemicity of meticillin-resistant Staphylococcus aureus in medical/surgical intesive care unit. Journal of Hospital Infection 2004; 56(3): 175–83.

1AP4-7

A clinical audit for improving utilization of tests and reducing costs in surgical wards and intensive care unit

A. Vezzani, M. Mergoni, F. Corradi, E. Bonilauri, D. Giordano

1st Anestesia and Intensive Care Unit, University Hospital of Parma, Parma, Italy

Background and Goal of Study: Excessive use of laboratory tests increases hospital expenditure. The economic effects of interventions to promote evidence-based use of laboratory tests by physicians are not yet fully understood. We performed a clinical audit in order to evaluate the effect on sanitary cost by promoting an evidence-based use of some laboratory tests in surgical wards and Intensive Care Unit (ICU).
Materials and Methods: A prospective observational study was carried out in the tertiary referral teaching hospital of Parma. Wards enrolled in the study were grouped as: Intermediate Surgery, Major Surgery and ICU. Laboratory biochemical tests (LBT) requested in each unit enrolled in the study were recorded in a blind manner during the month of Sept 07. On Oct 07 new guidelines (GL) for ordering LBT were implemented. Tests were grouped in “routinely” (RT) and “not routinely” (nRT), assessing for each test the respective cost reported as charge reimbursed to the hospital by the Public Health System. New GL were introduced in clinical practice on Nov 07. LBT requested in each unit during the month of Sept 07 and Jan 08 were recorded. Effects of amelioration action were evaluated by comparing the number and the charge of nRT ordered in Sept 07 and Jan 08. Analysis of data was performed using the “chi square” test. Statistical significance was defined as a $P < 0.05$.
Results and Discussion: Results of amelioration action are summarised in table 1 and 2. After implementation of the new guidelines, the number of nRT decreased both in surgical wards and in intensive care unit. Our intervention was able to decrease hospital expenditure in each unit.

Comparison in number of LBT

		Tests (n)		Differences	
		Sept 07	Jan 08	%*	p
Intermediate Surgery	RT	1975	2174		
	nRT	2836	1856	–12,9%	<0.001
Major Surgery	RT	4319	4294		
	nRT	4552	2070	–18,7%	<0.001
ICU	RT	2745	2621		
	nRT	2013	663	–22,1%	<0.001

*% differences in number of nRT per total tests

Comparison in costs of LBT

		€		Differences	
		Sept 07	Jan 08	%*	p
Intermediate Surgery	RT	2494	2753		
	nRT	5240	3748	–10,1%	<0.001
Major Surgery	RT	5447	5370		
	nRT	9645	4807	–16,7%	<0.001
ICU	RT	3458	3294		
	nRT	7482	4130	–12,8%	<0.001

*% differences in cost of nRT per total tests

Conclusion(s): Laboratory test ordering more adherent to clinical query may produce a relevant reduction of costs, particularly in high-cost settings, such as major surgical wards and ICU.

1AP4-8

Anaesthetic documentation in Scotland

B. Ulyatt, D. Burke

Department of Anaesthesia, St John's Hospital, Livingston, West Lothian, United Kingdom

Background and Goal of Study: Recommendations for the content of anaesthetic records have existed since 1996[1]. In 2004 we compared anaesthetic charts in Scotland with these criteria and examined documented information in two hospitals[2]. No chart fully complied and there widespread deficiencies. Since then, a national quality assessment body has reviewed individual hospital performance, including anaesthetic documentation, using the 1996 standards. This study therefore set out to compare current Scottish anaesthetic charts with those in 2004 and to ascertain if a new chart introduced in one hospital has resulted in improved documentation.
Materials and Methods: We have repeated the study, examining 22 out of 27 (81%) charts from all adult public hospitals delivering anaesthesia in Scotland. These were analysed for specific prompts for the recommended data fields. Documented information from 55 charts in the two hospitals previously studied was also examined. Data was compared with 2004 and analysed using the Mann-Whitney U test.
Results and Discussion: The median number of required fields on Scottish charts was 42 (IQR 35–48) compared with 35 (30–39) in 2004. This reached statistical significance ($p < 0.01$). Thirteen of the hospitals had introduced new charts in preparation for the hospital quality assessment review. In the two hospitals 28 and 27 charts were analysed respectively. The median number of relevant fields documented in hospital 1 was 49 (IQR 45–56) and hospital 2, 34 (27–39). This compares with 2004 figures of 28 (22–32) and 32 (28–37). The improvement in data documented in hospital 1 was statistically very significant ($p < 0.0001$), although there was no significant change in hospital 2 ($p = 0.60$). Hospital 1 introduced a new anaesthetic chart in 2006, whereas hospital 2 currently uses the same chart from the 2004 study. The introduction of the new chart to hospital 1 coincided with the improvement in documentation.
Conclusion(s): Anaesthetic records in Scotland have improved significantly since 2004. Furthermore, standards of documentation may be improved by the introduction of charts with specific prompts for important information.
References:

1 Royal College of Anaesthetists. Newsletter 1996; 27:8–9.
2 Ulyatt BC, Ledingham N, Harrison E et al. Anaesthetic records – Are we up to scratch? European Journal of Anaesthesia. 2005; 22,S34: 9.

1AP4-9

Regional patterns of anaesthetic fresh gas flows

R. Kennedy, P. Young, N. Abbott, R. French

Dept of Anaesthesia, University of Otago, Christchurch, Christchurch, New Zealand

Background and Goal of Study: We have previously described significant reductions in anaesthetic fresh gas flow and consequent cost savings over a five year period at one metropolitan hospital. We are interesting in comparing fresh gas flows with those seen at other hospitals. During 2007 data was collected at a similar sized hospital in a city 800km distant. This hospital has a reputation for the use of low flows. This abstract summarizes the patterns of fresh gas flow and volatile agent use seen.
Materials and Methods: Anaesthetic fresh gas flows, vaporisor dial setting and choice of volatile agent were collected every 10sec from a single Datex ADU over two 20 weeks periods in 2007 at Hospital M, a 720 bed teaching hospital serving part of a major metropolitan centre. Data were analysed by a program which sorts and counts data from the time periods when the vaporisor is on to give mean FGFs and frequency distributions of FGF. Results were compared with those collected at Hospital C in early 2006.
Results and Discussion: At Hospital M the mean FGF was 1.31 l/min and the median FGF was in the range 0.5–1.0 l/min. These results very similar to those from Hospital C in 2006 (mean 1.27 l/min, median 0.5–1.0 l/min). At Hospital M in the first part of the year isoflurane was used for 10% of the time with the balance divided between sevoflurane (44%) and desflurane (46%). In the second half of the year isoflurane use was unchanged but sevoflurane use had increased slightly (Sevo 67%; Des 25%). The Hospital C usage in 2006 was isoflurane 4%, sevoflurane 87% and desflurane 9%. Flow rates used with desflurane are slightly lower than with sevoflurane.
Conclusion(s): Anaesthetic fresh gas flow rates at two major hospitals 800 km apart are similar. We speculate the values seen represent the balance between the advantages and complexity of flow reduction. Long term automated data collection is a useful tool for gaining a true picture of gas flows and agent use. Data collection is ongoing in other hospitals.
Reference:

1 Kennedy RR, French RA. Anesth Analg;106:1487–90.

1AP4-10

Recycling in anaesthesia: Attitudes and experiences in the west of Scotland

G. Cowan

Department of Anaesthesia, Southern General Hospital, Glasgow, United Kingdom

Background and Goal of Study: Operating theatres generate considerable waste, with major financial and environmental impacts. Recommendations exist to separate clinical from domestic waste[1] which can then be recycled. Failure to separate waste into clinical and domestic streams increases disposal costs and reduces the amount of waste that can be recycled. We wished to investigate attitudes towards recycling amongst anaesthetists and determine the current facilities available to them.
Materials and Methods: An anonymous online questionnaire was sent via departmental secretaries to all anaesthetists in the West of Scotland.
Results and Discussion: 196 replies were received. 195 respondents completed all questions. 116 (59%) of respondents were consultants, 13 (6.6%) were non-consultant career grades and 67 (34.2%) were trainees. Anaethetists were asked how much they agreed or disagreed with several statements. These results are shown in table 1. Regarding the amount of waste per patient, 171 (87.7%) noted that there had been an increase over their working lifetime, 24 (12.3%) noted no change and none a decrease. 34 (17.4%) had facilities to separate waste in the anaesthetic room. 54 (27%) said that these facilities exist in theatre. The majority of respondents 124 (63.6%) did not know if their hospital had a waste reduction policy, 61 (31.3%) said it did not and 10 (5.1%) said it did. When asked if they would separate their waste by material if containers were supplied, 193 (99%) said they would.
Conclusion(s): Anaesthetists in the West of Scotland expressed concern about the amount of waste being generated, and felt that it was increasing. They were keen to recycle, but many did not have facilities to separate waste

Abstract 1AP4-10 – Results Table

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am concerned about the amount of rubbish generated during an operating list.	2	4	14	77	99
There are no incentives to prevent the wastage of resources in hospital.	2	1	7	65	121
I am more concerned now than five years ago about the environmental impact of my activities at work.	3	11	24	72	86
I would like to recycle more of the rubbish I generate during my work.	2	2	3	73	116

available to them at the point of generating the waste, nor were they aware of local policies. Without increasing the facilities for separation at the point of waste generation, hospitals will find it difficult to utilise this willingness to recycle.

Reference:

1 Waste Management in Scottish Hospitals Action Plan. Health Facilities Scotland December 2007.

1AP5-1

Web-based quality questionaire follow-up 30-days after electivee office based orthopeadic surgery in general anaesthesia

M. Brattwall, M. Lindqvist, I. Turan, J. Jakobsson

Anaesthesia, Physiology & Pharmacology, Karolinska Insitutet, Stockholm, Sweden

Background and Goal of Study: Day surgery is increasing and has been shown reassuringly safe and efficacious in many procedures. Not only safety but also quality of care has become of increasing importance. The aim of the present web-based questionnaire follow-up is two-fold, first to gain feedback about the feasibility of a web-based tool for follow-up/feedback around day case procedure and second from reports retrieved evaluate standard of care and its adherence to our internal quality goals.

Materials and Methods: One hundred and twenty seven consecutive patients were asked before discharge to provide a mail address and to respond to a web-based quality audit 30 days after surgery.

Results and Discussion: Nine patients did not have any e-mail address, and 5 provided in-adequate addresses, 13 did not respond. In all 100 patients responded to the web-survey. Acceptance with web-survey was high. Grading of a. easy to use and fill and b. good feedback tool were 9.6 out of 10 for each question respectively. Feed back about quality of care during the procedure and with the first week postoperative pain management was satisfactory. Mean values for personnel performance and quality of care was 9.4 and 9.0 out of 10 respectively and more important only 2 and 11% ratings were below 8 out of 10. Rating of pain (VAS 0-10) during 1st postoperative week was in average 3.2 and 23% had a score of more than four out of ten. Adequate pain medication and satisfaction with pain management was also overall high, mean 8.4 and 8.8 out of 10 respectively and 14 patients only made rating below 8 out of 10 for pain management in general.

Conclusion(s): In summary, web-based questionnaire follow-up about quality of care is a high acceptable tool and we found acceptable results both with regard to our general quality goal of care and postoperative pain management more than 85% satisfied patients.

1AP5-2

Quality of postoperative care after major orthopaedic surgery is corellated with both long term cardiovascular outcome and Troponin Ic elevation

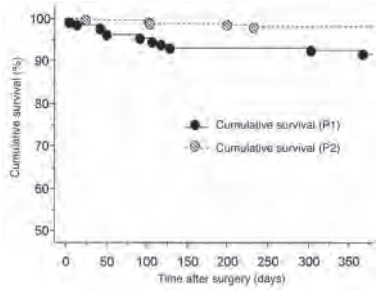
N. Donat, S. Ausset, G. Pelee de Saint Maurice, A. Cirodde, E. Falzone

Anesthésie Réanimation, Hôpital d'Instruction des Armées Percy, Clamart, France, Metropolitan

Background and Goal of Study: Troponin Ic (TnIc) elevation after major orthopaedic surgery is associated with an increased frequency of perioperative complications and worse long term cardiovascular outcome (LTCO). Furthermore, TnIc elevation incidence is correlated with quality of postoperative care. The aim of this study was to assess if this decrease in incidence of TnIc elevation observed after quality of care improvement was also correlated with a better LTCO.

Materials and Methods: During 3 years, TnIc was mesured during the three first postoperative days after major orthopedic surgery in a multidisciplinary hospital and patients followed-up for major adverse cardiac event (MACE) during one year. Cardiac deaths, myocardial infarctions and acute heart failure were considerede as MACE. After 16 month of study (P1), postoperative care were improved according to failure modes, effects and criticality analysis of the postoperative process (P2). The incidences of postoperative TnIc elevation and MACE during the first postoperative year were compared beetween the two phases of the study.

Results and Discussion: 387 patients were included, 130 for P1 and 257 for P 2. Incidence of TnIc elevation and MACE were 2.5 vs 9.2% (p = 0.0188) and 3.5 vs 9.2% (p = 0.003) for P2 and P1 respectively. Patients characteristics were similar for P1 and P2. Following univariate analysis, items associated with MACE were age, ASA score, cardiac risk index, type of surgery and postoperative TnIc elevation. Using Cox model including age, gender, cardiac risk index, ASA score, type of surgery and TnIc elevation, only gender (HR = 3.6 -IC 95: 1.1–11.1), phase P1 (HR = 5.6 -IC 95: 1.6–20.1) and postoperative TnIc elevation (HR = 7.2 -IC 95: 2.1–25) were statistically relevant. Incidence of MACE during the first year after surgery, acording to the phase of the study.



Conclusion(s): Quality of postoperative care in major orthopaedic patients is strongly correlated with both long term cardiac outcome and postop TnIc elevation. Mesurating TnIc after major orthopaedic surgery can therefore be used as quality of care indicator.

1AP5-3

Is a routine postoperative chest x-ray necessary after endoscopic transthoracic sympathectomy?

L. Srinivasa, M. Morgan, G. Thomas

Anaesthesia and Intensive Care, Princess of Wales Hospital, Bridgend, United Kingdom

Background and Goal of Study: Endoscopic transthoracic sympathectomy (ETS) is one of the major modalities of treatment for facial blushing, palmar and axillary hyperhydrosis. It is a standard practice to request a routine postoperative chest radiograph following the procedure[1] as pneumothorax is reported in 2–15%[2] of cases. This is usually performed in the recovery area exposing the patient and other recovering patients to radiation. Our aim of the study is to examine the outcome of patients following ETS submitted to routine postoperative chest X-ray and determine whether this was necessary.

Materials and Methods: A retrospective study of all the cases that have undergone endoscopic transthoracic sympathectomy in our hospital was done. 69 procedures were done before 2004 when routine postoperative chest X-ray was performed and 31 procedures after 2004 when chest radiographs have not been done routinely.

Results and Discussion: Of the 69 procedures that have been done before 2004, only 3 radiographs performed in recovery revealed minor pneumothoracies requiring no intervention. One patient developed pneumothorax 6 hours postoperatively and a chest drain was inserted (this patient had a normal chest x-ray in the recovery period). None of the patients after 2004 (31 procedures) showed any symptoms of pneumothorax. All the procedures have been done as day cases with endobronchial intubation and invasive arterial monitoring.

Conclusion(s): Our experience has shown that it is safe to omit a routine postoperative chest radiograph following endoscopic transthoracic sympathectomy. The risk of pneumothorax can be minimised by reinflating the lungs under direct vision until they are seen bulging into the endoscope.

References:

1 Beard JD, Gains P A. A companion to specialist surgical practice. Vascular and endovascular Surgery. 2nd edition. Saunders, London 2001.

2 Shachor D, Jedeikin R, Olsfanger D et al. Endoscopic transthoracic sympathectomy in the treatment of primary hyperhydrosis. *Archives of Surgery* 1994;129:241–244.

1AP5-4

Incidence of postoperative residual curarization in the postanaesthesia care unit

H. Vilela, C. Barreiros, M. Esquivel, C. Madeira, R. Fragoso

Anesthesiology, Hospital Fernando Fonseca, Amadora, Portugal

Background and Goal of Study: Residual paralysis following the use of neuromuscular blocking agents (NMBAs) remains a clinical problem. We investigated the incidence and degree of postoperative residual curarization in the postanaesthesia care unit (PACU).

Materials and Methods: In this observational study 95 patients were enrolled upon arrival in the PACU after general anaesthesia with NMBAs. On admission to the PACU, the ulnar nerve was stimulated supramaximally using train-of-four (TOF) stimulation and the evoked muscle response was quantified with Medelec-Sapphire four-channel electromyography (EMG) machine (Vickers

Medical, Medelec Ltd, Surrey, UK). The postoperative residual curarization was defined as a TOF-ratio < 0.9. Student's t-test and Fisher's exact test were used for statistical analysis. Data were expressed as mean ± SD for numeric variables and as number (percent) for categorical variables. Statistical significance was defined for $p < 0.05$.

Results and Discussion: The incidence of postoperative residual curarization was 17/95 (17.9%). Intermediate NMBAs were used in 91 (95,8%) of the cases. Intraoperative monitoring of neuromuscular blockade was performed in 51 (53.7%) patients (objective monitoring in 1 [1.0%]). Pharmacological reversal of neuromuscular block was carried out in 28 (29.5%) individuals. When comparing individuals with and without postoperative residual curarization, there was statistical difference regarding age (57.1 ± 20.6 vs 45.8 ± 15.0; $p = 0.02$), ASA physical status III (5 [29.4%] vs 2 [3.5%]; $p = 0.01$) and patients undergoing general surgery (12 [70.6%] vs 19 [33.3%]; $p = 0.01$).

Conclusion(s): The incidence of PORC in the recovery room was high. To improve patient safety in the postoperative setting and in order to reduce the incidence of postoperative residual curarization, perioperative objective monitoring of neuromuscular function and large indications of pharmacological reversal should be implemented.

1AP5-5

Post operative urinary retention: Can we do better?

T. Brouwer, C. Kalkman, C. Moons

Department of Perioperative Care, Anesthesiology and Pain, University Medical Center Utrecht (UMCU), Utrecht, Netherlands

Background and Goal of Study: In most hospitals the definition for POUR (=Post Operative Urinary Retention) is a bladder volume of 500 ml and being unable to void (=indication for bladder catheterization). Earlier studies with the BladderScan (BladderScan®, Verathon Medical, Redmond, WA, USA) have shown a wide range of bladder volumes with a mean larger than 500 ml. It is expected that most patients have a maximum bladder volume (MBV) larger than 500 ml. The goal of this study is to reduce the number of urinary catheterizations by changing the volume limit of 500 ml into the patients own MBV.

Materials and Methods: After institutional approval 2000 patients will be included and will measure their MBV at home. They are asked to void in a calibrated bowl after postponing voiding until it becomes unpleasant. Preoperatively patients are randomly divided in the 500 group or the MBV group. Postoperatively patients are scanned every hour until spontaneous voiding or until POUR occurs. If voiding is impossible in-and-out catheterisation is performed.

Results and Discussion: Till now 867 patients are included. The incidence of POUR is reduced from 10,8% in the 500 group to 7,6% in the MBV group. Of the 80 patients who needed to be catheterized 60 patients (75%) had a spinal anesthesia. In the MBV group 45 patients would have been unnecessary catheterized if they were randomized in the 500 group.

Results MBV and 500 group

	MBV group	500 group
Total patients (n)	432	435
Men (n)	188	179
Women (n)	244	256
Mean MBV (ml)	625	579
Mean MBV men (ml)	650	601
Mean MBV Women (mll)	606	562
Range (ml)	200–1290	177–1200
MBV ≥ 500 ml (n)	308	283
Bladder Catheterization (n)	33	47
Incidence POUR (%)	7,6	10,8
Relative Risk Index (%)	23,2	28

Conclusion(s): Using the MBV as definition for POUR lowers the incidence of urinary catheterization and prevents unnecessary catheterizations. Especially spinal anesthesia is a risk factor for POUR and these patients should measure their MBV at home to prevent unnecessary catherization. Measuring the MBV is a little burden for preventing unnecessary catherization or possible permanent bladder impairment.

1AP5-6

Perioperative pulmonary aspiration in 36,313 non cardiac anaesthetics in a tertiary hospital

S. Elrouby, I. Kashkari, N. Elkum

Anaesthesiology, King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia

Background and Goal of Study: Perioperative pulmonary aspiration of gastric content is rare but it carries high risk of morbidity and mortality. Goal of the study was to determine the incidence of perioperative pulmonary aspiration and its relationship to physical status in a tertiary hospital.

Materials and Methods: This prospective study was part of a quality improvement program from (1994–1999). Physical status was assessed preoperatively according to the classification of the American Society of Anesthesiology (ASA). Pulmonary aspiration (PA)was defined as either the presence of bilious secretions or particulate matter in the tracheobronchial tree or, in patients who did not have their tracheobronchial airways directly examined after regurgitation, the presence of an infiltrate on postoperative chest roentgenogram that was not identified by preoperative roentgenogram or physical examination. Data from 36,313 non cardiac anesthetics were collected.(PA) was recorded in the operating room (OR) by the attending anesthesiologist, in the (post anesthetic care unit PACU) by a nurse, and post-operatively by a postopertaive anesthetist. Data were encoded in a customized data base program and analyzed using SAS software.

Results and Discussion: 29.9% were ASA 3,4,5. 39.6% were ASA 2, and 30.5% ASA 1. PA was encountered in 7 patients, or 1.9/10,000. Intraoperative PA was 1.38/10,000, and PACU PA was 0.55/10,000. No aspiration was recorded in elective or emergency lower segment cesearian section. The incidence (/10,000) of PA was 1.02 in ASA 1, 2.37 in ASA 2, and 3.56 in ASA 3. PA correlation to ASA was clinically significant. 57% of aspiration was recognized immediately after induction, 14% occurred on emergence form anesthesia, and 28% in PACU. One patient was cancelled, one patient required ventilation for 48 hours, one patient required reintubation, and one patient died. (Aspiration mortality = 1:36,313 anaesthetics).

Conclusion(s): Perioperative pulmonary aspiration is infrequent but is associated with major adverse outcomes. Its incidence is higher on induction and in patients with higher ASA status.

References:

1 Anesthesiology. 1993 Jan;78(1):56–62. Clinical significance of pulmonary aspiration during the perioperative period. Warner MA, Warner ME, Weber JG.

2 Anesthesia & Analgesia 2006;103:941–947. The Incidence and Outcome of Perioperative Pulmonary Aspiration in a University Hospital: A 4-Year Retrospective Analysis. Sakai T, Planinsic RM,Quinlan JJ.

1AP5-7

Risk factors for unplanned ICU admissions in a tertiary care hospital in Switzerland

T. Kaufmann, G. Schüpfer, C. Konrad

Anesthesiology and Intensive Care, Kantonsspital, Luzern, Switzerland

Background and Goal of Study: The capacity for unplanned ICU admissions is limited in a hospital. Such admissions may interfere with the elective process of a hospital and cause delays or cancellations of surgery. Both factors have an impact on quality (safety of care) and satisfaction of surgeons and patients.

Materials and Methods: In the study period of two years, 1854 (8.97%) of 20662 adult patients were admitted to ICU as scheduled for their preoperative care. 133 (0.64%) patients were admitted unplanned to the ICU. Risk factors were preoperatively sampled by the attending anaesthetists. Elective and emergency cases were included in this study.

Results and Discussion: Elective surgery is a protective risk factor for unplanned ICU admissions (OR) 0.21). ASA class III–V (OR 20.5) and non fastened patients had a significant risk for unplanned ICU admissions. Also transfusion of banked (EC) or cell saved (CS) blood was an important risk factor. As compared to non weekend days, to be operated on a Saturday doubled the risk for an unplanned ICU admission. Age and preoperative haematocrit levels had no influence. The findings reflect the local situations, but they may give hints for generalisations.

	Unplanned ICU	Others	Odds Ratio	±95% CI	p value
Elective	50	13764	0.215	(0.12–0.31)	p < 0,001
Emergency	77	3963	5.104	(3.61–7.21)	p < 0,001
Hypertension	28	4362	0.875	(0.58–1.33)	0,601
Adipositas	20	2750	1.025	(0.64–1.65)	0,983
Cachexia	7	140	7.355	(3.37–16.03)	p < 0,001
Non fastened	28	2265	5.602	(3.97–7.92)	p < 0,001
ASA 1	14	6682	0.211	(0.12–0.36)	p < 0,001
ASA 2	36	8195	0.475	(0.32–0.69)	p < 0,001
ASA 3	58	3589	3.250	(2.30–4.59)	p < 0,001
ASA 4	22	199	18.401	(11.41–29.69)	p < 0,001
ASA 5	3	9	47.859	(12.81–178.80)	p < 0,001
Blood (EC)	24	174	23.410	(14.68–37.32)	p < 0,001
cell saved	10	281	5.792	(3.00–11.18)	p < 0,001

Conclusion(s): In this study, significant risk factors for unplanned ICU admissions were identified. In further investigations, the impact of preventive measures

has to be assessed. For example, supervision of the care of non fastened ASA III–V on Saturdays for emergency cases may be intensified. The results of this observational study suggest tools for the improvement of patient care, but every implemented measure has to be validated.

1AP5-8

Is letality after femoral neck fracture a valuable quality indicator for hospitals – A critical empirical investigation?

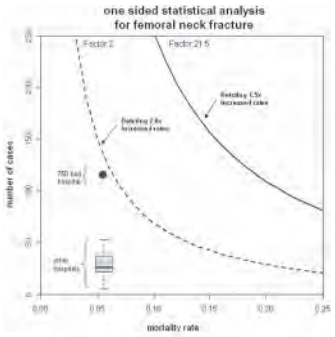
T. Kaufmann, G. Schüpfer, C. Konrad

Anesthesiology and Intensive Care, Kantonsspital, Luzern, Switzerland

Background and Goal of Study: Mortality or better letality as a measure of quality is very popular. This end point is precisely defined and data can often be assessed using routine administrative sources. With the results, regulators rank different hospitals even if the mortality is very low. Furthermore, available benchmark figures for inhouse mortality rates after femoral neck fracture range from 4.5% up to 20%.

Materials and Methods: Routinely collected data of 9 hospitals of central Switzerland as an epidemiologic closed area were analysed. The served population is around 0,5millions. In this study routinely colleceted data as required by the Swiss federal governement for billing and statistical reasons were used. A routinely check for plausibility was done by the locall government as required by law.

Results and Discussion: The 9 hospitals have 52 to 750 beds. 5 to 118 procedures were done per hospital and year (details see table). The inhouse letality rate varied from 0% to 10%. No significant correlation between mortality and number of procedures performed or beds per hospital was found. Given an inhouse letality of < 10% and assesing the power to identify underperforming hospitals, higher case loads are necessary than found in all 9 hospitals, especially if risk adjustment is not implemented or not possible. In the figure the treshold for a 1.5 or 2.0 fold increased letality rates are shown.



Conclusion(s): Perioperative letality rates after femoral neck fractures are not suitable quality indicators, although simple to study. Due to statistical reasons, this outcome measure should probably be replaced by process based quality indicators. In further studies the value of other letality rates needs to be evaluated. Furthermore routinely collected administrative data should also be validated.

1AP5-9

Postoperative quality of recovery after anaesthesia with sevoflurane or desflurane in patients undergoing minor abdominal surgery

F. Caliandro, E. Congedo, P. Aceto, G. Fortunato, G. De Cosmo

Department of Anesthesiology and Intensive Care, A. Gemelli Hospital, Rome, Italy

Background and Goal of Study: In the last decade there has been a shift from traditional evaluation of recovery to patient-oriented outcomes (1). The aim of the present study was to investigate quality of postoperative recovery in patients treated with sevoflurane or desflurane during minor abdominal surgery.

Materials and Methods: 86 patients, aged 18–50 years, with American Society of Anesthesiologists physical status I–III, were enrolled. The day before surgery patients were randomly assigned to two groups according to inhalational agent used for the maintenance of the anaesthesia: sevoflurane (group A) and desflurane (group B); afterwards, patients were asked to complete the baseline measurement of the quality of recovery with Quality of Recovery 40-item (QoR-40) questionnaire. In all the patients, induction of anaesthesia was standardized with propofol 2mg/Kg, fentanyl 3 mcg/Kg and cis-atracurium 0,15 mg/Kg. The maintenance of anaesthesia was performed with one the two inhalational anaesthetics according to randomization and was interrupted at the end of surgery. Ketorolac 30 mg was given for the postoperative analgesia. A rescue dose of intravenous tramadol 1mg/Kg was given when analgesia was inadequate (VAS > 4). QoR-40 was collected at the 1st and the 24th postoperative hour. Extubation time and emergency time were assessed at the end of anaesthesia; visual analogue score for pain (VAS) and tramadol consumption were registered. Data were analized using Mann Whitney test; $p < .05$ was considered statistically significant.

Results and Discussion: No differences were found between the two groups regarding emergency time, VAS values, tramadol consumption and global QoR-40 score. Preoperative and postoperative QoR-40 scores did not showed significant variations at the investigated times in the two groups. Extubation time was lower in group B compared with group A ($p < .0001$).

Conclusion(s): Postoperative quality of recovery after anaesthesia with sevoflurane or desflurane was different only for the extubation time in patients undergoing minor abdominal surgery.

Reference:

1 Myles PS, Weitkamp B, Jones K et al. Br J Anaesth. 2000;84:11–5.

Hospital	Number of beds	Procedures	portion died	percentage	95% confidence intervall
1	52	5	0	0%	
2	750	118	9	7.6%	0.048
3	110	25	0	0%	
4	90	22	2	9.1%	0.123
5	181	37	2	5.4%	0.074
6	160	31	2	6.5%	0.088
7	140	20	2	10%	0.135
8	132	26	2	7.7%	0.104
9	184	53	0	0%	
Total		337	19	5.1%	

Ambulatory Anaesthesia

2AP1-1

Remifentanil versus remifentanil/midazolam sedation during oral surgical procedures

O. Isbir, Z. Ustalar Ozgen, H. Cikrikci, H. Tanyeri, F. Toraman

Department of Anesthesiology and Reanimation, University of Acibadem, Istanbul, Turkey

Background and Goal of Study: The gag reflex is a somatic natural response in which the body attempts to eliminate instruments or agents from the oral cavity by muscle contraction. The search for optimal sedation to decrease gagging and retching for oral awake procedures continues. We hypothesized that ultra-short acting opioid remifentanil combined with very low dose of midazolam provides a better surgical outcome due to less gagging and a better recovery profile when compared to midazolam alone.

Materials and Methods: In this randomized, double-blind trial, we studied 106 patients who had undergone either radiofrequency ablation of tonsils and soft palate or soft palate implant application under local anesthesia by a single surgeon who was unaware of the sedation protocol. Patients recieved either (group 1, n = 67) IV midazolam 1 mg plus an infusion of remifentanil 0.1mcg/kg/min reduced to 0.075mcg/kg/min in 2 minutes and than titrated accordingly or (group 2, n = 39) IV midazolam 2 mg bolus plus 1 to 3 mg increments as needed. Duration of the procedure, presence of gagging and retching, surgeon

satisfaction regarding the ease of the procedure (scale over 4), complications like breatholding, decrease in SpO_2 as well as BP, HR and time to discharge from PACU (modified aldrete score > 12) were recorded.

Results and Discussion: There was no statistically significant difference between the duration of the two groups. Gagging and retching was significantly less ($p < 0.001$) and surgeon satisfaction score was significantly higher in group 1 ($p < 0.001$). Mean dose of midazolam was 3.8 ± 1.2. Mean time to discharge from PACU was significantly shorter in group 1 when compared to group 2, 5.3 ± 1.22 min v/s 17.2 ± 14.6 min respectively ($p < 0.001$). Breatholding was significantly higher in group 1 ($p < 0.001$) but the SpO_2 values did not decrease below %90 with the verbal stimulation.

Conclusion(s): In this pilot study remifentanil in combination with low dose of midazolam provided less retching and gagging resulting in better surgical outcome and early recovery when compared with midazolam alone. Breatholding and desaturation was the major side effect of remifentanil group and it was abruptly abolished upon verbal warning.

References:

1 Remifentanil versus remifentanil/midazolam for ambulatory surgery during monitored anesthesia care. Anesthesiology.1997 Jul; 87(1):51–7.

2 Intravenous remifentanil and propofol for gastroscopy. J Clin Anesth.2008 Aug;20(5):353–5.

2AP1-2

Desflurane requirements for laryngeal mask airway insertion during inhalation induction

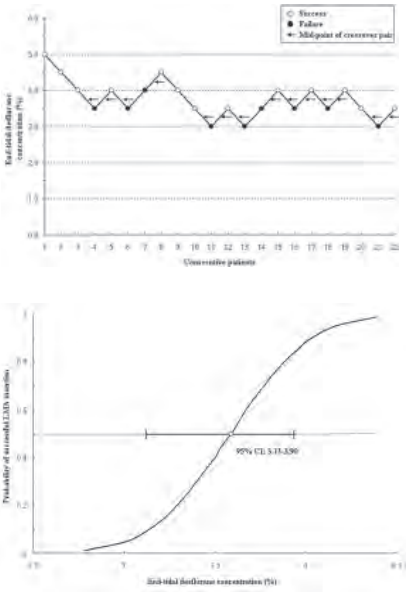
D. Kim, S. Kim, T. Yoon, H. Shin

Department of Anesthesiology and Pain Medicine, Konkuk University School of Medicine, Seoul, Korea

Background and Goal of Study: We hypothesized that if low concentrations (<6%) of desflurane, nitrous oxide (N_2O), and fentanyl were used simultaneously, a laryngeal mask airway (LMA) could be inserted safely with inhalation induction of desflurane, even in non-paralyzed patients. This prospective, observational trial determined the 50% effective concentration (EC_{50}) of desflurane for LMA insertion in such a case.

Materials and Methods: We studied 22 adult patients undergoing ambulatory surgical procedures under general anesthesia using an LMA. After fentanyl (1.5 $\mu g \cdot kg^{-1}$) was administered intravenously, anesthesia was induced with desflurane in 50% N_2O and oxygen using a normal tidal volume breathing technique. Thereafter, a pre-selected steady state end-tidal desflurane concentration was maintained for 10 min before insertion of the LMA. Successful LMA insertion was defined as the absence of adverse airway responses until cuff inflation. Target concentrations of desflurane for LMA insertion were determined using a modified Dixon's up-and-down method (starting dose, 5%; step size, 0.5%).

Results and Discussion: All 22 patients completed the study without adverse complications related to airway irritation. The EC_{50} of desflurane for insertion of the LMA was determined to be 3.61 ± 0.31%, and the 95% confidence interval (CI) of the EC_{50} obtained using a probit analysis was 3.13–3.90 (Figure 2).



Conclusion(s): We demonstrated that N_2O-desflurane inhalation induction with a normal tidal breathing technique after premedication with fentanyl can be used safely without any adverse airway events in non-paralyzed patients. In such cases, the EC_{50} of desflurane for the successful LMA insertion was 3.61 ± 0.31% (95% CI, 3.13–3.90).

2AP1-3

Comparison of 29- and 25-gauge Quincke spinal needles for patients undergoing anorectal surgery in saddle block technique

M. Schmittner, M. Dluzak, A. Janke, D. Bussen, G. Beck

Clinic of Anaesthesiology and Critical Care Medicine, University Hospital Mannheim, Mannheim, Germany

Background and Goal of Study: Postdural puncture headache (PDPH) occurs with a maximum incidence of 2% for very thin 29-gauge Quincke needles [1], but there exists only little information about the incidence of PDPH with hyperbaric local anaesthetics. This study compares the incidence of PDPH of very thin 29-gauge with the 25-gauge Quincke spinal needles for patients undergoing anorectal surgery in saddle block technique.

Materials and Methods: Within a three months period ASA I–III patients (m/f, 18–75 years) undergoing anorectal surgery were 1:1 randomized to receive either a 25-gauge or a 29-gauge Quincke spinal needle (Spinocan®, B. Braun AG, Melsungen, Germany). Ambulatory patients received 0.6 mL hyperbaric mepivacaine 4%, in-house patients 1.0 mL hyperbaric bupivacaine 0,5%. Optionally, a light sedation with propofol in bolus application was provided. The anesthesiologist monitored the duration of pricking, the number of attempts as well as arising problems. One week after surgery, a standardized questionnaire was completed by telephone interview. Statistic was performed with the SAS System (Version 9.01).

Results and Discussion: 297 patients (58.5% male gender, 30.3% ambulatory surgery) received a saddle block for anorectal surgery. 55.1% of the patients were randomized to a 25-gauge needle and 36.4% received additional sedation with propofol. There was no difference between the groups regarding demographic data, diagnosis or number and duration of pricks. 45 patients (18.75%, 25-gauge: n = 18, 29-gauge: n = 25, p = 0.5433%) suffered from PDPH, not depending on duration and number of prickings. Women were more frequently affected by PDPH (women n = 27 vs. men: n = 18, p = 0.0029) and suffered about twice as long from PDPH than men (women 41.0 ± 40.4h vs. men: 13.9 ± 22.0h, p = 0.0175). Ambulatory patients developed PDPH later (in-patients: 10.2 ± 19.0h vs. out-patients: 32.0 ± 17.3h, $p < 0.0001$), it lasted longer (in-patients: 7.2 ± 11.9h vs. out-patients: 55.9 ± 37.5h, $p < 0.0001$) and the pain score (VAS 0-10) also was higher (in-patients: VAS 3.8 ± 1.7 vs. out-patients: VAS 6.7 ± 2.2, p = 0.0002).

Conclusion(s): The incidence of PDPH in patients undergoing spinal anaesthesia in saddle block technique with Quincke needles is higher than reported in the literature. More investigations are necessary to determine the causes of the differences.

Reference:

1 Turnbull D. K., Shepherd D. B.: Post-dural puncture headache: pathogenesis, prevention and treatment. Br J Anaesth 2003; 91: 718–729.

2AP1-4

Comparison of dexmedetomidine with a combination of midazolam and ketamine in monitored anesthesia care for facial aesthetic surgery

Y. Inagaki, K. Sogabe

Anesthesiology and Critical Care Medicine, Tottori University Faculty of Medicine, Yonago, Tottori, Japan

Background and Goal of Study: Efficacy of Dexmedetomidine (DEX) in office-based anesthesia was reported recently (1). We conducted this prospective study to clarify the standard infusion rate of DEX alone and to compare a previous sedation technique with midazolam and ketamine (MK) on suitability for monitored anesthesia care (MAC).

Materials and Methods: After obtaining approval of our hospital Ethics Committee, fifty consenting female patients who underwent eyelid surgery, liposuction of face and face lifts were assigned to two study groups according to patient's decision. Patients in the DEX group (n = 30) were infused intravenously (iv) at a rate of 4 μg/kg/h until sedation level reached at OAA/S 3 and thereafter the infusion rate was reduced to 0.4 μg/kg/h. Patients in the MK group (n = 20) received iv midazolam 0.05 mg/kg and 0.2 mg/kg of ketamine. Local anesthesia was done using 1% lidocaine with epinephrine 1:200,000 after patient's sedation level attained OAA/S 3. The infusion rate of DEX was increased by 0.1 μg/kg/h when OAA/S was > 3 and decreased when OAA/S was < 3. The patients in MK group were given 1 mg of midazolam when their OAA/S was > 3. Patient's OAA/S was evaluated every 10 min after local anesthesia by an

independent nurse. Their pain level was also measured using numerical rating scale (NRS) from 0 to 100. Pentazocine 15 mg was iv injected when NRS was above 40. We evaluated time to OAA/S 3, requirements of midazolam and DEX, total doses of pentazocine, time to OAA/S 5 from the end of surgery, incidence of PONV and somnolence, and time to discharge. Data was analyzed by Mann-Whitney test. A P value < 0.05 was considered statistical significant.

Results and Discussion: Patients' profile was similar in the two study groups. Times to OAA/S 3 were also similar. Median infusion rate of DEX was 0.3 μg/kg/h (range: 0.2–0.6 μg/kg/h) and median midazolam injection was 1 mg (0–4 mg). Requirements of pentazocine was significantly less ($p < 0.001$) in the DEX group. Times to OAA/S 5 and discharge were shorter ($p < 0.01$) in the DEX group. Incidence of adverse effects was less ($p < 0.01$) in the DEX group. [Discussion] As light sedation provided by DEX alone was associated with analgesia, DEX infusion was superior to a combination of midazolam and ketamine during surgical procedure. Earlier full recovery and less incidence of adverse effects accelerated discharge from hospital.

Conclusion(s): Use of DEX in MAC for facial aesthetic surgery was superior to a combination of midazolam and ketamine.

Reference:

1 Plast Reconstr Surg 121: 269, 2008.

2AP1-5

Avoiding routine mask preoxygenation in patients ungergoing laryngeal mask anaesthesia in day surgery patients

D. Ail, S. Rao

Department of Anaesthesia, Kings Lynn Hospital, Kings Lynn, United Kingdom

Background and Goal of Study: The health sector, hospitals in particular, can make significant difference to climate change by reducing its own green house gas emmisions[1]. One method is to reduce non-recyclables used in our daily practise. There has also been a growing debate on the role of preoxygenation[2] in routine practise and its causative role in atelectasis[3]. We decided to investigate if we could avoid routine mask preoxygenation and if found safe, avoid preoxygenation in healthy patients undergoing LM anaesthesia in day surgery.

Materials and Methods: ASA grade 1 and 2 patients scheduled for day surgery procedures were divided into 2 groups. The first 20 patients were preoxygenated without mask (group A)and the next 20 patients were encouraged to do deep breathing in air (Group B). A mask was always kept available in case a patient desaturated. Anaesthesia was induced using Midazolam 1–2 mgs, fentanyl 50–100 mcg and propofol 2–3 mgs/kg. An adequately sized LMA was inserted and anaesthesia was maintained with inhalational agent. The patients were taken to recovery and extubated awake. The pre op, LMA insertion and post insertion saturations were recorded. These were then compared using student t test.

Results and Discussion: There were no significant differences in patient population in terms of age and BMI. There was no significant differences in the SpO_2 during LMA insertion and none of the patients desaturated to clinically unacceptable level. The pre opeartive sats and post LMA insertion saturations were statistically significant in Group B but this is not clinically significant

Comparison of demographics and the saturation between the two groups

	Oxygen Insuffulation	Deep air breathing	p value
Age	42.5 ± 16.1 secs	47.6 ± 13.3 secs	0.32
BMI	27.6 ± 5.23	29.2 ± 5.86	0.40
Preop Saturation	97.5 ± 0.8	99 ± 0.935	<0.001
Time of Insertion	1.12 ± 0.332	1.06 ± 0.243	0.56
Spo2 on insertion	97.4 ± 2.65	96.9 ± 1.87	0.51
Lowest saturation	96.7 ± 2.95	95.6 ± 3.62	0.36
Post insertion sats	96.4 ± 1.17	97.1 ± 0.243	0.02

Conclusion(s): Routine mask preoxygenation can be avoided in healthy day surgery patients done under LMA anaesthesia, but a larger randomised control trial is required.

References:

1 Global environmental…health sector. AJ McMichael BMJ Jan 2008.
2 Just a little oxygen…Lumb AB, BJA 2007;99(6):769–771.
3 The effect of pre-oxygenation and hyperoxygenation during total intravenous anaesthesia. A. Reber et al poster presentation ASA 1995.

2AP1-6

Can TCI provide less hemodynamic abnormality and respiratory depression than conventional TIVA in endocopic examinations

S. Wu, P. Wang, S. Yang, W. Liao, A. Chou

Department of Anesthesiology, Chang Gung Memorial Hospital-Kaohsiung Medical Center, Chang-Gung University College of Medicine, Kaohsiung, Taiwan

Background and Goal of Study: Target controlled infusion (TCI) system has been widely incorporated into daily practice of anesthesia in recent years. Smooth recovery, less PONV, high patient satisfaction rate and easy titration to effect are the above reasons.[1–3] We investigate TCI is whether a better way in endoscopic examinations than conventional TIVA settings.

Materials and Methods: After IRB approval and written informed consent, 100 patients, ASA I/II, attended esophagogastroduodenoscopy (EGD) and colonoscopy were included and randomized into a TCI or TIVA group. Sedation was initiated with alfentanil 10 μg/kg before infused propofol by Fresenius Orchestra Infusion Workstation. 50 patients in TCI group were started at effect site concentration (Ce) 4.0 μg/ml of Schnider model and another 50 patients in TIVA group were induced at 1.5 mg/kg followed by 12 mg/kg/h. EGD was inserted after loss of verbal response. If any adverse events such as gag, cough, talk, movement, hiccup occurred, endoscope was tried again after changing Ce 1.0 μg/ml in TCI group or bolus 0.5 mg/kg with increasing 1 mg/kg/h in TIVA group. Colonoscopy began after EGD was completed. We decreased Ce 1.0 μg/ml or 1.0 mg/kg/h after cecum intubation. Infusion was stopped at remaining 50 cm. The infusion rate was adjusted in order of Ce1.0 μg/ml or 1.0 mg/kg/h according to clinical presentations.

Results and Discussion: There were no significant difference in age, BMI, gender, hypertension, diabetes, insertion time of gastroscope, infusion duration, endoscopic procedure time, biopsy rate, adverse events and rescue ephedrine dose in both groups. Analysis of the percentage of time in respiratory rate < 8/min, $SaO_2 < 90\%$, $SaO_2 < 85\%$ and mean arterial pressure beyond 20%, there were significant less in TCI group than in TIVA group.

Clinical Presentations

Percent of time	TCI	TIVA	p value
RR<8/min	8.95 ± 10.70	15.50 ± 16.59	0.02
SaO2<90%	1.11 ± 2.35	3.37 ± 5.34	0.008
SaO2<85%	0.28 ± 0.94	1.15 ± 2.90	0.049
MAP beyond 20%	10.43 ± 9.78	20.75 ± 17.05	<0.001

data presentated as MEAN ± SD.

Conclusion(s): TCI can provide more stable hemodynamics and spontaneous respiration than conventional TIVA in endocopic examinations.

References:

1 Weninger B, Czerner S, Steude U, et al. Anasthesiol Intensivmed Notfallmed Schmerzther. 2004 Apr;39(4):212–9.
2 Passot S, Servin F, Pascal J, et al. Anesth Analg. 2005 May;100(5):1338–42.
3 Hohlrieder M, Tiefenthaler W, Klaus H, Gabl M, et al. Br J Anaesth. 2007 Oct;99(4): 587–91. Epub 2007 Jul 27.

2AP1-7

Cerebral state index in day-surgery: Efficacy in predicting an autonomic or somatic response to incision

P. Sansone, S. Romano, M. Pace, M. Iannotti, C. Aurilio

Department of Anaesthetics, Surgical and Emergency Sciences, Second University of Naples, Naples, Naples, Italy

Background and Goal of Study: A wide variety of electroencephalographic based monitoring system have been introduced to evaluate the depressant effect of anesthetic drugs on the central nervous system. It has recently been introduced a cerebral state index (CSI) as a new device. However, the different dynamic profiles of these monitors indicate CSI may be better for evaluating deeper anesthetic levels. For this reasons we thought that CSI may be more useful in patients undergoing surgical procedures in day-surgery. We designed this clinical study to examine the ability of the cerebral state monitor to predict autonomic/somatic responses to incision.

Materials and Methods: After the approval of Ethical Committee and written informed consent, 30 ASA I–II patients (15 men and 15 women; mean age 40 years, mean weight 70 kg) scheduled for day surgery under general anesthesia were evaluated. Anaesthesia was induced with propofol (1.5 mg/kg) and fentanyl (0.003 mg/kg) followed by the placement of a laryngeal mask airway. Maintenance was achieved using oxygen in nitrous oxide (1 : 2) with sevoflurane titrated to clinical needs. In all patients were monitored: HR, RR, NiBP, SpO_2. Anaesthetic depth was monitored using the CSI 5 min prior to and 5 min after incision.

Results and Discussion: During the 5 min prior to incision, the mean CSI was 40, after the incision, most patients (25/30) had an index between 40 and 60 and only two patients had a mean value above 60, while 9 had values below 40. In the majority of patients (20/30) the CSI increased after incision, while three did not show any change and for seven patients the CSI decreased after incision. Six patients showed minor movements after incision and eight patients had > 25% increase in blood pressure. The change in CSI did not show any consistent relation to the value before incision. No patients needed further administration of fentanyl and no episodes of awareness were recorded. In

our study this device was inadequate in approximately 30% of patients who showed minor signs of light anaesthesia when surgery begun, but it is important to remind that this is a clinical study and none received muscle relaxants.
Conclusion(s): The CSI in everyday clinical setting has greater relevance by demonstrating its benefits and its potential limitations. However in the majority of patients was within acceptable ranges during clinically adjusted anaesthesia prior to incision but seems not to be able to reliably predict an autonomic or somatic response to incision.

2AP1-8

Trends in the use of anesthesia techniques for inguinal hernia repair surgery in Spain: TACHI multicenter study

J. Zaballos, J. de la Pinta, M. Zaballos, S. López, J. Gómez

Anesthesiology, Policlínica Guipuzcoa, San Sebastián, Guipuzcoa, Spain

Background and Goal of Study: Inguinal hernia repair surgery is a very common elective procedure entailing low risk. It is adequate for inclusion in Major Outpatient Surgery (MOS) Units. Current data suggest an important variability of the anesthetic techniques performed. The study aims to determine the trends in the use of anesthesia techniques for inguinal hernia repair surgery in Spain.
Materials and Methods: A prospective, descriptive, multicenter study was conducted in the Spanish national setting. Each center recruited 12 patients (pt) undergoing hernia repair surgery. A case report form (CRF) was completed for each patient based on medical records relating sociodemographic and clinical variables, anesthetic techniques and postoperative period.
Results and Discussion: Twenty centers recruited 240 patients, 89.5% males and 10.5% females, with mean age of 57.3 years and mean BMI of 26.1. Most pt (90.8%) were ASA I/II. 46.6% of the pt underwent outpatient surgery, 26.1% short stay surgery and 27.3% surgery admission. Spinal was the type of anesthesia most frequently performed (60.1%), followed by general anesthesia (27.3%) and local infiltration anesthesia (12.6%). For spinal anesthesia, an hyperbaric solution was chosen in 76.6% of the cases and the most frequent local anesthetic used was bupivacaine (62.2%). Propofol was the most frequent general anesthetic administered for induction (73.4%), and sevoflurane for maintenance (74%). A laryngeal mask was used in 82.8% of pt and ventilation with intermittent positive pressure was used in 73.4% of the pt. Time of stay in PACU was between 1–3 hours in 94.7% of the pt and 3–6 hours in 5.3%. Additionally 94.7% of the outpatients and short stay pt were discharged during the following 12 hours after surgery. Adverse events were seen in 17,9% of pt, being pain and urinary retention the most frequent. The anesthetic technique performed was very satisfactory for surgeons in 92.1% of the pt and anesthesiologists would repeat the same technique in 97.1% of the cases. Spinal anesthesia is chosen more often than general or local anesthesia for the ease of performance but may be related to unwanted effects.
Conclusion(s): 1-Spinal anesthesia is the most frequently performed anesthesia technique for hernia repair surgery in Spain. The use of long duration hyperbaric local anesthetics may be related to unwanted side effects and to a delayed discharge time. 2-When general anesthesia is used, propofol is chosen for induction and sevoflurane for maintenance with a laryngeal mask airway.

2AP1-9

Intraperitoneal local anesthesia in ambulatory laparoscopic cholecystectomy

I. Vives, I. Salgado, C. Semeraro, M. Mateo, P. Cabré

Anesthesiology, Vall d'Hebron University Hospital, Barcelona, Spain

Background and Goal of Study: Postoperative pain is one of the many limiting factors regarding discharge of patients from the postanesthesia care unit (PACU) in ambulatory laparoscopic cholecystectomy (LC)[1]. Many methods have been used to reduce postoperative pain including nonsteroidal antiinflammatory drugs, local anesthetics (LA) and opioids with varying success[2]. This study was aimed at assessing the analgesics effects of intermittent injections of ropivacaine when injected through an indwelling catheter placed on the gall bladder bed at the end of the operation.
Materials and Methods: We sudied 40 patients, ASA I–II, aged 20–60 years, undergoing elective ambulatory laparoscopic cholecystectomy. Patients were divided in two groups: Group I (n = 20) at the end of surgery a catheter for analgesia was placed on the gallbladder bed and 10 ml of ropivacaine 0.5% was administered/90 min four times. After the last instillation the catheter was removed. Group II (n = 20) conventional analgesia was given with desketoprofen and paracetamol iv and metamizol and tramadol p.o as rescue. Wound infiltration with LA was injected in both groups. Induction and maintenance of anesthesia was standardized in all patients. The following data was collected: total operative time, surgical time, recovery time, peri/postoperative complications, analogic visual scale (VAS) on arrival in the PACU and before PACU discharge, verbal scale (VS) at 24–48h after surgery and 7th day, rescue analgesia at 24/48 hours and 7 days, patients' and surgeons' satisfaction, consumption of rescue analgesia.
Results and Discussion: There was a significant improvement in pain during the early postoperative period (10 hours postoperatively) at rest and when coughing in group I. No adverse events due to the use of LA were reported. Postoperative complications as nausea and vomiting or punction trocar bruise are similar in both groups. Supplemental consumption of metamizol was significantly lower ($P < 0.05$) in Group I compared to Group II during the first 8 h after surgery. No differences were noted between two groups on total analgesia delivered in the postoperative period after discharge.
Conclusion(s): The use of Ropivacaine 0.5% instillated through a catheter on the bed of the gallbladder after LC seems to be safe and results show a statistically significant reduction in early postoperative abdominal pain.
References:
1 Gupta A. et al. Anesth Analg 2002; 95:450–6.
2 Hernández-Palazón J. et al. Euro J Anaesthesiol 2003 Nov; 20(11):891–6.

2AP1-10

Interscalene blocks for daycase shoulder surgery: Introducing a new technique to suit our patient population

H. du Plessis, S. McKinlay, M. Booth

Anaesthetic Department, Glasgow Royal Infirmary, Glasgow, United Kingdom

Background and Goal of Study: Interscalene brachial plexus block (ISBPB) provides superior analgesia for arthroscopic shoulder surgery (ASS)[1,2] and allows it to be performed as a day case procedure[3]. Previously patients required a 2 day hospital stay in our institution. We aimed to perform the surgery under ISBPB and general anaesthesia as day case procedures in our hospital.
Materials and Methods: 73 patients received ISBPB and peripheral nerve catheter placement prior to general anaesthesia. The ISBPB was performed with a 30ml mixture of 1% lignocaine with adrenaline and 0.25–0.5% levobupivacaine. Postoperatively a 30 ml bolus of local anaesthetic (0.333%–0.5% levobupivacaine) was administered prior to nerve catheter removal and hospital discharge. Discharge analgesia comprised regular and breakthrough analgesia. Data collected included demographics, block duration, side effects and patient satisfaction (1 = very dissatisfied to 5 = very satisfied). Pain scores (verbal descriptor scale from 0 to 10) were assessed in recovery room (RPS), the next day as worst overnight pain score (WPS) and as best overnight pain score (BPS). Data was analysed using SPSS statistical programme.
Results and Discussion: The most commonly described procedure was arthroscopic subacromial decompression (n = 32). Mean age was 45 (SD 14.2). Gender distribution was 40 male patients and 33 female patients. Mean duration of block was 9.4 hours (SD 3.34). Median RPS was 0/10 (IQR 0-0/10, range 0-4/10). Median WPS was 4/10 (IQR 1-6/10; range 0-10). Median BPS was 0/10 (IQR 0–2; range 0–7). Patient satisfaction was median = 5 (IQR 5–5; range 1–5). Vomiting occurred in 3/73 (4.1%), nausea in 19/73 (26%) and dizziness in 19/73 (26%). 58.9% of patients reported the same as or better level of sleep than normal, on their first postoperative night. Only one patient required overnight admission due to low oxygen saturations.
Conclusion(s): ISBPB achieves excellent pain relief, low complication rate and high patient satisfaction. A large catchment area of patient referral makes it unable for us to discharge patients with a nerve catheter in situ. Introducing a technique of bolus topup rather than continuous infusion has made day case surgery possible and improved service delivery.
References:
1 Singelyn FJ, Lhotel L, Fabre B. Anesth Analg 2004;99:589–592.
2 Laurila PA, Lopponen A, Kangas-Saarela T et al. Acta Anaesthesiol Scand 2002;46:1031–1036.
3 Russin K, Sardesai AM, Ridgway S et al. BJA 2006;97:869–73.

2AP2-2

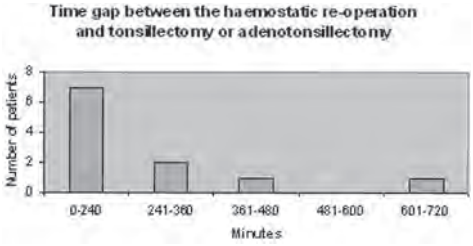
Haemostatic re-operation due to post-tonsillectomy primary bleeding

A. Takala, K. Pinomaa, J. Jero

Section of Anaesthesia at the Department of Otorhinolaryngology, Helsinki University Central Hospital, Helsinki, Finland

Background and Goal of Study: Tonsillectomy (TE) and adenotonsillectomy (TEA) are frequently performed as outpatient procedures. TE and TEA may cause significant bleeding postoperatively requiring haemostatic re-operation. Primary bleeding occurres within 24 hours after TE or TEA, and has been reported to complicate recovery in 0.5–2.2% of the patients. We examined the frequency of haemostatic re-operations and the time gap between TE or TEA and the haemostatic re-operation due to primary bleeding.
Materials and Methods: All the patients who were operated due bleeding after TE or TEA during a one year period, were retrospectively collected from automated database and included. Age, sex, the type of procedure (TE or TEA), the

estimated amount of haemorrhage and possible complications were registered. The time gap between TE or TEA and haemostatic re-operation was determined from the automated database. The results are presented as medians with range.
Results and Discussion: A total of 67 patients required haemostatic re-operations due to haemorrhage after TE or TEA. Eleven patients (6 men, 5 female) were re-operated within 24 hours after TE or TEA. The median age was 11.1 years (range 3.7–66.4). Of these 11 patients, 3 patients had TE and 8 patients TEA. Median time between TE or TEA and haemostatic re-operation was 150 minutes (range 23–707min.) Ten patients were referred to re-operation from the outpatient ward and one from home. The median value of estimated intra-operative haemorrhage was 30ml (0–700 ml). One patient developed pneumonia and required blood transfusion. During the study period, TE or TEA were performed to a total of 1539 patients. The frequency of haemostatic re-operations due to primary bleeding was 0.71%. The primary bleeding originated clearly from epipharynx in 5 out of 8 patients with TEA. Thus the primary bleeding from the removal area of tonsils was less common, only 0.39%.



Conclusion(s): The primary bleeding after TE or TEA may need a haemostatic surgical re-intervention up to 12 hours. However, the frequency of the haemostatic re-operations due to primary bleeding is low and the intra-operative blood loss is small thus suggesting that TE and TEA are safe outpatient procedures.

2AP2-3

Comparison of different TIVA dosage of remifentanil for direct laringoscopy procedure and effects on hemodynamic parameters, recovery time and stress response

A. Ozgultekin, G. Turan, N. Ozdemir, E. Dincer, G. Yuksel

II. Anesthesiology and Intensive Care Unit, Haydarpasa Numune Teaching and Research Hospital, Istanbul, Turkey

Background and Goal of Study: Direct laryngoscopy is a otolaryngeal procedure that is used both for diagnosis and treatment. As an ambulatory surgery, recovery from anesthesia is expected to be fast. In this study we compared the effects of three different infusion rates of remifentanil in TIVA, on hemodynamic parameters, perioperative stress and recovery response during direct laringoscopy surgery.
Materials and Methods: 63 patients ASA class 1–2, between the ages of 18–70 were randomly divided into three groups. 1 $\mu^{-1}kg^{-1}$ remifentanil, 2 $mg^{-1}kg^{-1}$ propofol and 1 $mg^{-1}kg^{-1}$ succinylcholine were given for induction. Perioperatively, we used 50% $N_2O + O_2$, 50 $mg^{-1}kg^{-1}min$ propofol for each group and 0.2–0.3 – 0.4 $\mu^{-1}kg^{-1}min$ remifentanil for group I, II, III respectively. Systolic, diastolic and mean arterial pressures, heart rate and SPO_2 were recorded before induction, after induction, every 3 minutes during the procedure, at the end of surgery and during extubation. Postoperatively, time to spontaneaus breathing, sufficient respiration, extubation, response to verbal stimulus and Aldrete scores at 5th, 10th, 15th minutes were also recorded. Side effects like muscle rigidity, bradycardia, hypotension, nausea, vomiting, shivering and pruritis were noted.
Results and Discussion: According to our results, all three dosages of remifentanil are sufficient to supress the stres responses during the procedure with fast recovery. In Group I (0.2 $\mu^{-1}kg^{-1}min$) and Group II (0.3 $\mu^{-1}kg^{-1}min$), extra bolus doses of remifentanil were needed (13 times in Group I, 6 times in Group II). In Group III (0.4 $\mu^{-1}kg^{-1}min$) no additional dose were given but a few hypotensive episodes which are at acceptable level were seen.
Conclusion(s): We conclude that; for laryngoscopic procedures remifentanil at the rate of 0.4 $\mu^{-1}kg^{-1}min$ is an effective dose with no significant side effects.
References:
1 Hall AP, Thompson JP, Leslie NA, et al. Br J Anaesth. 2000; 84: 100–2.
2 Nilsson LB, Viby-Mogensen J, Moller J, et al. Acta Anaesthesiol Belg. 2002; 53:213–9.

2AP2-4

Spinal anaesthesia for urological day-surgery: Plain ropivacaine 0,5% versus plain bupivacaine 0,5%.

M. Amicone, F. Cannata, P. Di Marco, L. Scattoni, C. Reale

Anaesthesiology, Intensive Care and Pain Therapy, University of Rome "La Sapienza", Rome, Italy

Background and Goal of Study: The current introduction of intrathecal ropivacaine in clinical practice arises interest in subarachnoid anaesthesia for day surgery. Ropivacaine solution at low doses seems to offer differential block as like as through epidural route with advantages in term of decreased duration of motor block compared to bupivacaine. Ropivacaine employ could result a suitable choice for spinal anaesthesia in day-surgery regimen because of proved safety and potential early discharge of the patient. Our study intended to evaluate efficacy and rapid regression of sensitive and motor block provided with plain ropivacaine compared to plain bupivacaine via intrathecal infusion.
Materials and Methods: This prospective randomized study included sixty ambulatory urological patients ASA status I–II, who received intrathecal injection of one of two plain local anaesthetics. Group R (n = 30) received 3 ml of an isobaric ropivacaine solution 0,5% (15 mg); group B (n = 30) received 2 ml of an isobaric bupivacaine solution 0,5% (10 mg) through a 25 gauge Whitacre pencil point needle. The onset time and duration of sensory block at dermatome level T10 with pinprick test, intensity and duration of motor block with Modified Bromage Scale were recorded as well upper spread of sensory block and required additional analgesic drugs.
Results and Discussion: Anaesthesia was effective in both groups, only two patients of group R and one patients of group B required additional analgesic drugs which consisted of fentanyl 50–100 mcg. Median onset of sensory block at dermatome level T10 was 8,5 min in group R and 7 min in group B. Median duration of sensory block at T10 dermatome was similar, 142 min in group R and 155 min in group B. Median duration of motor block was significantly shorter with ropivacaine compared with bupivacaine ($p < 0,005$). Major extension of cephalic spread was comparable, T8 (T5–T10) and T9 (T6–T10) respectively with ropivacaine 15 mg and bupivacaine 10 mg.
Conclusion(s): Our results agree with those previous studies which support significant difference concerning about motor block regression between ropivacaine solution and bupivacaine solution at equipotent doses (3:2). A more rapid postoperatory recovery of motor function was observed in group R compared with group B.

2AP2-5

Prilocaine: The best local anaesthetic for ambulatory hernioplasty

C. Botana Sicilia, G. Agreda Martinez, P. Cabre Fabre, I. Salgado Algaba, D. Mateo Arzo

Anesthesiology and Reanimation, Hospitals Vall d'Hebron, Barcelona, Spain

Background and Goal of Study: Spinal anaesthesia is often a less popular choice for day cases. This may be for historical reasons, but also because of concerns over delayed recovery and adverse effects. To be suitable for day surgery, spinal anaesthesia must be modified to reduce the extent and duration of motor block while retaining a useful degree of analgesia. Besides it provides good postoperative pain relief and minimises postoperative nausea. Using low dose spinal local anesthetic, excellent haemodynamic stability is achieved, and can significantly extend the population of patients suitable for day surgery. Reports of major and minor sequelae following lidocaine spinal anaesthesia have generated interest in an alternative short-acting subarachnoid agent. Of the available anaesthetics suitable for short-duration, prilocaine is perhaps the most promising agent, resulting in a lower incidence of transient neurological symptoms than lidocaine and, therefore it is more suitable for short surgical procedures.
Materials and Methods: Retrospective observational study from January 2007 to December 2008, including patients scheduled for inguinal hernioplasty, under spinal anaesthesia using a 27G pencil point needle, with low dose 5% hyperbaric prilocaine in lateral position. ASA physical status, demographic data, prilocaine dose, surgical and sensomotor block duration, and complications were registered.
Results and Discussion: 465 patients ASA physical status I–II were included, 413 male and 52 female, mean age 58 ± 14 years, weigth 73 ± 10 kg,. Mean prilocaine dose was 40 ± 6 mg (0.5 mg/kg). Mean surgical time was 38 ± 11 min. Mean regression of sensormotor block was 107 ± 32 min. Complications were postoperative nausea and vomiting 4 cases, wound bleeding 1case, fever 4 cases, acute pain 4 cases, and vasovagal syncope 8 cases. No acute orine retention nor transient neurologic symptoms were found.
Conclusion(s): Unilateral side blockade allows low dose of local anesthetic, providing good conditions for inguinal hernioplasty. Hiperbaric prilocaine as a short duration agent is ideal for ambulatory surgery under spinal anesthesia, with low number of complications.
References:
1 SS Liu. Anesth Analg 2005;101:1634–42.
2 Korhonen AM. Curr Op Anaest 2006, 19:612–6.
3 Urmey WF. Best Pract Res Clin Anaesthesiol. 2003 Sep;17(3):335–46.

2AP2-6

Recovery and long-lasting symptoms after day surgery

M. Warrén Stomberg, M. Brattwall, M. Segerdahl, N. Rawal, J. Jakobsson

University of Gothenburg at the Sahlgrenska Academy, Institute of Health and Care Sciences, Gothenburg, Sweden

Background and Goal of Study: The more protracted effects of day surgery and the impact of health quality are not well documented. Short-term follow-up, one week and thirty day follow-ups have been published. This is a prospective 6-month follow up questionnaire study evaluating postoperative symptoms and discomfort related to three common day surgical procedures; cosmetic breast augmentation (CBA), inguinal hernia repair (IHR) and arthroscopic procedures (AS).
Materials and Methods: A total of 355 patients were included and followed-up 1, 2, 4, 12 and 24 weeks in case of persistent symptoms/disabilities, 8 different subjective symptoms were asked about.
Results and Discussion: Response decreased over time but was in all 63% after 24 weeks. No major morbidity was reported. Seven patients were re-admitted to hospital. Two reoperations were carried out among CBA, IHR and AS respectively. One patient was re-admitted due to anaesthesia reasons; urinary problems following spinal anaesthesia. Contact with health care following discharge was reported on 90 occasions, in a majority due to surgical reasons; wound and wound dressing related issues, prolongation of sick leave. On 7 occasions after CBA, 6 after IHR and 24 after AS this was due to pain. Surgery related discomfort was common. After one week, 72% experienced on average 3.1 symptoms/discomforts related to their surgical procedure. Number of patients reporting surgery related symptoms decreased, as did number of symptoms recalled. At 2, 4, 12 and 24 weeks 54%, 35%, 20% and 10% of patients reported surgery related symptoms. Discomfort related to surgery decreased more slowly for arthroscopy patients; problems with ambulating were the most predominant symptom for all groups and were reported by 7%, 5% and 39% for CBA, IHR and AS respectively at four weeks. At 24-weeks only 22 patients reported any surgery related distress; 3% of CBA, 6% of IHR and 11% of AS.
Conclusion(s): During first 2 weeks following surgery major morbidity or complications were infrequent but surgical site related discomforts common. Problems decreased rapidly after breast augmentation and hernia repair. However, arthroscopic procedures were associated with slower resumption of surgical site related disability, at 4 weeks nearly 50% suffer subjective discomfort. The study indicates that surgical site discomfort exists for several weeks following elective minor surgery. It is not possible to say whether these symptoms are related to the day surgical logistics or to the surgical intervention per se.

2AP2-7

Pain, nausea and sleep disturbance in day-case surgical patients

J. Gjerlow

Department of Anaesthesia, Sorlandet Sykehus Arendal, Arendal, Norway

Background and Goal of Study: A quality assessment study using patient reports of symptoms during the first postsurgical week.
Materials and Methods: 200 patients reporting for by gynaecological, surgical and orthopaedic day-case surgery in one unit were asked to record perioperative experiences. A questionnaire about pain, nausea and sleep disturbance were given patients on arriving in unit. 120 women and 80 men aged 14–78 years were recruited. 26% of patients had local or regional anaesthesia, 74% general anaesthesia. Pain and nausea was reported for in-unit time, day-of-surgery at home, and for the period of day 1–6, sleep disturbance for the full week. Maximal pain intensity within period was rated by 5-step verbal scale, nausea and sleep disturbance rated as 'no/some/strong'. 8 subgroups were defined by anatomy of surgery: laparascopic and transvaginal gynaecological surgery, anal, hernia and varicose vein surgery, foot, hand and arthroscopic knee orthopedic surgery.
Results and Discussion: 172 questionnaires were returned including one mailed follow-up. 'High-level-pain' (HLP), defined as step 4 or 5 on 5-step scale was reported by 15% of patients in unit following surgery, by 16% of patients on day of surgery at home, by 10% within postoperative days 1 to 6. For subgroups of patients incidence of HLP in unit was highest in the gynaecological groups, exceeding 30%. Anal surgery and gynaecological laparoscopy patients had the highest incidence for day of surgery at home, 50 and 42% respectively; anal, hernia and foot surgery had 20–26% of patients experiencing HLP within days 1 to 6. Nausea in unit was reported in 14% and 6% of patients (some, strong), day of surgery at home in 15% and 4%, day 1–6 by 11% and 1%. 10 patients strongly nauseated in unit were all women. Sleep disturbance was reported as 'some' by 46% of patients, as 'strong' by 6%. Patients reported 80% or higher incidence of sleep disturbance following hernia surgery or gynaecological laparoscopy.
Conclusion(s): The study demonstrates that there is room for improving patient well-being. Improvements should in the authors opinion be based on use of timed balanced analgesia including regional anaesthetic techniques where applicable. Recording patient experience may help guide this work.

2AP2-8

Patient use and evaluation of analgesics in day-case surgery

J. Gjerlow

Department of Anaesthesia, Sorlandet Sykehus Arendal, Arendal, Norway

Background and Goal of Study: Patients were asked to report use of analgesics before surgery and evaluate perioperative analgesia.
Materials and Methods: Data about analgesic use were collected by questionnaires from 200 patients reporting for gynaecological, surgical or orthopaedic day-case surgery in one day-case unit. 120 women and 80 men aged 14–78 years were recruited from consecutive procedures. 26% of patients had local or regional anaesthesia, 74% general anaesthesia. 8 subgroups were defined: laparascopic and transvaginal gynaecological surgery, anal, hernia and varicose vein surgery, foot, hand and arthroscopic knee orthopedic surgery.
Results and Discussion: 172 forms were returned including one mailed follow-up. 58% of respondents confirmed pain for more than 3 days weekly during the pre-surgical month. Except for two patients all confirmed a relation between pre-operative pain and planned surgery. 9% of patients had been taking preoperative analgesics daily. *Analgesia in day-care unit*: Hospital records showed post-surgical administration of analgesics in unit in 70% of (all 200) patients. 69% received paracetamol and/or NSAID, 29% opioids with 8% having one or more dose by injection. In most patients only one dose of 30 mg oral codeine with paracetamol was given. *Pain and analgesics in post-surgical week:* Duration of postsurgical pain was reported by 149 respondents. Mean duration was 3,6 days with 28% of patients having pain throughout the week. Oral codeine 30 mg with paracetamol was the opioid most frequently prescribed. 154 patients reported taking medicine for post-surgical pain for a mean of 2,5 days, with 10% reporting a full week treatment. Anal surgery patients reported a mean of 4,1 days of analgesics, hernia surgery patients a mean of 3,6 days. *Patient evaluation:* Asked to confirm whether timely and effective pain relief had been given in unit. 86% confirmed, 2% disagreed the rest being inconclusive. Evaluating post-op pain treatment at large, 70% were very satisfied, 26% quite satisfied, 3% 'in between', 3% mostly unsatisfied while no respondents concluded being not at all satisfied. In gynaecologic laparoscopy and anal surgery less than 40% of patients were very satisfied, while in transvaginal and varicose vein surgery more than 80% were very satisfied.
Conclusion(s): Preoperative pain was frequent, and in almost all patients related to planned procedure. In general the time taking post-op analgesics was short, however with considerable variability. A great majority of patients returned a positive evaluation of treatment.

2AP2-9

A comparison of maintenance and recovery profiles after sevoflurane versus desflurane anaesthesia in ambulatory patients undergoing microlaryngoscopy

A. Papadima, E. Lagoudianakis, V. Panagopulou, I. Makri, M. Gouliami

Anaesthesiology, Hippocrateion Hospital, Athens, Greece

Background and Goal of Study: It has been suggested that desflurane is the volatile drug of choice for ambulatory surgery (1). Rapid and predictable recovery from anaesthesia are both important goals of anaesthesia. The objective of this prospective study was to test the hypothesis that the maintenance and recovery profiles of sevoflurane and desflurane are equivalent when used as part of a standardized balanced technique for ambulatory anaesthesia.
Materials and Methods: After approval from the local ethics committee and written informed consent, we prospectively studied 66 adult patients (aged 45–73 yr; ASA I–III) of both genders undergoing elective microlarygoscopy. We randomly assigned to anaesthesia with desflurane (group D: n = 31) or sevoflurane (group S: n = 35). The inhaled anaesthetics were titrated to achieve an adequate clinical "depth of anaesthesia" of Bispectral Index 40–50. Values of MAP, HR, SpO2, and BIS were recorded at 1-min intervals during induction and at 5-min intervals during the maintenance and recovery periods. The times from stopping the anaesthetic drugs to eye opening, to spontaneous respiration, to extubation, and to readiness for transfer to the recovery ward were recorded. The rate of breath holding, laryngospasm, and desaturation was also recorded. At 30,60, 90, and 120 min after the end of anaesthesia, the patients were asked to repeat the VAS (0–100 mm) for sedation, energy, confusion, coordination, nausea, and pain. For statistical analysis, t-tests for paired and unpaired data, and chi square tests were used, as appropriate.

Results and Discussion: There were no differences in recovery times between the groups (time to extubation: 11.7 (3.5) vs 11.0 (2.6) min, readiness for transfer to the recovery ward:15.4 (3.4) vs. 15.7 (2.6) min, mean (SD)). Intermediate recovery times, postoperative VAS scores, and side effects were similar in the two groups. The rate of breath holding, laryngospasm, and desaturation was similar between those receiving desflurane versus sevoflurane. The rapid administration of desflurane up to 1.8 MAC has been associated with systemic hypertension and tachycardia in two cases after induction of anaesthesia.
Conclusion(s): Desflurane has a similar profile to sevoflurane with respect to recovery times and side-effects. Although the rapid administration of anaesthesia with desflurane can result in sympathetic stimulation, which may induce cardiac arrhythmias, including ventricular arrhythmias.
Reference:
1 Van Hemelricjk J, et al. Anesthesiology 1991;75:197–203.

2AP2-10

Reduction of postoperative pain, nausea and vomiting *a quality audit of an intermediate care unit*

S. Dalbert, S. Brunnschweiler, A. Zollinger, C. Hofer

Triemli City Hospital Zurich, Institute of Anaesthesiology and Intensive Care Medicine, Zurich, Switzerland

Background and Goal of Study: The major task of an intermediate care unit (IMCU) is to minimize the incidence of major postoperative complications (i.e. cardiovascular and respiratory) as well as the reduction of postoperative pain[1], nausea and vomiting (PONV)[2]. Major postoperative complications are rare, whereas postoperative pain and PONV are frequently observed during IMCU stay. The aim of the prospective study was to assess quality of postoperative care in an IMCU using reduction of pain, nausea and vomiting as quality markers.
Materials and Methods: This quality audit was performed between 6/2004 and 12/2007. Socio-demographic and case relevant data were recorded for all patients requiring IMCU stay. Pain was assessed using a numeric rating scale (NRS 1–10) [3] after transfer to the IMCU and before discharge to a regular ward. At the same time the frequency of PONV was evaluated. Subgroup analysis was performed for gender, age, ASA classification, type of intervention, main diagnosis and anaesthetic technique. T-test and χ^2-test were used for statistical analysis. P-value < .05 was considered statistically significant.
Results and Discussion: Data of 12'179 patients were available for statistical analysis (female/male ratio = 48.2%/51.8%, age = 65.2 ± 17.7 years [mean ± SD], range = 10–103 years, ASA classification III/IV = 38.6%). A broad spectrum of operations was performed (visceral surgery 34%, traumatology 18%, urological surgery 12%). 72% of the patients had general anaesthesia, 14% had a combined anaesthetic technique, whereas for 10% regional anaesthesia was used. A significant reduction of pain could be achieved (ΔNRS = – 2.5 ± 1.7; p < .001). 236 patients (1.9%) had initial nausea, whereas vomiting occurred only in 21 (0.17%). At discharge 223 (87.1%) of these patients were free of nausea, no vomiting was observed. Subgroup analysis revealed significant differences of initial pain levels for age, gender (i.e. NRS female/male = 1.9 ± 1.2/ 1.7 ± 1.1 respectively, p < .05), type of intervention and anaesthetic technique as well as differences in initial frequency of PONV for age, gender (i.e. frequency of PONV female/male = 3.1%/1.3% respectively, p < .05), ASA classification and anaesthetic technique. In all subgroups a significant reduction in NRS and PONV during stay in IMCU could be achieved.
Conclusion(s): These data demonstrate that a good quality of postoperative care in terms of pain and PONV reduction during a stay in the IMCU was achieved.
References:
1 Minerva Anesthesiol 2007; 73: 201–6.
2 BMC Anaesthesiology 2006; 6:14.
3 Cancer Nursing 1997; 20(2):88–93.

Monitoring: Equipment and Computers

3AP1-1

Endotracheal tube cuff pressures are too high during anaesthesia

B. Rose, B. Kyle, A. Koshy-Delaffon, R. Cregg

Centre for Anaesthesia UCL, University College London Hospitals, London, United Kingdom

Background and Goal of Study: Endotracheal tubes (ETT) are routinely used to aid positive pressure ventilation and prevent aspiration of pharyngeal and gastric contents. Tracheal mucosal capillary blood flow is compromised at endotracheal tube cuff (ETTc) pressures above 25 cm H_2O [1], and increased ETTc pressures have been associated with laryngo-tracheal morbidity such as sore throat, hoarseness or dysphagia [2]. Routine ETTc pressure measurement is well established in the Intensive Care Unit setting [3] but not during anaesthesia. We therefore audited ETTc pressures in the operating theatre in three hospitals in London.
Materials and Methods: Participating hospitals were Barnet General Hospital (BGH), Chase Farm Hospital (CFH), and the Royal Free Hospital (RFH). In a prospective audit, we measured end-expiratory ETTc pressure in 119 patients. In addition, we evaluated the influence of secondary variables (ETT size and site, patient positioning, use of N_2O, and laparoscopy) on ETTc pressure. Values are represented as median [IQR]. The Mann-Whitney test was used to determine differences in ETTc pressures between hospitals and the influence of secondary variables on ETTc pressures. A p-value of < 0.05 was considered significant.
Results and Discussion: ETTc pressures were 41 [27–55] cm H_2O across the three hospitals which is well above the recommended pressure of 25 cm H_2O. We noted a statistically significant difference between RFH (31.00 [24.00–45.00] cm H_2O) and CFH (53.00 [42.25–74.50] cm H_2O; p < 0.001) as well as BGH (45.00 [29.25–58.75] cm H_2O; p < 0.05), respectively. We could not find statistically significant differences in ETTc pressures for ETT size, patient positioning, use of N_2O or laparoscopy. Intraoperative ETTc pressure measurement was not standard practice in the participating hospitals.
Conclusion(s): The observed median ETTc pressures during anaesthesia exceeded the recommended maximum pressure of 25 cm H_2O by 16 cm H_2O. In our opinion, the risk of complications with increased ETTc pressures should lead to routine monitoring during anaesthesia.
References:
1 Bunegin L, Albin MS, Smith RB. Anesth Analg 1993;76:1083–90.
2 Beebe DS. Seminars in Anesthesia, Perioperative Medicine and Pain 2001;20:166–172.
3 Jaber S, El Kamel M, Chanques G, et al. Intensive Care Med 2007;33:917–8.

3AP1-2

Effect of humidifying devices on humidification of inspired gas and tidal volume by ventilator monitoring

Y. Lim, Y. Kwon, J. Yon, K. Hong, W. Lee

Anesthesiology and Pain Medicine, SanggyePaik Hospital, College of Medicine, Inje University, Seoul, Korea

Background and Goal of Study: In general anesthesia, a heat and moisture exchanger (HME) is used to prevent hypothermia and to maintain humidity inspired gas. We hypothesized that after a HME expiratory tidal volume decreases because a HME traps the expired vapor. The aim of this study was to evaluate the humidity of expired gas and to investigate the accuracy of tidal volume monitoring.
Materials and Methods: Applying two heat and moisture exchanger, Pall Breathing filter (pall BB25, ACE medical, Korea) and Hygrobac S (Mallinckrodt Dar, Mirandola, Italy) between endotracheal tube and Y-piece and with same brand of ventilator, we measured expiratory tidal volume, temperature and relative humidity at before HEM and after HEM. And we recorded expiratory tidal volume monitored by ventilator with and without HME.
Results and Discussion: The relative humidity was significantly higher at before HEM than after HEM in both group. The temperature in Hygrobac S group was higher when measured at before hygrobac S but not in pall BB25 group. The measured expiratory tidal volume at before and after HEM was not significantly different. The tidal volume monitored by ventilator with HEM was significantly smaller than without HEM, by 3.1% in pall BB25 and 5.3% in Hygrobac S.
Conclusion(s): The HMEs improved inspiratory humidity and temperature of anesthetic gas. There was no significant difference between before and after HME expiratory tidal volume but tidal volume monitored by ventilator with HME was significantly smaller than without HME maybe due to resistance increased by using HME during general anesthesia.
References:
1 Yasuki Fujita, Hideaki Imanaka, Yuji Fujino, Muneyuki Takeuchi, Toshiji Tomita, Takashi Mashimo et al: Effect of humidifying devices on the measurement of tidal volume by mechanical ventilators. Journal of anesthesia 2006; 20: 166–72.
2 A. Johansson, D. Lundberg and H. H.: The effect of heat and moisture exchanger on humidity and body temperature in a low-flow anaesthesia system. Acta Anaesthesiol Scand 2003; 47:564–8.

3AP1-3

Vapour monitoring in the anaesthetic room: Current and intended future practise in Scotland

N. Smart, J. Glen

Anaesthesia, Victorai Infirmary, Glasgow, United Kingdom

Background and Goal of Study: Continuous end tidal vapour monitoring may reduce the number of critical incidents associated with overdosage or underdelivery of volatile anaesthetics. Awareness resulting from underdelivery remains relatively common, occurring in 0.1–0.2% of cases (1), although no comparative studies examine the effect of vapor analysers on its incidence (2). In March 2007, the Association of Anaesthetists of Great Britain and Ireland (AAGBI) updated guidelines to recommend vapour monitoring at all times during anesthesia, including in the anaesthetic room (3). To gauge the impact of these recommendations, we conducted a survey of current and intended future practise in hospitals across Scotland.

Materials and Methods: After piloting the questionnaire, all major hospitals and most smaller hospitals providing anesthetic services were surveyed by post. Non responders were followed up by telephone.

Results and Discussion: Of the 28 sites surveyed (257 anaesthetic rooms), replies were received from 27 (255 anesthetic rooms). While vapour analysis is routinely available in theatre, it is present in just over half the anaesthetic rooms (n = 139, 55%). Full compliance with the guidelines was recorded at only 15 sites (56%), while at 9 sites (33%), there was no vapour monitoring in any of the anaesthetic rooms. As regards future intentions in non compliant hospitals, 3 sites (16 anaesthetic rooms) planned to obtain vapor monitors in the short term, another 3 sites (33 rooms) reported that they would be unable to purchase monitors within 12 months, and the remaining 6 (67 rooms) were unsure, stating that they were in the process of assessing the financial implications of meeting the standards. Upgrading existing equipment has a lower initial cost than replacement, but the resources required for anesthetic directorates to meet the recommendations may nevertheless be considerable. The recommendations can also be met by inducing patients in theatre rather than in the anaesthetic room. None of the non compliant hospitals expressed an intention to do this, the reasons why not being identifiable from the questionnaire.

Conclusion(s): This survey demonstrates that almost half of Scottish departments do not comply with the recommendations of the AAGBI, and that full compliance is unlikely in the near future.

References:

1 Sneyd JR. *Br J Anaesthesia* 2004; 93(3): 324–6.
2 ASA Taskforce on Intraoperative Awareness *Anesthesiology* 2006; 104: 847–64.
3 http://www.aagbi.org/publications/docs/standardsofmonitoring07.pdf (accessed 11 12 2008).

3AP1-4

Detection of subclinical CO_2 embolism by transesophageal echocardiography during robotic-assisted laparoscopic radical prostatectomy

S. Na, S. Yang, H. Kim, E. Park, J. Hong

Department of Anesthesiology and Pain Medicine, Severance Hospital, Yonsei University, Seoul, Republic of Korea

Background and Goal of Study: Robotic-assisted laparoscopic radical prostatectomy (RALP) is now a widespread and rapidly expanding surgical technique for prostate cancer. Although the procedure involves minimal invasion and the least tissue damage, it may result in the rare but potentially lethal complication of gas embolism. The objective of this study was to document incidences of subclinical embolism in RALRP with continuous monitoring using transesophageal echocardiography.

Materials and Methods: Forty-three patients scheduled for elective RALRP under general inhalational anesthesia were enrolled in this study. After the induction of general anesthesia, a 5.0-MHz multiplane transesophageal echocardiography probe was inserted and the 4-chamber view was continuously monitored to detect intracardiac bubbles during surgery. Maximum insufflation pressure was set at 20 mm Hg and was maintained with 30 degree down-tilt Trendelenburg position during surgery. Cardiorespiratory instability during gas emboli entry was defined as an appearance of cardiac arrhythmias, sudden decrease in mean arterial blood pressure > 20 mm Hg, or an acute episode of pulse oximetric saturation < 90%.

Results and Discussion: Gas embolisms were observed in 7 of 41 (17.1%) patients during transection of the deep dorsal venous complex, but there were no signs of cardiorespiratory instability associated with emboli. The confidence interval for gas embolism was 0.204–0.138; 95%. There was no correlation between episodes of gas embolism and blood gas variables or end-tidal CO_2 partial pressure.

Incidences of intraoperative gas embolism and stages

Gas embolism	
Stage I	1 (2.4%)
Stage II	3 (7.3%)
Stage III	1 (2.4%)
Stage IV	2 (4.9%)
Total	7 (17.1%)

Data are number of patients (%).

Conclusion(s): Subclinical gas embolisms occur in 17.1% of robotic-assisted laparoscopic radical prostatectomies. We should consider the fact that this procedure has a potential for serious gas embolism, especially with the increasing popularity of laparoscopic prostatectomy using robot-assisted techniques.

References:

1 Matsunaga GS, Ahlering TE, Skarecky DW. Update on robotic laparoscopic radical prostatectomy. ScientificWorldJournal 2006; 6: 2542–52.
2 Derouin M, Couture P, Boudreault D, Girard D, Gravel D. Detection of gas embolism by transesophageal echocardiography during laparoscopic cholecystectomy. Anesth Analg 1996; 82: 119–24.

3AP1-5

Which finger do you attach pulse oximetry to? Index finger or not?

K. Mizukoshi, M. Shibasaki, F. Amaya, T. Mizobe, Y. Tanaka

Anesthesiology, Kyoto Prefectural University of Medicine, Kyoto, Japan

Background and Goal of Study: Pulse oximetry is a standard monitor during anesthesia but sometimes shows unreliably results, especially when the patients become hypoperfusion. Index finger is commonly selected for pulse oximetry measurement, but we do not know which finger is the best for probe location. The aim of this study is to investigate which finger is most resistant to hypoperfusion and the best for the pulse oximetry measurement.

Materials and Methods: A questionnaire of attachment to pulse oximetry sensor and its reason was filled out by circulating nurses, anesthesia fellows and anaesthesiologists. Twenty healthy volunteers were enrolled to this study. The measurements were performed in the supine position, and each pulse oximetry sensor was attached to all 5 fingers simultaneously. Oxygen saturation (SpO_2) and perfusion index (PI) were measured by radical, Masimo Corporation. To see the effects of hypoperfusion on pulse oximetry performance, arterial supply to the forearm was partially occluded with blood pressure cuff.

Results and Discussion: Questionnaires showed about 80% of medical staff in all groups selected index finger for attachment pulse oximetry sensor as a first selection. Perfusion index value showed significant difference between each finger (ANOVA, $p < 0.01$). PI of the middle finger showed the highest value in both control and hypoperfusion groups. SpO_2 did not show any remarkable difference between each finger in both groups. Previous report showed that ulnar artery is dominant for index finger, while ulnar and radial arteries are equally innervated to the middle finger. Highest PI value observed in the middle finger may reflect relatively abundant blood perfusion due to dual vascular supply.

Conclusion(s): Perfusion index showed remarkably different value between each finger. Among those PI of the middle finger was the highest in normal condition and during hypoperfusion. Monitoring pulse oximetry at the middle finger may reduce the risk that oximetry indicates inaccurate result during hypoperfusion.

Reference:

Buhre W, Rossaint R. Perioperative management and monitoring in anaesthesia. *Lancet* 2003; 362(9398): 1839–1846

3AP1-6

Accuracy and feasibility of a continuous blood glucose monitor STG-22 in critically ill patients

R. Hosoi, K. Yamashita, T. Yokoyama, T. Yatabe, K. Hanazaki

Department of Anesthesiology and Critical Care Medicine, Kochi Medical School, Nankoku, Kochi, Japan

Background and Goal of Study: Intensive insulin therapy has been reported to reduce the mortality in critically ill patients[1]. To obtain tight glucose regulation, an acute and feasible glucose monitor is necessary. However, there has been no continuous blood glucose monitoring system except the STG-22™ (Nikkiso Inc., Tokyo, Japan)[2]. The goal of the study is to determine the accuracy and feasibility of STG-22™, compared with a conventional laboratory glucometer (ABL™ 800FLEX (Radiometer Medical Aps, Brqnshqj, Denmark) in critically ill patients.

Materials and Methods: After receiving institutional approval of the Editorial Board of Kochi Medical School Hospital and written informed consent, 50 patients after elective surgery under general anesthesia were enrolled in this study. After admission to the surgical intensive care unit (ICU), a 20G intravenous catheter was inserted into the antebrachial vein and continuous blood glucose monitoring started with the STG-22™. Blood samples for intermittent blood glucose measurement were obtained from the radial artery at three times; at 0, 8 and 16 hours after admission in the ICU. Blood glucose of those samples was measured by ABL™ 800FLEX immediately.

Results and Discussion: Total 150 sets of paired blood glucose data were obtained at 3 measurements after admission to the ICU, and the changes of blood glucose between first sample (0 hour) and second sample (8 hours) and between second sample (8 hours) and third sample (16 hours) were calculated. The data were compared using Bland and Altman analysis. The bias and the limits of agreement (percent error) for each 3 measurements at 0, 8 and 16 hours after admission to the ICU were – 3.2 ± 24 mg/dl (14%), – 5.2 ± 23 (15%) and – 5.5 ± 20 (14%), respectively. For changes in blood glucose level, the bias limits of agreement were 2.0 ± 4.1 mg/dl for the first 8 hours period after admission to the ICU and 0.3 ± 4.8 mg/dl for the second 8 hours period after admission to the ICU.

Conclusion(s): The STG-22™ could measure blood glucose continuously. The percent error of each measurements were kept within 15%, and the limits of agreement for the changes of the first 8 hours period and for the second 8 hours period were kept within 5 mg/dl. The STG-22™ is accurate and feasible monitor, and may be useful for monitoring blood glucose continuously in critically ill patients in the ICU.

References:

1 Van den Berghe G, et al. N Engl J Med. 2001; 345: 1359–1367.
2 K Yamashita, et al. Anesth Analg 2008;106:160–3.

3AP1-7

Sudden increase in blood glucose after hepatic reperfusion

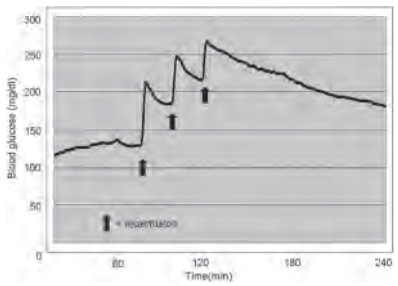
T. Yatabe, T. Yokoyama, K. Yamashita, Y. Maeda, K. Hanazaki

Department of Anesthesiology and Critical Care Medicine, Kochi Medical School, Nankoku, Kochi, Japan

Background and Goal of Study: It has not been thought that the blood glucose level change drastically during surgery except after quick intravenous administration of much dose of glucose or insulin. However, we observed sudden increase in glucose level after hepatic reperfusion during hepatectomy. In the current study, therefore, we investigated glucose alteration by continuous blood glucose monitoring during hepatectomy.

Materials and Methods: After receiving institutional approval of the Editorial Board of Kochi Medical School Hospital and written informed consent, patients undergoing hepatectomy were enrolled in this study. After induction of anesthesia with fentanyl, midazolam and vecuronium, blood glucose monitoring had started using the STG-22 (Nikkiso, Tokyo, Japan)1). Anesthesia was maintained with sevoflurane, and remifentanil or fentanyl was used for analgesia. However, no sugar was given during surgery. Blood flow of hepatic artery and portal vein was interrupted for 15 minutes by Pringle maneuver. This procedure had been repeated with 5 minutes intervals until the tumor was resected.

Results and Discussion: Thirty-six patients underwent elective hepatectomy. In most cases, Pringle maneuver was repeated 3 or 4 times, and blood flow of the hepatic artery and the portal vein was totally interrupted 51 ± 25 minutes. The blood glucose level did not changed during Pringle maneuver. However, the glucose level increased from 128 ± 28 mg/dl to 166 ± 36 mg/dl in 3 minutes after the first reperfusion. This increase in blood glucose level was observed after the second or the third Pringle maneuver similar to first time of Pringle maneuver. Here shows a typical blood glucose change in the figure.



Conclusion(s): Sudden increase in the blood glucose level after Pringle maneuver was revealed using continuous monitoring with STG-22. We have to pay attention this increase for maintenance of blood glucose level during hepatectomy.

Reference:

1 K Yamashita, T. Okabayashi, T Yokoyama, et al. Anesth Analg 2008;106:160–3.

3AP1-9

Comparison of haemoglobin and haematocrit values from three point-of-care-testing devices and the laboratory blood gas reference analyser

A. Martínez, V. Cegarra, M. Revuelta, M. Maestre, P. Paniagua

Cardiac anaesthesia and postoperative Care unit, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

Background and Goal of Study: Our regular erytrocite transfusion criteria is restricted to haemoglobin < 80g/L and/or haematocrit < 24%. To monitor this threshold we have two point-of-care-testing (POCT) blood gas analysers in theater: *GEM®Premier 3000 (Instrumentation Laboratory, USA)* and *Hemo®Cue (Quest Diagnostics, USA)*. A third device is available in the postoperative care unit: *ABL 800 (Radiometer, Denmark)*. The goal of study was to measure agreement, consistency and bias, of the haemoglobin and haematocrit values given by these devices and the values given by our hospital's laboratory (*Beckman Coulter®Hmx*) taken as reference. A difference ≥ 5g/L (haemoglobin)[1] and ≥ 1.5% (haematocrit) was considered as clinically relevant.

Materials and Methods: Haemoglobin and haematocrit values of blood samples from radial artery catheter prior to any liquid infusions (1) and prior to chest closure (2) were prospectively collected from 51 elective cardiac surgery patients. Statistics: Kaplan-Meier surviving curve method to measure agreement. Correlation of consistency. Passing-Bablock linear logistic regression for bias evaluation. False positive percentage of possible transfusions due to clinically relevant differences were also counted.

Results and Discussion: Comparison of haemoglobin and haematocrit values are shown in table 1 and 2.

Table1 and 2. KM (%): agreement obtained with Kaplan-Meier surviving curve. CC: correlation of consistency. FP (%): false positives. Haematocrit only available with Gem Premier.

Haemoglobin	K-M (%)	CC	Bias (g/L)	FP (%)
Beck-GenP(1)	47.1	0.91	6.4	–
Beck-GenP(2)	8.5	0.88	12.5	39.6
Beck-Hemocue(1)	94.0	0.98	0.14	–
Beck_Hemocue(2)	92.0	0.98	1.9	4.3
Beck_ABL800(1)	76.5	0.70	–1.6	–
Beck_ABL800(2)	90.4	0.97	–1.1	0
Haematocrit	**K-M (%)**	**CC**	**Bias (%)**	**FP (%)**
Beck_GemP(1)	34.9	0.85	– 1	–
Beck_GemP(2)	44.7	0.82	2.2	19.4

Conclusion(s): In our data with *Beckman ®CoulterHMX* taken as a reference, *GEM®Premier 3000,* was the POCT analyser that showed the lowest percentage of agreement (mostly at chest closure sample). The systematic bias observed should be taken into consideration when attempting to follow a precise transfusion protocol.

Reference:

1 Gehring H et al. Accuracy of point-of-care-testing (POCT) for determining hemoglobin concentrations. Acta Anaesthesiol Scand. 2002 Sep;46(8):980–6.

3AP1-10

Effects of a staggered tourniquet release on acute metabolic changes following surgery of the lower limb

A. Weinstein, O. Herzenstein, E. Gabis, I. Kagan, P. Singer

General Intensive Care Department and Institute for Nutrition Research, Rabin Medical Center, Petah-Tikva, Israel

Background and Goal of Study: Monitoring of blood parameters, such as glucose, hemoglobin and Oxygen saturation is essential in critically ill patients. The current invasive methods are not frequent enough for efficient tight glycemic control, and result in a high rate of hypoglycemia. In addition, there is a growing need for a continuous hemoglobin measurement in post-operative and intensive care units (ICU). The purpose of this study is to evaluate the feasibility of the fully non-invasive NBM device (OrSense Ltd.) for continuous monitoring of glucose, hemoglobin and Oxygen saturation in critically ill patients.

Materials and Methods: The study was conducted on 14 patients (7F, 7M, ages 34–92 years) in the ICU of the Rabin Medical Center, upon receipt of informed consent. The NBM probe was placed on patients' thumbs, where

it performed measurements for up to 24 hours, with readings every 10 minutes. Patient compliance was good and no adverse effects were identified. The results obtained from the NBM device were compared to blood samples taken through an arterial line every 30–60 minutes and analyzed with a blood gas machine (ABL 700, Radiometer, Copenhagen, Denmark).

Results and Discussion: A total of 208 paired data points were obtained in the trial. At each point, an algorithm based on a uniform model (with personal glucose calibration) was used to calculate the 3 blood parameters. Reference glucose range was 62–369 mg/dl. The median relative absolute difference was 7.3%, and a Clarke error grid analysis showed that 95.2% of the measurements fell within zones A (74.5%) and B (20.7%). Reference range of the hemoglobin was 7–14.5 g/dl and the median absolute error obtained was 1 g/dl. Oxygen saturation levels were tracked simultaneously with a mean error of 2.5%.

Conclusion(s): This study indicates the potential use of the non-invasive NBM for continual, accurate, safe, and easy-to-use multi-parameters monitoring in critically ill patients. The device holds the promise of improving patients' care and survival, as well as reducing staff workload.

3AP1-11

Validation of multi frequency phase fluorimetry for blood oxygen measurement in a porcine model

A. Vogt, S. Böhme, B. Dünges, B. Röhrig, K. Markstaller

University Department of Anaesthesiology and Pain Therapy, University Hospital Bern, Bern, Switzerland

Background and Goal of Study: Multi frequency phase fluorimetry (MFPF-100, TauTheta, USA) is a recently presented technique for the measurement of oxygen partial pressure by assessment of luminescence lifetime (τ) [1]. The light excitation frequency (f) is modulated and oxygen dependent phase shift (θ) of the emission is measured. Lifetime is related to phase shift by the equation: $\tau\tau = \tan(\theta\theta)/2\pi\pi ff$. OOISensor software (OceanOptics, USA) calculates online PO_2 with lifetime data. We determined precision out of replicated blood oxygen measurements as well as agreement of two devices and a Clark type based analysis.

Materials and Methods: After local IRB approval in 10 anaesthetized pigs (20.1 ± 1.9kg) FIO_2 was set to 0.21, 0.4, 0.6, 0.8 and 1.0 to get readings over the whole measurement range. Single and replicated blood samples were taken and PaO_2 (mm Hg) was determined simultaneously by two MFPF-100 (MF1 and MF2) and subsequently by a Clark type sensor (Rapidlab 248, Bayer, Germany) (BGA) at 37ºC and ambient pressure.

Results and Discussion: PaO_2 mean ± SD, (range) was 296 ± 170mm Hg (67,749) in MF1, 300 ± 180 (63, 749) in MF2 and 373 ± 212mm Hg (42,712) in BGA. Precision: coefficients of variation for replicated PaO_2 were 3.8% in MF1, 3.8% in MF2 and 1.8% in BGA. Linear regression analysis yielded: MF2 = – 7.9 + 1.04*MF1 (r = 0.98); BGA = 4.05 + 1.22* MF1 (r = 0.97); BGA = 25.6 + 1.14*MF2 (r = 0.96). Intraclass correlation coefficients were 0.980 for MF1 vs. MF2, 0.883 for BGA vs. MF1 and 0.889 for BGA vs. MF2. Agreement: for BA analysis of differences and averages the regression formulas were given as: MF2–MF1 = – 13.40 + 0.06 * [(MF2 + MF1)/2] (r = 0.29); BGA–MF1 = – 6.82 + 0.23 * [(BGA + MF1)/2] (r = 0.70); BGA–MF2 = 7.68 + 0.18 * [(BGA + MF2)/2] (r = 0.51).

Conclusion(s): 1) Multi frequency phase fluorimetry provides accurate reproducibility for oxygen partial pressure measurements with coefficients of variation < 5%. Simultaneous MFPF readings are highly correlated and interchangeable. 2) Agreement with Clark type sensor analysis as gold standard is acceptable, however MFPF values were lower compared to BGA in general (differences of means).

Acknowledgements: All experiments were performed at the Department of Anaesthesiology, Johannes Gutenberg-University, Mainz, Germany, supported by German Research Foundation DFG Ma 2398/3, Swiss National Foundation SNF POIB—117065/1 and an institutional grant of the University Department of Anaesthesiology, Inselspital, Bern.

Reference:

1 Herman P, Vecer J. Frequency domain fluorometry with pulsed light-emitting diodes. Ann N Y Acad Sci. 2008;1130:56–61.

3AP2-1

Comparison of the adductor pollicis, orbicularis oculi, and corrugator supercilii as indicators of endotracheal intubation

K. Kim, J. Jeong, M. Cheong, J. Shim

Department of Anesthesiology, Hanyang University Hospital, Seoul, Korea

Background and Goal of Study: The purpose of this study was to verify which muscle among the adductor pollicis (AP), orbicularis oculi (OO), and corrugator supercilii (CS) is a better predictor of optimal intubating conditions after administration of rocuronium.

Materials and Methods: In this prospective trial, 201 patients were randomized into 6 groups to receive rocuronium at a dose of 0.6 or 1.0 mg·kg^{-1} during propofol-remifentanil-nitrous oxide anaesthesia. The endotracheal intubation was performed after maximal neuromuscular blockade by acceleromyography at the thumb (AP), the eyelid (OO), and the superciliary arch (CS). The onset time, intubating conditions, peak vital signs, and bispectral index (BIS) were assessed.

Results and Discussion: The onset time of rocuronium in the OO and CS muscle was significantly shorter than in the AP muscle ($p < 0.001$), but excellent intubating conditions were significantly increased in the AP (87%) and CS (77%) compared with the OO (32%) after a dose of 0.6 mg/kg of rocuronium ($p < 0.05$).

Conclusion(s): We conclude that monitoring the onset of neuromuscular blockade in the CS can predict the presence of excellent tracheal intubating conditions earlier than the use of the AP or OO following administration of rocuronium.

Reference:

Plaud B, Debaene B, Donati F. The corrugator supercilii, not the orbicularis oculi, reflects rocuronium neuromuscular blockade at the laryngeal adductor muscles. *Anesthesiology* 2001; 95: 96–101.

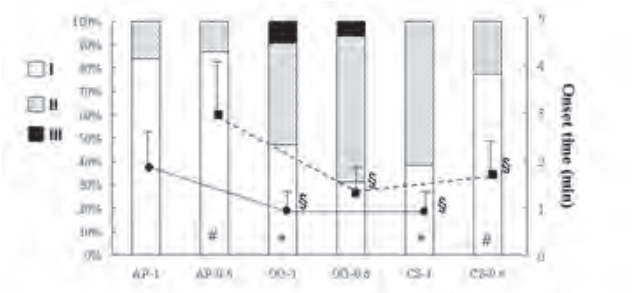


Fig 1. Intubation conditions and onset time following administration of 1.0 or 0.6 mg kg^{-1} of rocuronium for the adductor pollicis (AP), the orbicularis oculi (OO), and the corrugator supercilii (CS), evaluated using a scale adapted from Goldberg and colleagues:6 I = excellent (3), II = good (4 - 6), III = poor (7 - 9). *$P < 0.05$ compared with the AP group, #$P < 0.05$ compared with the OO group. §$P < 0.001$ compared with the AP group.

3AP2-2

Detection of painful stimulation using Surgical Stress Index (SSI) during sevoflurane-remifentanil anaesthesia

M. Gruenewald, P. Meybohm, C. Ilies, J. Scholz, B. Bein

Department of Anaesthesiology and Intensive Care Medicine, University Hospital Schleswig-Holstein, Kiel, SH, Germany

Background and Goal of Study: A reliable measurement of nociception – anti-nociception balance during anaesthesia is still missing. Recently, the surgical stress index (SSI), derived from finger photoplethysmographic signal has been introduced as a surrogate measure of nociception [1]. The aim of the present prospective randomized study was to challenge the ability of SSI to detect standardized noxious stimulation during sevoflurane anaesthesia at various remifentanil concentrations.

Materials and Methods: In this prospective study, twenty-four patients were randomized to 0, 2 and 4 ng·ml^{-1} remifentanil effect-site concentration (Ce(remi)) during 0.7 MAC sevoflurane. Tetanic stimulation was applied at least 5 minutes after changing remifentanil concentration. SSI, heart rate (HR), response entropy (RE), state entropy (SE), RE – SE difference were obtained in each patient before and after stimulation. Prediction of response was calculated using prediction probability [2].

Results and Discussion: SSI, but not HR, SE, RE or RE-SE difference was significantly altered after noxious stimulation at all examined concentrations of remifentanil. Change in SSI (ΔSSI) depended significantly on remifentanil concentration, as ΔSSI was (median [IQR]) 20 [15 – 31] at 0 ng/ml Ce(remi), 10 [1 – 19] at 2 ng/ml Ce(remi) and 3 [1 – 10] at 4 ng/ml Ce(remi). Detection of painful stimulus was significantly more frequent using SSI than HR (57.1% vs. 33.3%; $p < 0.01$). However, prediction of stress response using SSI before stimulation was not better than by chance (PK = 0.59 ± 0.09).

Conclusion(s): In contrast to all other variables studied, SSI was able to consistently reflect noxious stimulation dependent on different Ceremi during sevoflurane – remifentanil anaesthesia. SSI improves detection but not prediction of inadequate anti-nociception.

References:

1 Huiku M, Br J Anaesth 2007; 98:447–455.
2 Smith WD, Anesthesiology 1996; 84:38–51.

3AP2-3

Evaluation of neuromuscular blocker monitored reinjections vs systematic reinjections

M. Bamadhaj, S. Hamrouni, H. Soussi, A. Ammous, A. Cherif

Anesthesia and Intensive Care, Rabta University Hospital, Tunis, Tunisia

Background and Goal of Study: Clinical neuromuscular monitoring is frequently but not systematically used. The purpose of the present study was to assess the influence of the use of neuromuscular block (NMB) monitoring on the consumption of neuromuscular blockers, number of injections, the total dose injected and the satisfaction of surgeon.

Materials and Methods: Thirty ASA1-2 patients from 20 to 75 years old scheduled for various surgeries under general anesthesia were randomized in two groups of 15 patients. In the two groups the anesthetic procedure included fentanyl-propofol- cisatracurium. In the group 1, neuromuscular blockade assessments were done with a NMB monitor and the anaesthetist give 0.03 mg/kg of cisatracurium when patient have more than 1 response in TOF. In the group 2, the anaesthetist give 0.03 mg/kg systematically every 20 min.

Results and Discussion: Demographic data were similar in 2 groups. There is no significant difference between the two groups in the total amount of NMB received and numbers of injections and the extubation seems faster and the satisfaction of surgeons was significantly better in the first group ($p = 0.01$). There were no accident related to residual curarization.

Conclusion(s): NMB monitoring does not influence the amount of NMB used in per-operative period but gives a better surgeons satisfaction.

3AP2-4

Lower Composite Variability Index (CVI) was associated with better clinical global impression scores

D. Mathews, L. Clark, J. Johansen, E. Matute, C. Seshagiri

Department of Anesthesiology, St. Vincent's Medical Center & New York Medical College, New York, New York, USA

Background and Goal of Study: The variability of BIS (sBIS) and EMG (sEMG) and their combination in a Composite Variability Index (CVI), increase prior to intraoperative somatic responses [1,2]. This study prospectively evaluated whether increases in CVI and its subcomponents, sBIS and sEMG were associated with the increased likelihood of intraoperative somatic responses.

Materials and Methods: Records from 117 patients undergoing elective, non-cardiac surgery were collected from 4 institutions. Heart rate, blood pressure, BIS, sBIS, sEMG, and CVI were recorded continuously to laptop. Descriptions and times of all significant intraoperative events including somatic and hemodynamic events were recorded. Balanced anesthesia was maintained with remifentanil and either sevoflurane or propofol, randomized by site. Propofol or sevoflurane concentrations were adjusted to maintain BIS in the 45–60 range. Patients received morphine (0.15mg/kg) 20 minutes prior to the anticipated end of surgery for postoperative analgesia. All other anesthetic management was left to the discretion of the anesthesia provider who was blinded to sBIS, sEMG, and CVI. After exclusion of 12 cases for technical and clinical reasons, the maintenance phases of the remaining 105 cases were divided into ten minute segments. Segments were split by whether or not they contained a somatic event. Mean CVI, sBIS, and sEMG were computed for each segment ignoring data for three minutes following somatic responses. For each metric, the sensitivity and specificity at previously defined thresholds (table 1) and the area under the ROC curves were computed for discriminating somatic event segments from segments without hemodynamic or somatic events.

Results and Discussion: The sensitivity and specificity for CVI, sBIS, and sEMG are listed in table 1. The areas under the ROC curves were 0.78 ± 0.08, 0.71 ± 0.09, and 0.82 ± 0.06, respectively. All three of these metrics were significantly different from random chance (0.5) at the 95% level.

Table 1. Sensitivity and Specificity of Variability Metrics

	Threshold	Sensitivity	Specificity
CVI	18	73% (24/33)	74% (617/829)
sBIS	2.1	88% (29/33)	38% (311/289)
sEMG	0.4	79% (26/33)	67% (551/829)

Conclusion(s): Increases in variability measured by sBIS, sEMG, and CVI were strongly associated with intraoperative somatic response. Monitoring this variability may help clinicians identify periods of inadequate anesthesia that reflect patient responses to noxious stimulation.

References:

1 *Anesthesiol,* 2006; 105: A1027.
2 *Anesth and Analg,* 2008; 106 (3S): Poster #28.

3AP2-5

Lower Composite Variability Index (CVI) was associated with better Clinical Global Impression scores

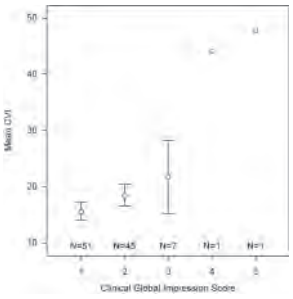
A. Moreno, L. Clark, J. Johanssen, D. Mathews, C. Seshagiri

Department of Anaesthesiology, Hospital Sanitas La Moraleja, Madrid, Spain

Background and Goal of Study: High intraoperative variability of BIS (sBIS) and EMG (sEMG), and their combination in a Composite Variability Index (CVI), have been associated with somatic responses [1,2] and higher postoperative pain scores [3,4]. This study investigated whether intraoperative variability of these metrics during a case was associated with the overall clinical assessment of managing the case.

Materials and Methods: Records from 117 patients undergoing elective, non-cardiac surgery were collected from 4 institutions. Heart rate, blood pressure, BIS, sBIS, sEMG, and CVI, were recorded continuously to laptop. In addition, the primary anesthetist was asked to rate each case using a 5-point Clinical Global Impression (CGI) scale where 1 indicates a case that was very easy to manage and 5 indicates a case that was very difficult to manage. Balanced anesthesia was maintained with remifentanil and either propofol or sevoflurane, randomized by site. Propofol or Sevoflurane concentrations were adjusted during maintenance to maintain BIS in the 45–60 range. Patients received a bolus of morphine (0.15 mg/kg) 20 minutes prior to the anticipated end of surgery for postoperative analgesia. All other anesthetic management was left to the discretion of the anesthesia provider who was blinded to sBIS, sEMG, and CVI. After excluding 12 cases for technical and clinical reasons, the mean CVI, sBIS, and sEMG values during the maintenance phase of the remaining 105 cases were computed. Spearman Rank Correlation was used to assess the association between these variability metrics and CGI. $P < 0.05$ was considered statistically significant.

Results and Discussion: CVI and sEMG, but not sBIS, were correlated with CGI ($r = 0.36$, $p < 0.0005$ and $r = 0.42$, $p < 0.0005$, $r = 0.17$, $p = 0.09$ respectively). Figure 1 shows mean CVI ± 95% CI for each CGI score.



Conclusion(s): Lower intraoperative variability of EMG and the composite variability measure, CVI, were associated with better CGI scores. Further study is needed to investigate whether anesthesia care with CVI monitoring would improve the ease of case management.

References:

1 Anesthesiol 2006; 105: A1027.
2 Anesth Analg 2008; 106 (3S): Poster #28.
3 Anesthesiol 2006; 105: A1042.
4 Anesthesiol 2007; 107: A729.

3AP2-6

The Cerebral State Index (CSI) – Differentiation between awareness and anaesthesia?

T. Kiel, S. Pilge, E. Kochs, G. Schneider

Klinik fuer Anaesthesiologie, Klinikum rechts der Isar der TU München, Munich, Germany

Background and Goal of Study: The Cerebral State Monitor (CSM, Danmeter A/S, Denmark) calculates the CSI as a dimensionless number between 0 and 100. This EEG-based index inversely correlates with the hypnotic component of anaesthesia [1]. The present study evaluates the performance of CSI concerning the differentiation between consciousness and unconsciousness in surgical patients.

Materials and Methods: This controlled clinical-prospective study was performed after approval of the local ethics committee. Adult patients (ASA I/II) undergoing general anaesthesia for elective surgery were included after written informed consent. Exclusion criteria were diseases and/or medication of central nervous system and drug/alcohol abuse. EEG and CSI data were recorded for each patient. The patients received a specific combination of drugs according to the anaesthetist's decision (table1). Using the forearm technique [2] during induction of anaesthesia the patients were twice asked to squeeze hand every

15 seconds. At the time a patient did not respond to verbal command, loss of consciousness (LOC) was documented. Return of consciousness (ROC) was obtained by examination of the emergence period after surgery. Prediction probability P_K [3] was calculated from CSI data pairs affiliated to the previously reported events.

Table 1. anaesthetic drug administration

Group	Drug administration (induction/maintenance)
1 (n = 15)	Prop + Remifent/Prop + Remifent
2 (n = 15)	Prop + Sufent/Sevoflurane + Sufent
3 (n = 15)	Prop + Sufent/Isoflurane + Sufent

Results and Discussion: CSI data were obtained from 45 patients (18 f, 27 m). Mean values were 48 ± 16 (age), 174 ± 11 cm (height) and 80 ± 15 kg (weight). P_K for the separation of consciousness and unconsciousness at the transition between both states was 0,68 in the study group (table2). Relatively low values are due to the fact that clinical endpoints are very close to each other both in time and clinical status. While P_K in propofol and sevoflurane group are similar, application of isoflurane provides a lower P_K. This may be a result of "slower" phamacokinetic properties of isoflurane.

Table 2. prediction probability P_K

P_K	Propofol	Sevoflurane	Isoflurane	Study Group
LOC	0,79	0,83	0,66	0,79
ROC	0,64	0,58	0,50	0,57
LOCROC	0,71	0,69	0,63	0,68

Conclusion(s): The findings of the present study indicate a good capability of CSI to distinguish consciousness from unconsciousness in surgical patients.

References:

1 Anesth Analg 2005; 100: S-184.
2 BMJ 1977; 1:1321.
3 Anesthesiology 1996; 84: 38–51.

3AP2-7

Monitoring recurrent laryngeal nerve electromyography activity during anterior cervical discectomy and fusion

H. Shay, G. Lu, A. Abramowicz, A. Bestien, S. Nguyen

Department of Anesthesiology, Montefiore Medical Center, Albert Einstein College of Medicine, Bronx, New York, USA

Background and Goal of Study: Injury to the recurrent Laryngeal Nerve (RLN) during Anterior Cervical Discectomy and Fusion (ACDF) is a known complication. This study at first is intended to investigate the normative baseline values for background electromyography (EMG) activity during different phases of the operation under total intravenous anesthesia (TIVA). As more data being obtained, it is now noticed that lidocaine topicalization may affect RLN minoring.

Materials and Methods: 120 patients underwent ACDF, with either cervical myelopathy or radiculopathy, their RLN EMG were recorded using the NIM™ EMG ET tube. 55 patients received awake fiberoptic intubations, 65 patients received sleep fiberoptic intubation. All of them then were placed with bite block. The anesthesia is maintained with propofol 120 –250 (mcg/kg/min) and Fentanyl 50 to 100 (mcg/hour) or sufanta 10 to 20 mcg/hr intravenously. The ET tube cuff was routinely deflated after retractor placement. The activity ("alert") was not reported to the surgeon unless there were sustained discharges for more than 10seconds, exceeding a threshold of 50mcV amplitude, and frequency higher than 70Hz. Patients were asked to complete a postoperative speech and swallow function questionnaire. Postoperative pharyngeal examination was performed to assess for vocal cord paresis.

Results and Discussion: In all 120 cases, transient increased EMG activity (less than 10 seconds) occurred coincidentally with placement of retractors, and manipulation of ET tube or its cuff. Their responsive amplitudes remain to baseline values within 10 seconds in 14 cases; returned upon replacement or readjustment of retractors in 5 cases; returned upon increase of anesthesia drugs in 6 cases. Three weeks after surgery found no instances of RLN injury. The RLN firing amplitudes of the awake intubation (lidocaine topicalized) patient is slightly less than patients under sleep fiberoptic intubation (non-lidocaine topicalized). DISCUSSION: ET tube manipulation, placement of retractor, and topicalization with lidocaine that may affect EMG activity on RLN during ACDF surgery.

Conclusion(s): Monitoring RLN activity during ACDF surgery under total intravenous anesthesia can provide navigating information to surgeon to prevent RLN injury. If airway condition allowing, sleep fiberoptic intubation may be more sensitive for RLN monitoring.

3AP2-8

MUSTIMEG: A new device for polytopic EMG as perioperative neuromuscular monitoring

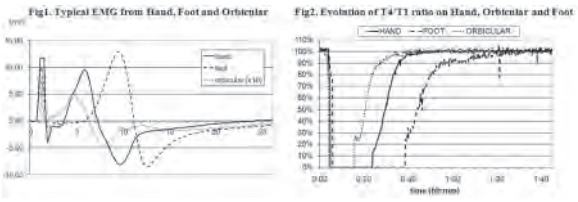
F. Cantraine, M. De Bel, M. Baurain, P. Nockerman, Y. Deryck

Computer Science, Université Libre de Bruxelles, Brussels, Belgium

Background and Goal of Study: Monitoring neuromuscular transmission (NMT) during anesthesia appears to be essential when using muscles relaxants (MR). Muscles differ in their sensitivity, onset, offset and peak effect in response to MR. Several studies have shown that the eyes muscles like the orbicularis oculi reflect the response of laryngeal muscles, diaphragm and more central muscles, whereas peripheral muscles are the latest ones to relax and to recover. To study the difference between the pharmacodynamic of those muscles, we developed "MUSTIMEG" a configurable device enabling us, to stimulate through Twitch, TOF, Tetanos, etc, to obtain the subsequent response to derive the usual ratios (T_1/T_0, T_4/T_1, S_1/S_0 ……) and to display continuously the evoked electromyogram (EMG). By using as many devices as the number of sites investigated, we were enabled to collect polytopic data.

Materials and Methods: 36 ASA (1, 2, 3) patients under general IV anesthesia (propofol) and administration of a bolus dose of MR during angiography were distributed randomly under 3 groups to receive Rocuronium, Mivacurium or Cisatracurium. Three Mustimeg channels were used simultaneously to stimulate the muscles of interest by delivering TOF at supramaximal intensity (25–80 mA) every 15 seconds, to make the acquisition, processing and storing of their evoked response.

Results and Discussion: Figure 1 demonstrates respective amplitudes and delays between stimulation artefacts and related EMG from one patient obtained simultaneously from each site (abductors of the hand and foot, and the orbicularis oculi) for Rocuronium. Figure 2 presents ratios T4/T1 from each site on the same patient after a bolus dose of Rocuronium. MUSTIMEG provides reliable and accurate measurement of the eyes, hand and foot muscular activities for polytopic NMT monitoring. Accurate control of the adequate wished level of NM block for intubation, surgical procedure and recovery is now available to assess residual neuromuscular blocks.



Conclusion(s): Availability of MUSTIMEG enables to start comparing the pharmacodynamic of many surface muscles.

Acknowledgements: We wish to thank "la region wallonne" for its contribution to this project under convention n°516160.

3AP2-9

MUSTIMEG: A new evoked EMG device for anaesthetist

M. Jaumain, F. Cantraine, M. De Bel, P. Nokerman, A. d'Hollander

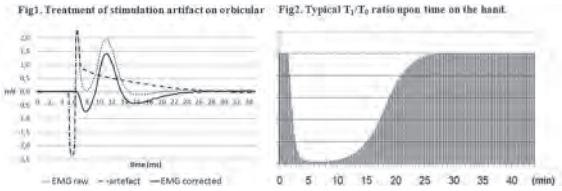
Bio Electrical and Mechanical Systems, Université Libre de Bruxelles, Brussels, Belgium

Background and Goal of Study: Among all the monitors available today for mecanomyography, acceleromyography and electromyography, none are currently used in clinical practice because of the presence of multiple artefacts in the response and the lack of display to validate the quality of the measurement. In practice, this leaves the evaluation of the residual curarisation a major problem in anaesthesia. To meet these requirements we have built MUSTIMEG a device made of a stimulator and one EMG acquisition channel.

Materials and Methods: MUSTIMEG is made out of three parts: one stimulator, one acquisition chain and one computer program to process the data obtained. The stimulator produces usual electro-stimulation patterns (Single Twitches, Train-Of-Four, TETANOS (50 or 100 Hz)). The acquisition chain includes a preamplifier located close to the measurement point to improve the signal to noise ratio, a programmable gain amplifier to provide the best resolution of the signal and a pass-band filter (10–1000 Hz). The EMG software running on the computer permits to visualize and to understand the effect of the different artefacts. Some options can be selected to increase the quality of the signal (patent EP1814452) in real-time f.i. filtering the surgical knife.

Results and Discussion: To improve the quality of measurement on evoked EMG, Mustimeg device is able to remove the stimulation artefact as illustrated in Figure 1 which shows the same EMG of an orbicular muscle with and without stimulation artefact (patent EP1814452). Mustimeg provides a history sheet to

visualize the evolution of usual ratios. Figure 2 presents one typical T_1/T_0 ratio obtained on a hand after a bolus dose of Mivacurium.



Conclusion(s): MUSTIMEG is a new device providing reliable and accurate measurements of the muscular activity for several muscles like hand, foot and orbicular, this results in a better detection of residual curarisation which could lead to improvements in the dosage of curare and antagonists.

Acknowledgements: We wish to thank "la region wallonne" for its contribution to this project under convention n°516150.

3AP2-10

Definition of the IoC-TIVA for monitoring consciousness during general anaesthesia

P. Gambus, M. Palacios, X. Borrat, M. Jospin, E. Weber Jensen

Department of Anaesthesia, Hospital Clinic Barcelona, Barcelona, Catalonia, Spain

Background and Goal of Study: The present study is based on the hypothesis, that if information from infused volume, plasma concentration, effect-site concentration and EEG (Index of Consciousness, IoC) are combined, then a much more precise description of the patient's depth of anaesthesia can be achieved. In this study the effect site concentrations of propofol and remifentanil (as estimated by the models described in Schnider (1) and Minto (2) respectively) and the IoC were the inputs to an adaptive neuro fuzzy inference system (ANFIS) to design the interaction model while the output was termed the IoC-TIVA.

Materials and Methods: Under IRB approval and written informed consent, 177 patients undergoing USE were randomly assigned to receive a fixed concentration of either propofol (0, 1.5, 2, 3 mcg/mL) or remifentanil (0, 0.5, 1, 2 ng/mL), by means of a TCI system targeting the effect site, while the other drug was allowed to change depending on clinical requirements. IoC (Morpheus Medical, Spain), BIS, (Aspect medical, USA) and haemodynamic parameters as well as drug information were recorded online (Rugloop II). The Ramsay Sedation Score (RSS) was assessed at random time periods between successive measurements. The model was build (training) with data from 110 patients and prospectively validated in a subsequent population of 67 patients of similar characteristics. The ability of the different indicators to predict the RSS was evaluated by means of the "prediction probability (Pk)".

Results and Discussion: Table 1 shows the prediction probability (Pk) for the new index, IoC TIVA, and the Pk 's for the individual input parameters and BIS to the model.

Table 1. Pk values for the indices versus Ramsay scale

	Ce remi	Ce pro	IoC	BIS	IoC-TIVA
Pk (SE)	0.58 (0.012)	0.73 (0.01)	0.81 (0.008)	0.80 (0.01)	0.87 (0.007)

Conclusion(s): By combining information from predicted effect site concentration of anaesthetics with information extracted from the EEG, here the IoC, a significantly better prediction of the patients level of consciousness can be achieved with respect to the Ramsay score.

References:

1 Schnider TW et al. The influence of method of administration and covariates on the pharmacokinetics of propofol in adult volunteers. Anesthesiology 1998;88:1170–82.
2 Minto CF et al. Influence of age and gender on the pharmacokinetics and pharmacodynamics of remifentanil. I. Model development. Anesthesiology 1997;86:10–23.

3AP2-11

Time delay of the Index of Consciousness

S. Pilge, M. Kreuzer, E. Kochs, G. Schneider

Department of Anaesthesiology, Klinikum rechts der Isar der TU München, Munich, Germany

Background and Goal of Study: The Index of Consciousness (IoC) (Morpheus Medical, Barcelona, Spain) is a device for monitoring the hypnotic component of anaesthesia. IoC is a dimensionless index from 0 (isoelectric EEG,) to 99 (fully awake patient). According to the manufacturer, the IoC for adequate anaesthesia ranges from 40 to 60, for an awake state from 80 to 99. Its calculation method is based on symbolic dynamics. In the presented study, the time delay of IoC to sudden changes between the levels isoelectric EEG (iso EEG), general anaesthesia and awake was evaluated.

Materials and Methods: Five minute sequences of stored EEG representing the anaesthetic levels "awake" (IoC = 94), "adequate anaesthesia" (AA) (IoC = 51) and suppressed signal (iso EEG, IoC < 2) were consecutively played to the IoC using an EEG player [1] following these protocols. (i) iso EEG- > awake and back; (ii) iso EEG- > AA- > awake and back. Each protocol was played four times to the monitor. The processing time of IoC until the correct Index value was displayed was stopped. Further, the time delay the monitor needed to change the IoC from one stage to the other was evaluated, e.g. from over 80 (awake) to below 60 (AA).

Results and Discussion: The time delays for all transitions are shown in the table below

Transition	IoC values	Delay in s; Mean (SD)
iso EEG - > awake	1 - > 94	50 (5)
Awake - > iso EEG	94 - > 1	54 (7)
iso EEG - > Range awake	1 - > IoC > 80	46 (5)
awake - > Range iso EEG	94 - > IoC < 5	44 (6)
iso EEG - > AA	1 - > 51	55 (9)
AA - > awake	51 - > 94	37 (9)
Awake - > AA	94 - > 51	91 (5)
AA - > iso EEG	51 - > 1	52 (10)
iso EEG - > Range AA	1 - > IoC > 40	42 (6)
AA - > Range awake	51 - > IoC > 80	25 (3)
Awake - > Range AA	94 - > IoC < 60	61 (11)
AA- > Range iso EEG	51 - > IoC < 5	45 (10)

Conclusion(s): The time delay of IoC to sudden changes in the hypnotic component of anaesthesia is comparable to other monitors' delay (BIS, CSI, NCT) [2]. Transition times into the target index range were approximately 5 to 10 s faster than the transition to the constant index value. For the transition from awake to AA, the IoC required 61 s to reach the interval of "adequate anaesthesia", while it took 91 s to reach the constant value of 51. The transition time from AA to awake varies by 30 s to the delay from awake to AA. The time delay may indicate a limitation for the use of monitors in pharmacodynamic studies.

References:

1 Anesth Analg. 104(1):135–9, 2007.
2 EJA 2005; 22 (Suppl.34): A-125.

3AP3-1

Bispectral index (BIS) monitoring for the assessment of efficacy of sedation during colonoscopy

M. Czechowski, E. Karpel, I. Duda

Anesthesiology and Intensive Therapy, Medical University of Silesia, Katowice, Poland

Background and Goal of Study: Bispectral index (BIS) monitoring is currently used in clinical practice to objectively assess the depth of sedation/anesthesia. The aim of this study was to determine whether BIS monitoring is useful for monitoring the routine sedation in patients undergoing elective colonoscopy in comparison with widely used Ramsay score.

Materials and Methods: Prospective, randomized, single-blind clinical study was performed in 90 adult consecutive patients undergoing elective colonoscopy. Patients receiving midazolam and fentanyl were randomized into three groups depending on anesthetic agent (P-propofol, M-methohexital, E-etomidate) used. The bispectral index (BIS), the Ramsay score, the cardiorespiratory parameters (MAP, HR, SpO2) were monitored and recorded in 3-minutes intervals. In same intervals the depth of sedation was assessed by the anesthesiologist performing sedation according to clinical signs and Ramsay score and at the same time by independent observer via BIS-monitor. Correlation between adequate pairs of variables included bispectral index value and Ramsey score value were analyzed at nine established time-points in all analyzed groups.

Results and Discussion: The mean baseline value of BIS index was 96,9 (range 92–99, SD = 1,45) and during the colonoscopy procedure it has decreased to the range 62–97. The lowest BIS value was detected at point T1 but it never achieved the value less than 60. The mean value did not vary between the study groups except for point T4 and T5 (fig. 1). The median range of the Ramsay's score in all groups was 3 (273 measurements in all groups), at range 4 were assessed fewer patients (145 measurements in all

groups), only few at range 5 (40 measurements in all groups) and at range 2 (19 measurements in all groups). At the end of the procedure all patients were classified at range 2 of Ramsay score. The median values did not differ between the study groups except for time point T5 (fig. 2). The correlation between bispectral index value and Ramsey score value was statistically significant ($p < 0,05$) except T7 and T8 time intervals in propofol group P and T8 time-point in etomidate group E.

Conclusion(s): Bispectral index monitoring provides an objective assessment of the depth of sedation and well correlates with the assessment at widely used in clinical practice Ramsay score. In patients undergoing elective colonoscopy bispectral index ranged 65–85 corresponds with sufficient and functional sedation without the incidence of recall and awareness.

3AP3-2

Bilateral BIS variability during isoflurane anaesthesia

C. Pomfrett, B. Pollard

School of Clinical & Laboratory Sciences, Faculty of Medicine & Life Sciences, The University of Manchester, Manchester, United Kingdom

Background and Goal of Study: Bispectral Index (BIS) is usually measured using an electrode montage placed on one side of the head. We have recently reported a drug trial where significant bilateral asymmetry of BIS was observed [1]. Unilateral variability in BIS, measured as the standard deviation over 3 minutes (sBIS) may reflect the level of analgesia [2]. This was an observational pilot study to examine bilateral BIS and sBIS during routine isoflurane anaesthesia.

Materials and Methods: We studied historical, anonymized BIS records from 9 female ASA I patients obtained as the randomized placebo component of a previous drug trial. Patients had given written informed consent to a protocol approved by our ethics committee. 2 channel BIS recordings were obtained using a referential frontal montage (A-1000, BIS v3.3, ZipPrep electrodes). 30 minutes of continuous BIS recording (5s updates) were identified during surgery for the left and right side of the head (LBIS and RBIS). The standard deviation for the bilateral BIS values was calculated based on 3 minute epochs (LsBIS and RsBIS). Paired non-parametric analysis (Wilcoxon Signed Rank) compared LBIS v RBIS and LsBIS v RsBIS. $P < 0.001$ was considered significant.

Results and Discussion: Combining all patients indicated a clinically small but statistically significant difference between paired bilateral BIS (RBIS median 38.4, range 14.8–92.7; LBIS median 36.2, range 14.5–94.6) and sBIS (RsBIS median 2.98, range 0.1–34.8; LsBIS median 2.87, range 0.2–33.6). Individual paired analysis indicated only one patient with no significant difference in bilateral BIS (RBIS median 38.6, range 22.2–46.1; LBIS median 38.1, range 24.3–44.4 $P = 0.068$), and two other patients with no significant difference in bilateral sBIS. 4 patients demonstrated clinically obvious asymmetry in BIS when bilateral traces were overlaid. The relatively high incidence of bilateral asymmetry in BIS and sBIS was unexpected, and there was no obvious clinical cause. Surgical or sensory stimulation could not be discounted.

Conclusion(s): Studies on the EEG during anaesthesia should consider that brain asymmetry may be present. Brain asymmetry is known in specialties other than anaesthesia [3], and additional clinically-relevant information may be present in bilateral indices such as BIS and sBIS.

References:

1 Pomfrett CJD, Dolling S, Anders N et al. EJA 2009; in the press.
2 Bloom MJ, Bekker A, Sesgagiri CV et al. Anesthesiology 2008; 109:A1303.
3 Davidson RJ, Hugdahl K (eds) Brain Asymmetry 1996; MIT Press.

3AP3-3

Can AEP monitoring reduce postoperative cognitive decline?

P. Jildenstaal, A. Gupta, J. Hallén, N. Rawal, L. Berggren

Anaesthesiology and Intensive Care, Institution for Clinical Medicine, Orebro, Sweden

Background and Goal of Study: Postoperative cognitive dysfunction (POCD) after non-cardiac surgery is a well-known problem in certain patients. The degree of surgical trauma and the type of anesthesia technique may influence POCD (1,2). The aim of this study was to evaluate the influence of Auditory Evoked Potential (AEP) monitoring on requirement of anesthetic drugs and their influence on cognitive decline.

Materials and Methods: After obtaining approval from the ethics committee, 450 patients aged 18–92 yrs, (ASA 1–4) scheduled for ophthalmic surgery under general anaesthesia were randomly assigned to two groups: group I: Depth of anaesthesia (DoA) was monitored using the AEP and aimed for an AEP –index (All) between 15–25. Group II: DoA was monitored according to clinical signs at the discretion of the anaesthetist. Group II had AEP-index recorded but the attending anaesthetist was blinded to its value. All patients were anaesthetized according to the department routine, which included propofol, fentanyl, N_2O: O2 and desflurane. Cognitive function was evaluated using Mini Mental State Evaluation (MMSE) and Cognitive Failure Questionnaire (CFQ) at four times; preoperatively, first postoperative day, and by a modified MMSE test by telephone after one week and one month.

Results and Discussion: The two groups were comparable with respect to demographic variables. In Group I, the anesthetic drug requirements were significantly lower than in group II., propofol 92.5mg ± 26.5 *vs*. 103.8mg ± 39.5, ($p = < 0.001$, t-test), desflurane ET%2.5 ± 0.58 *vs*. ET%3.3 ± 0.79, ($p = < 0.001$, t-test). AEP values differed significantly between the groups, groupI, All 18 (11–21), group II, All 12 (10–19), ($p = < 0.001$, Mann Whitney U test). Postoperative cognitive decline as assessed by MMSE was significantly more pronounced in group II *vs.* group I ($n = 16$ *vs*. $n = 2$), ($p = < 0.00189$, chi-2), ($p = < 0.001$, t-test).

Conclusion(s): In this study of patients undergoing minor surgery, monitoring of depth of anaesthesia by AEP allowed reduction in the doses of propofol and desflurane, which most likely lead to a decrease in cognitive decline.

References:

1 Monk TG el al. Anesthesiology. 2008:108:18–30.
2 Homburger JA el al. Curr Opin Anesthesiology. 2006:19:423–28.

3AP3-4

Raw EEG characteristics during a case of propofol induced myoclonic movements

B. Wyler, J. Van Limmen, M. Jospin, K. Vonck, H. Vereecke

Faculty of Anaesthesiology, Ghent University, Gent, Belgium

Background and Goal of Study: In rare occasions, myoclonic movements can be observed during a propofol induction.[1,2] It is unclear whether this has either a muscular or cerebral origin. We describe a case of a patient who had bilateral tonic-clonic arm and leg movements during propofol induction, while being monitored by the Index of Consciousness (IoC).(Morpheus, Barcelona, Spain).

Materials and Methods: We had approval of the institutional Ethics Committee (Ghent University Hospital, Belgium), and written informed consent. We administered propofol1% at 300ml/h to a female patient, weight 77kg, length 161cm, age 24y. IoC was monitored at the left side of the brain. The IoC monitor transmits data to a computer running Rugloop software (Demed, Temse, Belgium). The single channel, frontally obtained, EEG data is transmitted with a sampling frequency of 1024 Hz and a resolution of 16 bits within a ± 475μV interval. The differential amplifier of the IoC monitor has a high Common Mode Rejection ratio (CMRR > 130 dB) in order to reduce interference. Artefacts as defined by the monitor were rejected. The artefact free EEG wave was printed and evaluated by a epilepsy expert (Prof. Dr. Vonck) in order to evaluate whether this EEG wave contained any signs of epileptic activity.

Results and Discussion: Throughout the case, moderate levels of EMG activity were detected by the IoC monitor without negative effects on the signal quality index. We extracted 22,5 min of artefact free EEG data that was interpreted by visual inspection as "low voltage activity with mainly β-activity at 12–14 Hz and very slow θ-δδ activity after 8 minutes of EEG recording. The latter reflects propofol induced hypnosis. After 18 minutes, normal sleep spindles were observed. No epileptiform discharges were visually detected by the expert. Ideally, a multichannel EEG combined with a time synchronized EMG registration is mandatory to study the origin of abnormal motor responses evoked by propofol. Due to the rare incidence of this observation such a measurement has not yet been performed. Casuistic reports remain the only source of information.

Conclusion(s): Although not scientifically conclusive, our observation supports the hypothesis that propofol evoked myoclonic activity is more likely to have a muscular instead of a cerebral origin.

References:

1 Walder B. et al. Neurology, 2002; 58:1327–32.
2 Hickey K. S. et al., The Journal of Emergency Medicine, 2005; 29(4):447–449.

3AP3-5

Magneasium can change BIS values

C. Oztin Ogun, A. Duman, B. Ozkaya, G. Sarkilar

Anaesthesiology and Intensive Care, Selcuk University Meram Medical Faculty, Konya, Turkey

Background and Goal of Study: Magnesium ion (Mg2+) is involved in important processes as modulation of ion channels, receptors, neurotransmitter release, and cell excitability in the central nervous system. It was reported that

magnesium sulphate has anaesthetic, analgesic and muscle relaxation effects. It is used commonly in preeclamptic patiens. But there is no evidence about its central nervous depressant effect on bispectral index (BIS). We studied the effects of (Mg2+) loading on BIS in awake patients.
Materials and Methods: After approval of ethical committee and written consent; 67 ASA I–II (age 16–65yr, weighing 50–100kg) were included in this double blind, prospective, randomised study. After BIS monitoring besides monitoring of heart rate (HR), mean arterial pressure (MAP), respiration rate (RR) and oxygen saturation (SpO_2) As a preloading; 5mL. kg^{-1} jelatin solution was given in all patients. Control group (n = 25) received normal saline while Magnesium group (n = 42) received 50 mg. kg^{-1} (Mg2+) as a loading mixed in 100mL NaCl during 15 minute. BIS values, MAP, HR, RR, SpO_2 and sedation scores were recorded at baseline and after loading. Un-paired and paired t test and correlation test were performed for statistics and $p < 0.05$ was accepted as significant.
Results and Discussion: Patients demographics were similar. In Magnesium group, MAP, SpO_2 and BIS values decreased compared to baseline ($p < 0.05$); while any parameters did not change after loading in control group. There are no difference in MAP, HR, RR, SpO_2 and sedation scores in both groups. The decreasing in BIS values was greater in Magnesium group than control group ($p < 0.05$). Only moderate positive correlation ($r = 0.355$; $p = 0.021$) was observed between SpO_2 and BIS.
Conclusion(s): Magnesium loading in dose 50 mg. kg^{-1} can affect BIS values. BIS monitoring can detect changes in sedation level related with magnesium while sedation scores are not changed.

3AP3-6

The correlation between bispectral index and observational sedation scale in volunteers sedated with dexmedetomidine and propofol

Y. Kasuya, R. Govinda, S. Rauch, D. Sessler, A. Turan

Outcomes Research Consortium and Department of Anesthesiology and Perioperative Medicine, University of Louisville, Louisville, Kentucky, USA

Background and Goal of Study: With some anesthetic agents, BIS values correlated poorly with clinical evaluations. A unique feature of dexmedetomidine is that patients can be easily aroused from deep sedation levels. But a corollary is that BIS may poorly characterize sedation with dexmedetomidine. We thus correlated BIS values and Observer's Assessment of Alertness and Sedation scores in volunteers sedated with dexmedetomidine and propofol.
Materials and Methods: This was a prospective, randomized and controlled, 2-day, cross-over design volunteer study. On the first study day, healthy volunteer were randomly allocated to either propofol or dexmedetomidine. Drugs were administrated using target-controlled infusion targeting at effect-site concentration for propofol (1, 2, and 4 µg/mL) and plasma concentration for dexmedetomidine (0.6, 1.2, and 2.4 ng/mL). BIS values were recorded every 5 minutes and averaged from 20 to 40 minutes after stepping up each drug concentration. Observational sedative evaluation was performed using OAA/S at 20 and 40 minute for each drug concentration.
Results and Discussion: Nine volunteers were included in our analysis. Heart rate was significantly decreased with dexmedetomidine. End-tidal CO_2 was significantly elevated with high doses of propofol, but did not increased with high doses of dexmedetomidine. BIS values were significantly lower with dexmedetomidine than propofol at OAA/S responsiveness of 2, 3, 4, and 5. Spearman's correlation coefficients between OAA/S and BIS were 0.96 for both propofol and dexmedetomidine. The slopes of the linear regression were significantly greater with dexmedetomidine. (6.4 ± 0.3 [95% CI; 5.8 to 6.9]) than with propofol (4.2 ± 0.2 [95% CI; 3.9 to 4.5]), $p < 0.01$. BIS values at an OAA/S of 2 were thus ~20 points lower with dexmedetomidine than with propofol. A BIS value of 64 had a high sensitivity and specificity for detecting an OAA/S score of 2; similarly, a BIS value of 42 had a high sensitivity and specificity for detecting an OAA/S score of 2.
Conclusion(s): Both propofol and dexmedetomidine, OAA/S and BIS were well correlated and their relationships were linear. However, BIS values were significantly lower with dexmedetomidine than propofol at OAA/S responsiveness scores of 2, 3, 4, and 5. BIS values during sedation thus need to be evaluated in context, with attention to the drugs being used.

3AP3-7

Automatic control of propofol's effect on the state entropy using a sliding-mode technique (a simulation study)

A. Castro, C. Nunes, P. Amorim, F. Almeida

Investigação Clínica - Serviço de Anestesiologia, Hospital de Santo António, Porto, Portugal

Background and Goal of Study: Automation is a promising field in anaesthesia [1,2]. State Entropy (SE) is a well established indicator of anaesthetics' effect on brain/EEG. The goal was to develop a SE based controller for propofol, using sliding-mode control taking in account the model uncertainties.
Materials and Methods: Model structure (Fig.1): Schnider's PKmodel + Hill Equation. Those models define nominal values for the parameters (k10,…,γ) and also report the subjects' variability, information incorporated in the control law [3,4]. To test the controller robustness 3 theoretical patients were simulated: nominal patient, with model average parameters; minimum patient (MinPat) with reported min. parameters; and maximum patient (MaxPat) with max. parameters. Simulations were obtained for two different SE targets: step reference (StepR) set to 50 to observe the controller response to drastic changes, and sinusoidal reference (SinR) to observe the controller response to variable targets. Simulink-MatlabR2007a®

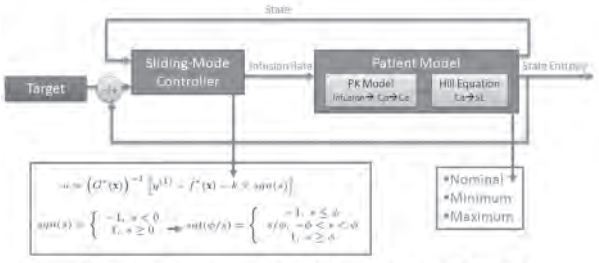


Figure 1. System structure and feedback sliding-mode control.

Results and Discussion: The original control law uses a sign function but with excessive control action, smoothed by a saturation function (Fig.1). For StepR all patients achieved the target within a small time window conditioned by the maximum infusion rate (Fig.2a). MinPat presented an overshoot (error < 5), insignificant for the recommended SE range. SinR demonstrates the robustness of the method, and its ability to follow descending segments, also showing that depending on the patient characteristics a longer time may be required for recovery (Fig.2b-MaxPat recovery conditioned by high modelled excretion rate).

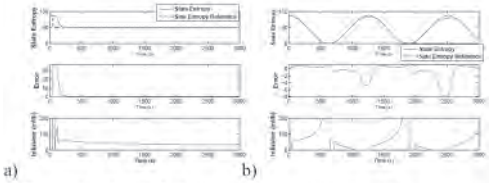


Figure 2. Control activity for the maximum patient using the saturation function: on top SE and SE reference, below the error and on bottom the infusion rate (ml/h)
a) Step Reference b) Sinusoidal Reference

Conclusion(s): The controller performed adequately, demonstrating robustness to deviations from the average model. This technique may be implemented for future closed-loop control of anaesthesia.
Acknowledgements: FCT;UISPA-IDMEC, Portugal.
References:
1 BJA,2003,90:737–41.
2 Anesth,2007,105:1629–38.
3 Anesth.,1999,90:1502–16.
4 Anesth,2006,102:1456–62.

3AP3-8

Performance of BIS, Narcotrend, Cerebral State Index and State Entropy during constant anaesthetic levels

M. Bretschneider, M. Kreuzer, E. Kochs, G. Schneider

Department of Anaesthesiology, Klinikum rechts der Isar der TU München, Munich, Germany

Background and Goal of Study: The performance of four monitors of the hypnotic component of anaesthesia regarding separation between stable states of different anaesthetic levels was evaluated. Different recorded EEG sequences were replayed to the BIS, CSI, Narcotrend and the Entropy module (state entropy SE) using an EEG player [1]. Pk values were calculated to elvaluate the monitors ability to distinguish different anaesthetic levels.
Materials and Methods: Standard EEG was recorded from volunteers at five distinct anaesthetic levels during propofol or sevoflurane anaesthesia: awake, loss of consciousness (LOC), burst suppression (BS) and intermediate levels inter1 and inter2 [2]. A five minute artefact-free EEG sequence was selected at each level. The sequences were played back to the monitors using an EEG player. Every 5 s

the index value was recorded (Entropy module: every 10 s). The 12 (6) index values derived during the final minute of the EEG sequence played back to the monitor were averaged and stored. Pk was calculated for the sevoflurane, respectively propofol group and for pooled data. Four different Pk values were obtained: Pk of distinguishing (i) all five levels, (ii) awake from all other levels, (iii) awake from all other levels with BS excluded, (iv) the levels LOC, inter1, inter2 and BS.

Results and Discussion: During analysis, the BIS and CSI showed no invalid indices, while for the NCT 236 (21%) of the indices were invalid and there were 20 (4%) invalid values for the SE. Tables 1 to 3 show the PK values.

Sevoflurane/ Propofol		All levels	Awake vs. LOC to BS	Awake vs. LOC to inter1	All levels except awake
	BIS	0.83	1.00	0.91	0.72
	NCT	0.54	0.73	0.51	0.59
	CSI	0.91	0.99	0.94	0.85
	SE	0.87	0.95	0.90	0.81
Propofol	BIS	0.89	1.00	0.90	0.82
	NCT	0.56	0.83	0.56	0.63
	CSI	0.90	0.99	0.93	0.83
	SE	0.81	0.95	0.84	0.71
Sevoflurane	BIS	0.78	1.00	0.91	0.63
	NCT	0.51	0.62	0.57	0.57
	CSI	0.94	0.99	0.95	0.90
	SE	0.90	0.95	0.91	0.86

Conclusion(s): The BIS, CSI and SE distinguish wakefulness from unconsciousness for both propofol and sevoflurane the NCT shows poorer performance. In summary, BIS, CSI and SE different stable levels of anaesthesia with a reasonable reliability.

References:

1 Anesth Analg. 104(1):135–9, 2007.
2 www.asa-abstracts.com A-329, 2004.

3AP3-9

The comparison of somatosensory evoked potential index (SSEP index) and bispectral index (BIS) in detecting the perception of intraoperative painful stimuli during propofol/ remifentanil or desflurane/remifentanil anaesthesia

H. Kang, E. Kim, J. Kim, K. Park, K. Yoo

Department of Anesthesiology, Chungbuk National University, Chung ju, Chungbuk, Republic of Korea

Background and Goal of Study: There have been some studies suggesting that some aspects of somatosensory evoked potential (SSEP) can specifically reflect the analgesic effect of anesthetics administered.[1] While there is no device of specifically and purely assessing pain perception of the patients under general anesthesia, we developed the SSEP-derived index (SSEP index) reflecting the function of both latency and amplitude of SSEP to assess pain evoked responses for the patients during anaesthesia and this was compared with BIS.

Materials and Methods: Thirty patients (aged 17 to 70 and ASA class I–II) scheduled for elective surgery were randomized to one of the two groups (SSEP (n = 15) or BIS (n = 15)). Anaesthesia was induced and maintained with either propofol (TCI) or desflurane with background infusion of remifentanil (TCI) and vecuronium. SSEP index, BIS and cardiovascular variables were measured in the awake state and pre-determined time points before and after intubation and surgical incision. SSEP index was obtained from the purpose-built system developed based on the specially designed mathematical algorithm and BIS was measured using a commercially available BIS monitor. Mean values of measurements were analysed using Wilcoxon Signed Rank Test.

Results and Discussion: All mean awake values in SSEP index and BIS before anaesthetic induction were significantly higher than all mean unconscious values during anaesthetic induction ($P < 0.05$). SSEP index and BIS decreased significantly with increasing depth of anaesthesia. Mean SSEP index values after tracheal intubation and surgical incision, producing nociceptive stimuli to the patients, were significantly higher than the values before intubation and incision ($P < 0.001$), whereas mean BIS decreased gradually during the same periods regardless of nociception. It may suggest the high sensitivity of SSEP to nociceptive painful stimuli while adequate levels of hypnotic components of surgical anaesthesia was maintained over the study period, evidenced by BIS being not increased.

Conclusion(s): It is carefully expected that SSEP index may open a scope of an objective indicator of pain perception during anaesthesia and surgery.

Reference:

1 Thornton C, Creagh-Barry P, Jordan C, Luff NP, Dore C, Henley M, Newton DEF. Somatosensory and auditory evoked responses recorded simultaneously: differential effects of nitrous oxide and isoflurane. Br J Anaesth 1992; 68: 508–514.

3AP3-10

Adapted permutation entropy as a general purpose EEG-parameter in anaesthesia

D. Jordan, E. Kochs, European Multicenter EEG/AEP Anaesthesia Monitoring Study Group and Research Group Knowledge Based Signal Processing, G. Schneider

Klinik für Anaesthesiologie, Klinikum rechts der Isar der TU München, Munich, Germany

Background and Goal of Study: The EEG-parameter Permutation Entropy (PeEn) reflects nonlinearity of a dynamical system. Using two different parameter configurations, PeEn separates consciousness from unconsciousness and indicates increase and decrease of the anaesthetic level [1]. The present investigation evaluates the ability of $PeEn_{SD}$, an adaptation of the classical parameter PeEn, and of BIS to reflect the entire range from consciousness to deep anaesthesia.

Materials and Methods: Configuration of $PeEn_{SD}$ is based on previous studies leading to parameter embedding dimension of 4 and a time lag of 3. EEG data from a study performed in 6 European centres involving 263 adult patients undergoing surgery under general anaesthesia was used for parameter assessment [2]. $PeEn_{SD}$ was calculated immediately before and after loss and return of consciousness and in phases of anaesthetic increase (until EEG burst suppression) and decrease from EEG signals of 10s length using a low pass filter at 30Hz. Offline, the recorded EEG was re-played to the BIS A-2000 with an EEG-player [3]. The capability of $PeEn_{SD}$ and BIS to separate consciousness from unconsciousness was evaluated using prediction probability (P_K) including bootstrap confidence intervals (CI). Spearman correlation coefficients (r_S) indicate the monotonic behaviour in phases of anaesthetic increase and decrease ($r_S = 1$: perfect, $r_S < 0$: antimonotonic).

Results and Discussion: P_K and r_S of the single parameter $PeEn_{SD}$ and the multi-parametric index BIS are shown in table 1. All correlations are significant (level of 0.01).

Table 1. P_K with 95% CI (conscious/unconscious), r_S (anaesthetic increase/decrease).

parameter/index	P_K	r_S decrease	r_S increase
$PeEn_{SD}$	0.79 (0.76–0.81)	0.32	0.16
BIS	0.81 (0.78–0.83)	0.20	0.18

Conclusion(s): In contrast to PeEn, the parameter $PeEn_{SD}$ suppresses information in analyzed EEG sequences with standard deviation less than 1µV, improving the robustness against influence of noise. This approach leads to a straightforward EEG-parameter, which separates consciousness from unconsciousness and shows a monotonic behaviour during anaesthetic increase and decrease. In contrast to BIS, $PeEn_{SD}$ uses the EEG band with an upper frequency limit of 30Hz, which reduces the influence of electromyogram (EMG). Therefore, detection of potential awareness is based on signals from the target cortex (EEG) rather than a surrogate EMG.

References:

1 Anesthesiology 2007; 107: A-800.
2 Anesthesiology 2006; 105: A1553.
3 Anesth Analg 2007; 104: 135–139.

3AP4-1

Stroke volume variation as a predictor of preload in patients undergoing hepatic surgery

T. Tateda, S. Morita, M. Sakamoto

Anesthesiology, St. Marianna University School of Medicine, Kawasaki, Kanagawa, Japan

Background and Goal of Study: Several procedures are employed to reduce blood loss in hepatic surgery. Pringle technique has been widely used during hepatic resection for liver tumor. On the other hand, the lowering the central venous pressure (CVP) is effective in reducing blood loss during hepatic surgery. However, it is well known that CVP is a poor indicator of blood volume because it depends not only on blood volume but also on venous compliance, pleural pressure, and abdominal pressure. Recently, stroke volume variation (SVV) has been introduced to predict of fluid responsiveness during several surgery. We studied the relationship between SVV and hemodynamic variables (cardiac index; CI, stroke volume index; SVI and CVP) during hepatic section with Pringle technique.

Materials and Methods: Fourteen patients who underwent hepatic resection for liver tumor were analyzed retrospectively. Anesthesia was maintained with sevoflurane and remifentanil. An epidural catheter was inserted before surgery for postoperative analgesia. All patients underwent controlled mechanical ventilation with oxygen and air. SVV, CI and SVI were measured by arterial pulse contour analysis using Edwards FloTrac sensor (Edwards lifescience LLC, CA). Hemodynamic variables were assessed before and during Pringle technique.

Statistical analysis used ANOVA and Scheffe's test. Pearson's correlation was used for linear regression analysis. $P < 0.05$ was considered significant.
Results and Discussion: We obtained 1330 data points in each periods. SVV correlated significantly to SVI ($r = 0.65$; $p < 0.01$). In contrast, CVP was not significantly correlated to other hemodynamic variables.
Conclusion(s): Our results indicate that SVV is a useful predictor to evaluate preload on hepatic surgery.

3AP4-2

Validation of the integrated pulmonary index in the post anesthesia care unit

Y. Gozal, D. Gozal

Anesthesiology, Perioperative Medicine and Pain Treatment, Shaare Zedek Medical Center, Jerusalem, Israel

Background and Goal of Study: In the postanesthesia care unit (PACU), different parameters such as heart rate (HR), blood pressure, respiratory rate (RR), oxygen saturation (SpO2), etc… are monitored for every single patient. The nurse may miss part of the data which is crucial for the well being of the patients after surgery. To facilitate the immediate postoperative monitoring, we have used the "Integrated Pulmonary Index" (IPI). This is a software tool which constitutes a representation of four parameters: endtidal CO_2 ($ETCO_2$), RR, SpO2 and HR in the form of a single index value, ranging from 1 to 10. The aim of the present study was to evaluate the reliability of the IPI in the setting of the PACU.
Materials and Methods: After approval by the Institutional Ethics Committee and signed informed consent, 34 adult patients were enrolled in the study. All patients were scheduled to undergo surgery under general anesthesia and to stay in the PACU after surgery. In the PACU, the device used for this evaluation was a Capnostream 20 (Oridion, Israel) hooked to a laptop with the dedicated software and screen display. Four parameters ($ETCO_2$, RR, SpO2, and HR) were displayed by the Capnostream 20 and exported to the laptop. They resulted in the IPI, a single numeric value from 1 to 10 displayed on the screen. The reliability of this single value was evaluated by a senior anesthesiologist. He compared the IPI to the clinical status of the patient.
Results and Discussion: All patients met the inclusion criteria. They underwent different types of surgery under general anesthesia. There were 12 male and 22 female patients. Their age was 54 ± 16 years (mean ± SD). Patients were monitored for two hours postoperatively. They all breathed spontaneously and got oxygen through a nasal cannula allowing the measurement of $ETCO_2$ and RR (Smart Capnoline H Plus O2, Oridion, Israel). The IPI was in good correlation with the respiratory status of the patients. In only two occasions, the IPI was not in accordance with the real clinical status of the patients. It was due to a falsely increased respiratory rate as displayed on the capnograph because cardiac oscillations were considered as breaths. Almost, all decreases in the IPI represented a decrease of the RR mainly due to opioid analgesia administration.
Conclusion(s): The IPI has been shown to correlate with the respiratory status of adult patients after surgery under general anesthesia. Since it is displayed as a single value, it may simplify the monitoring of patients in a busy PACU.

3AP4-3

Individualized intraoperative patient optimization using uncalibrated arterial pressure waveform analysis in high risk patients undergoing major abdominal surgery

J. Mayer, J. Boldt, R. Beschmann, A. Stephan, S. Suttner

Anaesthesiology and Intensive Care, Klinikum Ludwigshafen, Ludwigshafen, Germany

Background and Goal of Study: There is evidence that perioperative optimization of cardiac function and fluid balance based on flow-related variables can improve patient outcome. However, established methods are invasive (pulmonary artery catheter, PiCCO) or require considerable attentiveness (oesophagus Doppler). The purpose of this study was to guide intraoperative fluid and catecholamine therapy in addition to normal vital signs in patients undergoing major abdominal surgery using a recently introduced less-invasive device without the need of manual calibration (FloTrac/VigileoTM, Edwards Lifesciences, Irvine, USA) and to determine possible improvement in outcome by means of intensive care unit (ICU) and hospital stay.
Materials and Methods: Forty ASA III patients scheduled for elective major abdominal surgery and two or more risk factors according to the Lee classification scheme (1) were studied. Patients with permanent cardiac arrhythmias, valvular dysfunction and the need of mechanical cardiac support were excluded. Patients were randomly allocated into a standard care group and an intervention group, where a stroke volume variation (SVV) and cardiac index (CI) based protocol for volume and catecholamine therapy was implemented until end of surgery. In brief, a CI of ≥ 2.5 $L \cdot min^{-1} \cdot m^{-2}$ was tried to achieve, with a SVV threshold value for fluid challenge of ≥ 12%. After the baseline (skin incision), haemodynamic and vital data were obtained after 180min (T2), end of surgery, 5h post surgery, postoperative day 1 and 2, and ICU and hospital stay were recorded.
Results and Discussion: Demographic data and POSSUM physiology and operation score values were comparable between the groups. The intervention group received significantly more colloid volume replacement and more dobutamine, crystalloid volume replacement and norepinephrine consumption did not differ. Heart rate and mean arterial pressure (MAP) were comparable throughout the study period except at T2, where MAP was significantly higher in the intervention group. The mean hospital stay was reduced in the intervention group (14.8 ± 4.7 days) versus 20.6 ± 8.1 days in the standard care group ($p = 0.009$), whereas the ICU stay did not differ significantly (41.0 vs 49.2 hrs, $p > 0.05$).
Conclusion(s): The use of uncalibrated arterial waveform analysis (FloTrac/Vigileo) for intraoperative patient optimization in high risk patients undergoing major abdominal surgery is associated with a reduction of hospital stay, although ICU stay is not affected.
Reference:
1 Lee TH et al. Circulation 1999;100:1043–49.

3AP4-4

Heart rate variability as a predictor of fluid responsiveness in postoperative coronary patients

A. Smetkin, V. Kuzkov, A. Lenkin, K. Paromov, M. Kirov

Anesthesiology and Intensive Care, Northern State Medical University, Arkhangelsk, Russian Federation

Background and Goal of Study: The majority of current predictors of fluid responsiveness (FR) is based on invasive monitoring tools, thus new, less invasive techniques are required. Besides other factors, the pattern of cardiac rhythm is influenced by baroreflex feedback affecting autonomic nervous regulation and coronary circulation, which is preload-dependent [1]. Therefore we hypothesized that RR interval (RRI) variability on ECG may be a predictor of the hemodynamic response to fluid load after coronary surgery.
Materials and Methods: We analyzed heart rate (HR) variability and hemodynamic changes in 12 patients within one hour post coronary surgery (3 females, 9 males aged 59 ± 8 yrs, ejection fraction 0.57 ± 0.12). The patients were ventilated and sedated with propofol. Electrocardiogram was captured during 5 min and RRI variability including standard deviation (SD), skewness, and kurtosis were analyzed using PC-based software (Valenta-CRG, Russia). Invasive arterial pressure (AP), pulse-pressure variation (PPV), stroke volume variation (SVV), and peak ventricular contraction velocity (dPmx) were registered throughout the study. The response to fluid load (gelatin solution, 6 ml/kg) was assessed by absolute changes in pulse AP. Suspected predictors were compared using multiple regression model (stepwise method, $p < 0.05$ was required to enter variable).
Results and Discussion: Among studied HR variability characteristics, RRI SD was the only reliable predictor of FR as confirmed by the absolute increase in pulse AP following the fluid loading ($r2 = 0.50$, $p = 0.01$). Also, the RRI SD predicted the changes in systolic AP ($r2 = 0.46$ $p = 0.015$). Other studied variables including PPV and SVV did not show any FR predictive value in this category of patients.
Conclusion(s): In emerging post coronary surgery patients, the heart rate variability assessed by RR interval SD may be considered as an acceptable non-invasive predictor of fluid responsiveness.
Acknowledgements: We appreciate the assistance of Drs. Katysheva LV, Zemtsovsky MJ, and Slastilin VY.
Reference:
1 Cooke WH, Convertino VA. J Trauma. 2005;58(4):798–805.

3AP4-5

Feasibility of non-invasive cardiac output estimated by using pulse wave transit time

R. Ochiai, T. Terada, N. Sato, Y. Kotake

Department of Anesthesiology, Toho University, School of Medicine, Oomori-nishi, Oota-ku/Tokyo, Japan

Background and Goal of Study: Theoretically, pulse wave transit time (PWTT), which is defined as the interval between R wave of electrocardiogram and the arrival of pulse wave at the finger tip measured by pulseoximeter, is proportional to the physical property of the vascular system and thus cardiac stroke volume (SV). In order to evaluate the feasibility of such non-invasive technique, we compared the cardiac output (esCCO; estimated continuous cardiac output, Nihon-Kohden, Japan) estimated by PWTT with the cardiac output (ICO) obtained by thermodilution technique.

Materials and Methods: Twenty-seven adult patients with pulmonary artery catheter were studied during general anesthesia with informed consent. The signal of electrocardiogram and finger plethysmogram was continuously recorded to obtain PWTT. Stroke volume (SV) was estimated by using PWTT, and cardiac output was calculated as the product of SV and heart rate (HR). Immediately prior to the data collection, esCCO was calibrated by ICO. Linear correlation was evaluated between ICO and esCCO, and the bias and precision was obtained by Bland Altman plot. Continuous thermodilution CO measurements (CCO) were also comapred with ICO.
Results and Discussion: 97 pairs of data were obtained from 27 patients. The correlation coefficient of esCCO and ICO was 0.874, and slope and intercept was 0.86 and 0.76, respectively. Bland-Altman plot revealed that the bias and precision were – 0.05 L/min and 2.53 L/min, respectively. The present study shows that there is a good correlation between esCCO and ICO, but esCCO tends to underestimate CO at higher range of CO. Still, it is clear that the bias and precision of esCCO is comparable to those of CCO.

esCCO and Thermodilution Technique

	R	slope	Intercept	bias	precision
esCCO vs. ICO	0.874	0.861	0.758	−0.055	2.531
CCO vs. ICO	0.903	0.966	0.270	0.074	2.319

Conclusion(s): Although the CO estimation of esCCO seems feasible because of its non-invasiveness and high correlation, but the need for calibration is to be solved in future study.

3AP4-6

Influence of site of measurement to predict automatically and non invasively fluid responsiveness in mechanically ventilated patients under general anaesthesia

O. Desebbe, P. Chiari, P. Rosamel, J. Lehot, M. Cannesson

Department of Anesthesiology, Hospices Civils de Lyon Université Claude Bernard Lyon 1 ERI 22, Lyon, France

Background and Goal of Study: The Pleth Variability Index (PVI) is an algorithm of fluid responsiveness derived from the respiratory variations in the photoplethysmographic waveform amplitude (ΔPOP) in mechanically ventilated and sedated patients. However, the optimal site of measurement (finger, ear, forehead) is still debated.
Materials and Methods: Seven patients were studied after induction of general anesthesia. A pulse oximeter (LNOPAdt, Masimo Corp) attached to the index of the patients was connected to a monitor (Radical 7, Masimo Corp). PVI calculates the respiratory variations in the plethysmographic waveform amplitude as: PVI = (PImax-PImin)/PImax where PImax and PImin are the maximum and the minimum Perfusion Index values over a given period of time. Hemodynamic data (cardiac index (CI) measured using pulmonary artery catheter, respiratory variations in arterial pulse pressure (ΔPP), and PVI) were recorded before and after volume expansion (VE) (500 ml of hetastarch 6%). PVI was measured at 3 differents sites: forehead (PVIfo), ear (PVIea) and finger (PVIfi). Responders to VE were defined as patients presenting > 15% increase in CI following VE. Non parametric test were used for statistical analysis.
Results and Discussion: Over the 14 pairs of studied data, mean ± SD values for ΔPP, PVIfi, PVIfo, and PVIea were respectively 9 ± 3, 9 ± 6, 11 ± 5, and 13 ± 6%. We also observed differences in PI values over the three differents sites: 3.61 ± 1.58, 0.77 ± 0.65, and 1.54 ± 0.91 for PIfi, PIfo, and PIea respectively. There was a significant relationship between ΔPP and PVIfo (r = 0.533, p = 0.05), ΔPP and PVIea (r = 0.687, p = 0.007) and ΔPP and PVIfi (r = 0.709, p = 0.005). The effects of VE on haemodynamic and plethysmographic data are reported in table 1. PVI at baseline was higher in responders (n = 2) than in non-responders (n = 5) whatever the site (19 ± 2 to 13 ± 6%; p = 0.33 for PVIfo; 22 ± 5 to 11 ± 4%; p = 0.02 for PVIea; 19 ± 1to 11 ± 5%; p = 0.08 for PVIfi).

Haemodynamic data before and after VE

	before VE	after VE
PVIfo	15 ± 6	11 ± 6
PIfo	1.60 ± 0.94	1.48 ± 0.94
PVIea	14 ± 6	9 ± 3
PIea	0.74 ± 0.68	0.8 ± 0.66
PVIfi	13 ± 6	11 ± 6
PIfi	3.15 ± 1.37	4.06 ± 1.75
ΔPP	10 ± 4	7 ± 2

Conclusion(s): First, PVI value depends on the site of measurement. Second, whatever the site, PVI seems to be related to ΔPP and is higher in responders to VE. Consequently, we can expect PVI to have potential for fluid responsiveness prediction whatever the site of measurement. However, the threeshold values strongly depend on the site of measurement and have to be interpreted with caution.

3AP4-7

Mid esophageal left ventricular short-axis view using real-time 3-dimensional transesophageal echocardiography during coronary artery bypass surgery

K. Toyota, K. Koshikawa, T. Nomura, Y. Saito

Department of Anaesthesiology, Shimane University Faculty of Medicine, Izumo City, Shimane prefecture, Japan

Background and Goal of Study: Left ventricular new regional wall motion abnormality detected by transesophageal echocardiography (TEE) is regarded to be the most sensitive indicator of intraoperative myocardial ischemia. However vertical displacement of heart during beating coronary artery graft bypass surgery (bCABG) frequently disturbs to obtain transgastric left ventricular short axis (LVSA) view. Recent real-time 3D transesophageal echocardiography (RT-3DTEE) has given us the new window for LVSA view. The image has been constructed from mid esophageal examination. Our study was conducted to assess the usefulness and the quality of this new mid esophageal LVSA image.
Materials and Methods: Patients undergoing bCABG were participated in the study. In order to observe LV wall motion, real-time mid esophageal LVSA image were constructed using RT-3DTEE (iE33: Philips Medical Systems) before and during displacement of heart, and were stored into built-in hard disc. Those recorded images were examined offline by two trained TEE manipulators, anesthesiologists, to evaluate the quality of the image of the left ventricular mid level segments (segment 7–12 by AHA 17-segment model) by 4-grade scale (excellent, good, fair or poor).
Results and Discussion: Eleven patients undergoing bCABG were recruited in this study. RCA or Cx revascularization with heart displacement was performed in eight of these eleven cases. 66 segments (11 cases) on original heart position and 48 segments (8 cases) on heart displacement were evaluated. 92% of the 66 segments were evaluated as excellent or good on the normal position. 76% of the 48 segments were evaluated as excellent or good on heart displacement.
Conclusion(s): Mid esophageal LVSA view obtained using RT-3DTEE can be sufficient quality to monitor LV regional wall motion during bCABG.

3AP4-8

Predictive value of cardiac output with pulse contour analysis for determination of thermodilution cardiac output

C. Pregardien, C. Verborgh, H. van den Bossche, V. Umbrain, J. Poelaert

Anesthesiology, UZ Brussel, Brussels, Belgium

Background and Goal of Study: The VIGILEO (R) monitor was recently introduced as a less invasive device for cardiac output (CO) determination (1). Assets include ease of use, continuous determination and display, no need for calibration. Cardiac output is determined by pulse contour analysis (PCCO) of the arterial pressure tracing and internal referring to stored demographic data. Validation of this technique is mandatory if it is to replace traditional thermodilution cardiac output (TDCO) measurement in cardiac surgery.
Materials and Methods: Data coming from 20 patients were analyzed retrospectively following Ethics Committee approval. Data from the simultaneously recorded PCCO and TDCO displays were gathered during cardiac surgery as CO tends to vary during the procedure. Recording times were: control, incision, sternotomy, pericard incision, before 500 mL fluid load, after 500 mL fluid load, before cardiopulmonary bypass (CPB), after CPB, after pericard closure, after sternum closure and after skin closure. Values from both devices were compared at these different time points. Transitions in PCCO were compared to transitions in TDCO and qualified either as true positive or true negative or false positive or false negative. Applying different cut-offs provided the sensitivity and specificity for each. Other analyses included trend performance, Bland-Altman plot and correlation.
Results and Discussion: A total of 682 measurements were analyzed. PCCO was significantly higher than TDCO after incision and after sternotomy and remained similar during the rest of the procedure. A positive increase of 2.5% in TDCO is adequately reproduced with a sensitivity of 80%, while specificity is only 25%. Sensitivity rapidly decreases with increasing cut-off values, with only 55% sensitivity left for adequately reflecting a 15% increase in TDCO. Bland-Altman plot revealed a bias of 0.19L/min, while precision is 1.19L/min. Trend performance indicates a considerable part of CO values changing in opposite directions. 35% of readings indicate a stable or improving PCCO, when in fact TDCO is decreasing. Correlation function: PCCO = 0.52*TDCO + 2.34L/min.

Conclusion(s): PCCO slightly overestimates TDCO, while agreement is only moderate (r = 0.64). Sensitivity of PCCO in predicting TDCO rapidly decreases. Worrisome is the large part of negative CO evolutions that are not picked up by the PCCO.

Reference:

1 Manecke GR: Expert Rev Med Devices 2005; 2: 523–7.

3AP4-9

We should not use dumping coefficient and natural frequency for dynamic response evaluation of blood pressure monitoring lines

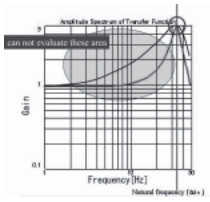
H. Watanabe

Anesthesiology, Sapporo Medical University, Sapporo, Japan

Background and Goal of Study: To evaluate the dynamic responses of pressure monitoring lines, the damping coefficient and natural frequency had been standard parameters for these evaluations 1). Recently we proposed the defects of these parameters with our original analysis methods and physical equations 2). But it is difficult to understand these equations for standard anesthesiologists. Therefore I will try to explain this reason as plain as possible and elucidate what is the best way to evaluate the dynamic response of pressure monitoring circuits.

Materials and Methods: Basically this study was carried out using our original impulse response analysis methods with pressure monitoring lines, two channels pressure amplifiers and personal computer. In some case we used simulator (601A, Bio-Tek, USA) to demonstrate pulse pressure waves.

Results and Discussion: 1. Estimation of natural frequency and damping coefficient with manual artifact measurement: In the case of low or no ringing flush artifact, it is impossible to get these parameters. This method can not be applied in over damped conditions. 2. These two parameters demonstrated the dynamic response just only at the natural frequency. If all pressure monitoring line's frequency response curves have similar figures, these parameters are useful for dynamic response evaluation. But in clinical situations, each pressure monitoring line contains different tubes, different three way stopcocks, different blood sampling ports and indwelling catheter. Therefore frequency response curves are not similar figures in each pressure monitoring line with same value of these parameters like in figure 1.



Conclusion(s): The damping coefficient and natural frequency are defective parameters and especially useless to compare the dynamic response of different types of monitoring lines. True dynamic response evaluation is derived only by drawing frequency response curves.

References:

1 Mark JB, Slaughter TF. Cardio Vascular Monitoring: Miller's Anesthesia sixth edition, New York: Elsevier Inc, 2005.
2 Watanabe H, Yagi S, Namiki A. J Clin Monit Comp 2006; 20: 37–42.

3AP4-10

Analysis of the oxygen delivery/consumption relationship in perioperative thoracic surgery through non-invasive monitoring

A. Ruiz Ortega, F. Ramasco Rueda, P. Crespo Aliseda, M. Santos Ampuero, A. Planas Roca

Anesthesiology, Hospital La Princesa, Madrid, Spain

Background and Goal of Study: Single lung ventilation (SLV) during thoracic surgery causes important cardiopulmonary disturbances. We analyzed the incidence and magnitude of the decrease in cerebral oxygen saturation (rSO_2), regional tissue saturation (StO_2), central venous oxygen saturation ($ScvO_2$), and peripheral oxigen saturation (SpO_2) in patients undergoing SLV during thoracic surgery.

Materials and Methods: Data were obtained from 20 consecutive patients undergoing thoracic surgery and requering SLV of more than 1hour. The INVOS® 4100 absolute oximeter was used to measure absolute rSO_2 and StO_2. The central venous oxygen saturations were recorded with CeVOX monitoring. Data were measured in 8 moments: Awake state, Induction (15min after anaesthesia induction), LD (15 min in Lateral decubitus), SLV (30min after the beginning of single-lung ventilation), DLV (15min after return to double-lung ventilation), Extubation (15min after awakening and extubation), ICU 6h (after 6h in Intensive Care Unit), ICU 24h (after 24h in ICU). Data median were analyzed using repeated-measured ANOVA.

Results and Discussion: Patients [median age 50 yr (range 35 – 65)] showed a mean rSO_2 ± SD of 64 ± 10,93 in the awake state, which decreased to a minimum rSO_2 of 61,88 ± 6,6 inmediatly after extubation to recover to a rSO_2 of 64,13 ± 7,72 6h after extubation. $ScvO_2$ after anaesthesia induction was 75,75 ± 11,08 and decreased to a minimum $ScvO_2$ of 66,18 ± 7,35 after extubation. We found a statistically significant decrease of rSO_2 (p = 0,003) and $ScvO_2$ (p = 0,04) in the time of extubation with the withdrawal of the anaesthesia. However, during SLV there was not statistically significant decrease in the mean data respect of awake state data. Changes in StO_2 and SpO_2 were not statistically significant in any moment.

	ScvO2	rSO2	StO2	SpO2
Awake		64	66,88	96,1
Induction	75,75	72,1	69	97,35
LD	77,12	68,63	67,13	97,28
SLV	79	66,25	66	94,95
DLV	78,62	70,75	65,38	98,55
Extubation	66,18	61,88	69,88	97,5
ICU 6h	67,45	64,13	69,38	98,06
ICU24	68,37	67	69,25	97,84

Conclusion(s): In adult patients undergoing thoracic surgery and SLV, the moment inmediatly after extubation seems to be associated with a significant decrease of rSO_2 and $SvCO_2$, however, these changes were not significant during SLV. So, the moment with highest risk of occult hypoperfusion would be the withdrawal of anaesthesia, awakening and subsequent extubation probably because the oxygen comsuption increases abruptly.

3AP4-11

Optimization of oxygen delivery in vascular surgery with Flotrac System, a prospective double blind randomized study

S. Wilmin, A. Dierick, S. De Hert, P. Van der Linden

Anesthesia, CHU Brugmann, Bruxelles, Belgium

Background and Goal of Study: Perioperative optimization of oxygen delivery improves outcome of patients undergoing peripheral vascular surgery (1). This prospective randomized double-blind study assessed the clinical value of the cardiac output monitoring using pulse contour analysis with the new Flotrac® system, version 1.07; Edwards, Santa Ana, CA).

Materials and Methods: Following institutional Ethics Committee approval and written informed consent, 38 patients undergoing peripheral arterial bypass graft were studied. All patients were equipped with a radial artery catheter allowing determination of the cardiac output through analysis of the arterial pressure curve (Flotrac® system,). Patients were randomized to a control group (C; N = 17), where hemodynamic management was based, as routinely, on arterial and central venous pressures or to a protocol group (P; N = 21) where hemodynamic monitoring was based on the cardiac output obtained by the Flotrac® system. Parameters were measured at pre-defined time points pre, per end postoperatively. In the C group, cardiac output data were collected by an independent observer. Data between groups were compared with a two-way analysis of variance for repeated measurements followed by a post-hoc Tuckey test. A $p < 0.05$ was considered significant.

Results and Discussion: Demographic and surgical characteristics did not differ among groups (Data: mean ± SD). Postoperative complications and hospital length of stay were not different among groups.

		Preop	Before Surgery	End Surgery	ICU	POD1
CI	C	3.8±1.5	2.5±0.4	2.7±0.5	3.7±0.8	3.3±0.5
l/min.m²	P	3.4±07	3.1± 0.9	3.0±0.4	3.5±1.0	3.0±0.5
ScO2	C		80±10	80±15	77±9	73±8
%	P		83±6	83±8	71±12	69±8
DO2i	C	627±187	404±85	382±68	527±217	461±110
ml/min.m²	P	597±151	488±155	416±88	529±180	486±198
Lactate	C	0.8±0.4	1.0±0.6	1.1±0.5	0.9±0.4	0.9±0.4
mM/l	P	0.9±0.6	0.9±0.5	1.1±0.6	1.4±1.2	0.8±0.3
Troponin	C	0.01±0.00			0.01±0.01	0.02±0.02
(ng/mL)	P	0.01±0.00			0.01±0.00	0.01±0.01

Conclusion(s): In the conditions of our study, monitoring of cardiac output with the Flotrac® technique did not influence hemodynamic perioperative course or postoperative outcome.

Reference:

1 Wilson J et al. BMJ 1999; 318:1099–1103.

3AP5-1

The change of upper limbs PVI in spinal block (The comparison in high spinal block and non-high spinal block)

K. Takeyama, M. Yoshikawa

Anesthesilogy, Tokai University School of Medicine, Hachioji, Tokyo, Japan

Background and Goal of Study: PVI (Pleth Valiability Index: Pulse wave change index) calculates a respiratory-related change of PI (Perfusion Index)automatically and expressed it ratio (PImax–PImin/PImax × 100%). It is said that PVI changes with a change of circulation change (BP, CO) under the general anesthesia.[1) 2)] [Purpose] We examined how PVI changed in spinal block (SAB).

Materials and Methods: The cases (Caesarean procedures, TUR-P, inguinal hernia repaired) under SAB were planned. We attached PI & PVI sensor (Masimo Radical 7/TM) to upper limbs and PI sensor (Masimo Radical/TM) to lower limbs at the time of entering a room. We recorded parameters (PI&PVI of upper limbs/PI of lower limbs) as previous values. SAB was performed by L2/3 or L3/4 and injected 0.5% bupivacaine (2.0–2.3ml). We recorded (PI&PVI/PI) as immediate post-SAB values. (PI&PVI/PI) were subsequently recorded every 2 minutes. Simulutaneously, Blood pressure (BP) was measured. We divided into 2 Groups (high-SAB and non-high SAB). High SAB group is anesthesic level reached C-area. Non-high SAB group is its level did not reached the C-area.

Results and Discussion: At high SAB group, BP decreased, PI of lower limbs increased, PI of upper limbs increased and PVI of upper limbs decreased. On the other hand, at non-high SAB group, PI of lower limbs increased, but BP, PI & PVI of upper limbs hardly changed. [Disscussion] It is reported that PVI decreased with increasing of $BP_{1)}$ and $CO_{2)}$under Trenderenberg position. This mechanism is that Trenderenberg position increase of Venous return. Increasing of Venous returns occure increasing of CO. Increasing CO getting better peripheral arterial blood flow. Getting better of peripheral arterial blood flow increases of PI. Increasing of PI minimize the respiratory changes of PI (=PImax–PImin). For that reason, we think that PVI (PImax–PImin/PImax × × 100%) decreased. In our study, BP (CO) decreased, but PI increased and PVI decreased of upper limbs at high SAB group. High SAB dilate vessels and getting better blood flow of upper limbs. Getting better of upper-limbs blood flow increases PI. As a result, we think that PVI decreased.

Conclusion(s): It is shown that PVI changes different mechanism with general anesthesia and SAB.

References:

1 Canesson, MD et. al. Aneth & Analg 2,008, It is 1189-94 106.
2 Keller et al. Critical Care 2,008, 12:00 R37.

3AP5-2

Does stroke volume variation guided fluid management improve postoperative outcome?

D. Oubaha, J. Poelaert

Anaesthesiology, University of Brussels V.U.B. Medical Centre, Brussels, Belgium

Background and Goal of Study: Systolic pressure variation and stroke volume variation (SVV) have been shown to be good dynamic preload descriptors in high risk postoperative patients. However, the value of these variables in intraoperative preload management is nearly unknown. We aimed to assess the predictive value of intraoperative SVV guided fluid management on postoperative outcome variables in high risk abdominal surgery.

Materials and Methods: After Ethics Committee approval and patient informed consent, patients, ASA physical status class 2–3, undergoing an elective major abdominal surgery, were randomized either to group1 (n = 15) or group2 (n = 14). In group1 fluid loading was monitored by SVV, as determined by the FloTrac/Vigileo system (Edwards®) via a radial artery connected FloTrac sensor; in group2 the central venous pressure (CVP) via a standard central catheter formed the fluid guidance. In both groups the same colloids were administered to optimize the intraoperative fluid status monitored by either SVV or CVP. Measurements were performed each 15 minutes after induction of anaesthesia till the end of surgery. Postoperatively, three blood samples were taken to determine lactate, $ScvO_2$ and serum creatinine at regular times. All patients were followed till the day of discharge.

Results and Discussion: Stepwise linear regression analysis with dependent variable SVV guided management showed a determining influence on postoperative lactate levels. (p < 0,05; CI 0,026–0,634).

Conclusion(s): Significant lower lactate levels were found in the SVV guided fluid managed patients, however, without any impact on renal variables or length of stay in the hospital.

Table 1

	group 1	group 2
SVV (%)	8,00 ± SD2,48	7,69 ± SD2,78
CVP (mm Hg)	15,4 ± SD4,98	16,1 ± SD4,75
Lactate (mmol/L)	0,86 ± SD0,31*	1,60 ± SD1,06
$ScvO_2$(%) arrival PACU	75,6 ± SD8,93	71,8 ± SD12,4
$ScvO_2$(%) discharge PACU	75,8 ± SD6,33	68,6 ± SD11,6
Serum creatinine (mg/dl)	0,72 ± SD0,21**	0,74 ± SD0,16
Length of hospital stay (days)	10,2 ± SD3,47***	11,8 ± SD3,56

*p = 0,036 **p = 0,783 ***p = 0,114

3AP5-3

Hemoglobin concentration and body surface area determine optimal lithium dose for Lidco™ *Plus* cardiac output determination

A. Vannucci, V. Krejci, A. Abbas, I. Kangrga

Department of Anesthesiology, Washington University in St. Louis, St. Louis, Missouri, USA

Background and Goal of Study: Lidco™*Plus* cardiac output (CO) monitor combines Lithium chloride (LiCl) dilution CO and Pulse™CO. The LiCl dilution CO generates a calibration factor (CF) that estimates instantaneous arterial compliance. CF is integrated into the PulseCO™ algorhitm that calculates beat-to-beat CO based on arterial pressure waveform. Lithium dilution curve is obtained by LiCl injection (0.15 or 0.30 mmol). A sensor connected to an arterial catheter measures lithium washout curve as electrical potential. Peak voltage of 0.2 mV or higher is optimal, although voltage exceeeding 0.1 mV is acceptable. Two dilution curves are recommended. Required patient data are Na^+, Hb, height and weight. We repeatedly noticed that the optimal peak voltage was not reached, necessitating repetitive injections. As this was not reported in literature, we set to study factors determining the lithium peak voltage.

Materials and Methods: Liver transplant or carotid endarterecomy patients (n = 22) were enrolled in this prospective observational study. LiDCO was calibrated before induction of anesthesia. LiCl 0.3 mmol was injected through a forearm vein and concentration measured by a radial artery sensor. Calibration data, peak voltages and lithium dilution curve were stored for analysis. Data were anlyzed using single and multiple regression to model determinants of the peak voltage, and their interactions.

Results and Discussion: Single regression showed significant correlation of peak voltage with Hb (R^2 0.26 p = 0.016 slope 0.313 Intercept – 0.473) and BSA (R^2 0.17, p = 0.056, slope – 2.12 Intercept 7.44), but not with Na^+. Multiple regression demonstrated a good fit with a combined Hb-BSA model: R^2 0.66 p < 0.0001, intercept 4.04, slope Hb 0.406, slope BSA – 2.88. With Hb < 10 and BSA of > $2m^2$ the peak voltage did not reach 0.2mV in 75% patients. Conversely, Hb > 10 and BSA < $2m^2$ was usually associated with adequate peak voltage (see Table 1).

Table 1. Predictive values for Peak 0.2 mV, based on Hb 10 g/dl and BSA 2 m^2 presence or absence

	Estimated value	95% CI lower limit	95% CI upper limit
Positive	0.75	0.219	0.987
Negative	0.944	0.706	0.997

sample = 22 patients

Conclusion(s): Hb and BSA are main determinants of lithium peak voltage. Patients with Hb > 10 g/dl and BSA < 2 m^2 rarely need a LiCl dose higher than 0.3 mmol. In contrast, if Hb < 10 and BSA > 2 m^2 higher dose of LiCl may be indicated[1]. These findings may help clinicians use the correct dose of lithium and expedite LiDCO™*Plus* monitor calibration.

Reference:

1 Linton Br J Anest 1993.

3AP5-4

Arterial pressure based cardiac output monitors in patients with different vascular compliances

V. Krejci, A. Vannucci, L. Zhurav, A. Abbas, I. Kangrga

Department of Anesthesiology, Washington University School of Medicine, Saint Louis, Missouri, USA

Background and Goal of Study: Arterial pressure based cardiac output monitors use different approaches to correct for individual vascular compliance. LiDCO Plus monitor (LiDCO Group Plc) generates a calibration factor (CF) from a lithium chloride (LiCl) dilution cardiac output measurement and PulseCO™. Vigileo monitor (Edwards Lifesciences) determines changes

in vascular compliance by analysis of the arterial pressure waveform and does not require a calibration process. The aim of the study was to compare these monitors in two groups of patients with presumed different vascular compliances: end-stage liver disease (ESLD) and peripheral vascular disease (PVD).

Materials and Methods: Written informed consent was obtained from patients with ESLD scheduled for orthotopic liver transplantation (n = 15), or with PVD scheduled for carotid endarterectomy (n = 9). Cardiac index (CI) was measured from the radial artery simultaneously with LiDCO™ and Vigileo™ monitors. LiDCO™ monitor was calibrated as per manufacturer instructions: A bolus (0.3 mmol) of LiCl was injected intravenously to determine cardiac output and CF. All Measurements were performed before the start of surgery. The difference between LiDCO™ CI and Vigileo™ CI was plotted against the average of both methods, using Bland-Altman analysis. All other Results are presented as average (SD).

Results and Discussion: In patients with ESLD, CF was 0.99 (0.30) and in patients with PVD 0.56 (0.18); p = 0.007. Bias between LiDCO CI and Vigileo CI was 0.64 $L*min^{-1}m^{-2}$ (–1.95 to 3.22) in ESLD patients and $–0.77L*min^{-1}m^{-2}$ (–1.32 to –0.22) in PVD patients (p = 0.004). Linear regression showed a significant correlation of CF with Bias (slope = 2.91, intercept = 2.3, $R^2 = 0.62$).

Conclusion(s): In patients with PVD, CF determined by LiDCO™ was significantly lower than in patients with ESLD. This finding is consistent with the hypothesis that in PVD arterial compliance is decreased compared to ESLD. Bias was significantly correlated with CF. Compared to Vigileo™, cardiac output measured with LiDCO™ was significantly lower in patients with PVD, while in patients with ESLD the comparison between the LiDCO™ and Vigileo™ monitors was characterized by a nonsignificant bias but wide limits of agreement. Although both monitors determine cardiac output from the same arterial pressure waveform signal, they yield different results and therefore are not interchangeable.

Acknowledgements: Funded by Division of Clinical and Translational Research, Department of Anesthesiology, Washington University School of Medicine, St. Louis, MO, 63110.

3AP5-5

Noninvasive pulse wave analysis for monitoring the cardiovascular effects of pneumoperitoneum during laparoscopic cholecystectomy

P. Sárkány, S. Lengyel, E. Szelei, D. Páll, B. Fülesdi (1)

Anesthesiology and Intensive Care (1), First Department of Medicine (2), Health and Medical Science Centre, University of Debrecen, Debrecen, Hungary

Background and Goal of Study: Due to absorption of carbon dioxide and elevated intraabdominal pressure, pneumoperitoneum during laparoscopic cholecystectomy has potentially harmful intraoperative cardiovascular effects. Our aim was to test the usefulness of a non-invasive method for detecting these hemodynamic parameters.

Materials and Methods: A total of 35 patients, with low anaesthesia risk (ASA 1 and 2) who underwent laparoscopic cholecystectomy were investigated using SphigmoCor arterial wave analysing system. Conventional pneumoperitoneum was performed, insufflation using carbon dioxid to an intraabdominal pressure of 8–12 mm Hg. We determined the estimated central aortic pressure, augmentation pressure, augmentation index, ejection duration and subendocardial viability ratio throughout the surgery. These parameters were recorded after induction of anaesthesia and during the inflation period of surgery.

Results and Discussion: A significant increase in mean arterial blood pressure (84.5 ± 22.1 vs. 94.0 ± 14.4 mm Hg, p = 0,04), aortic pulse pressure (29.5 ± 9.2 vs. 32.7 ± 11.5 mm Hg, p = 0.04), augmented pressure (5.9 ± 4.1 vs. 11.0 ± 6.9 mm Hg, p < 0.001) and corrigated augmentation index (20.1 ± 13.3 vs. 32.8 ± 12.9, p < 0.001) were recorded after insufflating the abdomen. The derived parameters suggested an increased mechanical cardiac activity and a raised peripheral vascular resistance along with increases in left ventricular end-systolic wall stress. Despite this alterations, the left ventricular function was preserved. After deflating the abdomen the measured parameters tended toward normalisation.

Conclusion(s): SphigmoCor arterial wave analysis succesfully documented hemodynamic changes occuring during laparoscopic surgery. Our results from this non-invasive technique correspond to data reported previously, using invasive hemodynamic monitoring.[1,2]

References:

1 A.-M. Koivusalo, P. Pere, M. Valjus, T. Scheinin: Laparoscopic cholecystectomy with carbon dioxide pneumoperitoneum is safe even for high-risk patients. Surg Endosc (2008) 22: 61–67.

2 S. Odeberg, O. Ljunqqist, T. Svenberg, P. Gannedahl, M. Bäckdahl, A. von Rosen, A. Sollevi: Haemodynamic effects of pneumoperitoneum and the influence of posture during anaesthesia for laparoscopic surgery. Acta Anaesthesiol Scand (1994) 38: 276–283.

3AP5-6

Saturation pattern detection index for predicting airflow reduction in obstructive sleep apnea

J. Ojile, E. Powell, K. Russell, M. Uhles

The Research Center, Clayton Sleep Institute, St. Louis, Missouri, USA

Background and Goal of Study: Obstructive sleep apnea (OSA) is a major risk factor for cardiovascular disease, obesity, and even perioperative adverse events. OSA can lead to cyclical impairment of airflow, with resultant recurrent patterns of desaturation in the pulse oximetry SpO_2 trend. This desaturation pattern and the severity of the airflow impairment may not be detected with current pulse oximetry alarm setting. In addition, there is a need to implement better alarm algorithms to reduce the frequent alarms triggered by threshold criteria [1]. We report a study to determine the effectiveness of Saturation Pattern Detection (SPD) Index (Nellcor™ OxiMax SPD™ Alert) for automated detection of airflow problems.

Materials and Methods: Ninety-two patients with symptoms of sleep apnea underwent a standard diagnostic polysomnogram. The presence of repetitive reductions in airflow was determined via a scoring of the PSG data (airflow, SpO_2 fluctuations, chest movement and abdomen movement) for discrete 10 minute epochs. A comparison between the score and the SPD prediction was made for each epoch over a range of SPD thresholds.

Results and Discussion: Values for the maximum SPD index (range 0–31) were 14.5 ± 9.2 when airflow problems were present, 1.30 ± 4.0 when airflow problems were absent. There were large and highly significant differences (p < 0.0001 in all cases) in both the maximum and mean SPD index when pairwise comparisons according to airflow status were performed. Typical airflow reduction and corresponding SPD index demonstrated a cumulative effect of cyclical desaturation. The area under the ROC curve was 0.89 (90% CI 0.86–0.92), indicating that the SPD index does an excellent job of discriminating between subjects with and without airflow problems. Many cut points of the SPD index yield sensitivity and specificity values that are both substantially greater than 80%.

Conclusion(s): The current study demonstrates the SPD index is a highly sensitive marker in detecting epochs with airflow problems in comparison to epochs without airflow problems in patients with OSA symptomology. We conclude that SPD index is a useful parameter to detect airflow reduction in obstructive sleep apnea. Further studies are needed to explore the potential SPD index in a variety of clinical setting, such as in identifying postoperative respiratory depression, and in providing critical care of obese patients.

Reference:

1 Overdyk FJ et al., Anesth Analg 2007; 105: 412–8.

3AP5-7

Real-time 3-dimensional transesophageal echocardiography: Improved localization and spatial orientation of mitral valve prolapse

M. Hien, C. Hörner, A. Lichtenberg, T. Bruckner, H. Rauch

Department of Anaesthesiology, Universitätsklinik Heidelberg, Heidelberg, Germany

Background and Goal of Study: With minimally invasive surgery on the advance, 3-dimensional (3D) visualization devices are gaining importance for the intra-operative guidance of the heart surgeon. Our study aimed to evaluate hypothetical superiority of intra-operative real-time 3D transesophageal echocardiography (RT3DTEE) to the established 2-dimensional (2D) imaging (2DTEE) in assessing mitral valve prolapse (MVP) localization, dimensions and associated pathologies of importance for surgical planning.

Materials and Methods: 50 consecutive patients with mitral regurgitation (mean age 62.1 years, 10 women) undergoing mitral valve surgery (28 minimally invasive) were included after approval of the local ethics committee and patient consent. Intra-operative TEE was performed by anaesthesiologists with Philips IE33 using an X7-2t probe and Qlab Quantification software. Standard 2DTEE and new RT3DTEE loops were acquired, independently evaluated by anaesthesiologists and analyzed with reference to the surgeon's intra-operative view.

Results and Discussion: With statistical analysis in process of validation, preliminary results show precise localization of MVP by RT3DTEE in 98% of the cases, with a high level of certainty of the 3D-examiner and 3 cases partially detected due to poor image quality. 2DTEE achieved 84% accuracy with a low level of certainty in 28% of the cases and 7 cases partially detected. 2D misinterpretation was most evident in compartment P1 (p < 0,01; McNemar's-Test) whereas RT3DTEE showed good correlation in these cases. RT3DTEE proved stronger in both detecting and localizing associated pathologies such as chordal ruptures or flail leaflet. Additionally, abnormal clefts between leaflet scallops could be successfully found with 3D but not with 2D imaging. 3D visualization of the complex prolapsing structure, estimation of its volume and

evaluation of the post-operative valve function furthermore led to a change of the surgical procedure in 4 cases.
Conclusion(s): RT3DTEE eliminates disturbing factors such as difference in heart position, deviation of probe angle and movement, superposition of prolapsing compartments and lack of spatial information regarding prolaps width. As RT3DTEE offers functional imaging corresponding 100% to the surgical view of the mitral valve, with the additional feasibility to crop, rotate or slice the images in all directions, it facilitates spacial orientation especially for echocardiographers with greater difficulties to develop a 3D imagination from 2D slices.

3AP5-8

Central venous pressure versus transesophageal echocardiography indices measured during Pringle maneuver

G. Fortunato, E. Congedo, P. Aceto, I. Damato, G. De Cosmo

Anaesthesiology and Intensive Care, A. Gemelli Hospital, Rome, Italy

Background and Goal of Study: Blood loss has been recognized as a significant factor adversely affecting the postoperative outcome of patients undergoing liver resection. The Pringle maneuver or hepatic pedicle clamping has been widely adopted to prevent intraoperative blood loss and postoperative complications. The main haemodynamic effect is a decrease in preload and an increase in mean arterial pressure (1). The aim of the present study was to evaluate the changes of central venous pressure (CVP) and transesophageal echocardiography (TEE) indices during Pringle maneuver.
Materials and Methods: After hospital's Ethics Committee approval and informed consent 18 patients, aged 30–70 years, each with American Society of Anaesthesiologists (ASA) physical status I–III, scheduled to undergo major liver resection, with preserved systolic and diastolic ventricular function and without significant valvular pathology, were enrolled in the study. CVP, left ventricular end-diastolic area (LVEDA), peak velocity of early and late diastolic mitral inflow wave (E and A), the ratio of these velocities (E/A) and the early wave deceleration time (Edt) were recorded at the following times: incision, after clamping, after releasing the clamp, at the end of surgery. At the same times, mean arterial pressure was recorded. Data were analized using Mann Whitney test; $p < .05$ was considered statistically significant.
Results and Discussion: Following the Pringle maneuver CVP and wave A significantly decreased ($p < .01$) and increased ($P < .05$) respectively; they reverted to baseline values after releasing the clamp. No variations were found regarding LVEDA, Edt and mean arterial pressure at the investigated times.
Conclusion(s): CVP and wave A were good indicators of haemodynamic variations during Pringle maneuver.
Reference:
1 Chouker A, Schachtner T, Schauer R et al. Br J Anaesth 2004: 93 204–11.

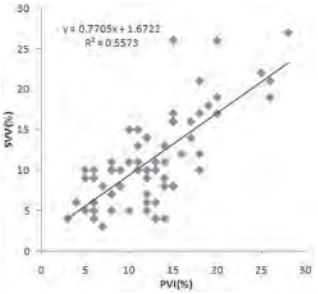
3AP5-9

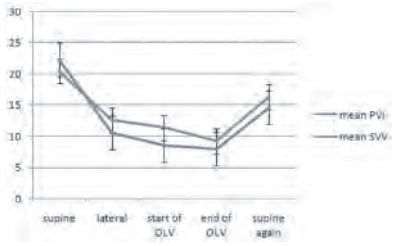
Does the Pleth Variability Index correlate with stroke volume variation?

Y. Kawashima, Y. Shiraishi, S. Sato

Department of Anesthesiology, Hamamatsu University School of Medicine, Hamamatsu-City, Shizuoka, Japan

Background and Goal of Study: The Pleth Variability Index (PVI, Masimo Corp., Irvine, CA) is a new algorithm that allows continuous and automatic estimation of respiratory variations in the pulse oximeter waveform amplitude (ΔPOP). This approach may allow accurate prediction of fluid responsiveness in mechanically ventilated patients. Stroke volume variation (SVV) derived from pulse contour analysis is also evaluated as a predictor of fluid responsiveness. However, the correlation of PVI with SVV is unclear, and in this study we investigated this correlation.
Materials and Methods: A prospective clinical study was performed in 13 patients after induction of general anesthesia for thoracoscopic surgery. Catheters were placed in the lower part of the radial artery in the lateral position and connected to a FloTrac sensor and Vigileo monitor (Edwards Lifesciences Corp., Irvine, CA). A Radical-7 pulse oxymeter (Masimo Corp., Irvine, CA) was attached to the forefinger on the same side. HR, MAP, PVI and SVV were recorded at five points (supine position, lateral position, start of one-lung ventilation (OLV), end of OLV, and finally in the supine position again). Pearson's test was used to determine the significance of a linear correlation between PVI and SVV.
Results and Discussion: There was a significant relationship between PVI and SVV ($r = 0.75$; $p = 0.017$). DISCUSSION: Our results suggest that an accurate prediction of fluid responsiveness can be obtained non-invasively using the PVI. However, there was a discrepancy between PVI and SVV in 3 cases, which suggests that there may be involvement of another factors and that further analysis is needed.





Conclusion(s): This is the first study to show a significant correlation between PVI and SVV. Our results suggest that the PVI has potential clinical applications in monitoring of fluid responsiveness under general anesthesia.

3AP6-1

Computer driven performance improvement in anesthesia practice

W. Sandberg, S. Spring, J. Walsh, J. Ehrenfeld

Anesthesia & Critical Care, Massachusetts General Hospital, Boston, Massachusetts, USA

Background and Goal of Study: Anesthesiologists mitigate anesthetic and procedural risk by vigilance, assiduous documentation, and consistent execution of clinical tasks. Accidental omissions expose patients to reducible risk. We decided that reminders delivered via 'pop-up' windows in our Anesthesia Information Management System (AIMS) and/or via hospital pagers could effectively prompt clinicians to complete and document tasks more efectively. The goal was to deliver reminders before tasks were due.
Materials and Methods: We created custom software that applies logical rules to the accumulating AIMS database in real time during each anesthesia case (Ref 1). After testing, new rules are widely implemented without fanfare. Individuals receive immediate feedback about their performance via automatically generated real-time alphanumeric pages or 'pop-ups'. Dramatic performance improvement occurs as quickly as 3 days after implementing a new alert. We used task completion rates extracted from the AIMS to gauge the immediate effects.
Results and Discussion: At baseline, epidural catheter follow-up care, and documentation related to billing, antibiotic administration, or key information (such as drug allergies) only occurred for 60–90% of cases. After the improvement project, all tasks related to generating a bill for services are properly completed at a rate of 98% within 2 hours of the end of anesthesia. All epidural analgesia patients receive timely follow–up care. Clinical history documentation tasks such as medication allergies are now completed for 99% of cases. Documentation of proper preoperative antibiotic decision-making occurs for 98% of all cases. There were initial concerns about excessive reminder traffic distracting clinicians, and this engendered resistance to implementation. However, we currently generate approximately one alert per case, despite running roughly 100 separate checks on each. Each new rule engenders a flurry of alerts, diminishing within days as clinicians avoid alerts by improving performance.
Conclusion(s): AIMS facilitates real-time process monitoring and process control in anesthetizing locationss. Roughly 26 million patients in the US alone undergo anesthesia each year, so the number of people potentially benefited by our results is enormous.
Reference:
1 Spring SF, Sandberg WS, et al. Automated Documentation Error Detection and Notification Improves Anesthesia Billing Performance. Anesthesiology 2007; 106: 157–63.

3AP6-2

Cost-effectiveness of balanced and total intravenous anaesthesia with or without Navigator device: Preliminary results

N. Lomartire, F. Caracciolo

Anesthesiology & Intensive Care Unit, S.S. Trinità Hospital, Sora, Frosinone, Italy

Background and Goal of Study: In the era of healthcare reform, the ability to demonstrate the clinical and economic value of new technologies is essential. This is especially important for IV anesthetics, which are, in part, discarded after their use. With the introduction of new, short-acting anesthetics and the development of computer-assisted target-controlled infusion systems and Navigator Application Suite®, total IV anesthesia is increasing acceptance. Several cost-analysis studies with varying anesthesia techniques have been published, but there is only limited information about the costs associated with propofol-based TCI anesthesia and Navigator application suite anaesthesia. Thus, we designed the present study to compare the costs and side effects of three anesthesia techniques: a TCI-based TIVA anesthesia technique, a TCI view-based TIVA anesthesia with Navigator device with standard balanced anesthesia regimen.
Materials and Methods: 30 patients were randomly allocated to receive one of three types of general anaesthesia: TIVA/TCI was used with propofol and remifentanil administered by a continuous computer-assisted TCI system (Base Primea pump; Fresenius), Balanced anesthesia with sevoflurane and fentanyl and TIVA/TCI view in conjunction with a Navigator system. Cost effectiveness was measured for all patients.
Results and Discussion: There were no differences among the groups regarding ASA class, age, weight, and duration of surgery and anesthesia. The most rapid time of extubation, eye opening and respond command at the end of surgery were observed in group TIVA/TCI and Navigator compared with group balanced anesthesia ($P < 0.001$) Significant statistical differences were seen with regard to propofol consumption. Patients in Group Navigator spent a significantly shorter period of time in the PACU than the other patients. The incidence of postoperative nausea and vomiting was less frequent in Group 3. TCI/TIVA using propofol and remifentanil was the most expensive anesthesia regimen if compared with the navigator application suite IV propofol regimen and almost two times larger compared with a balanced anesthesia.
Conclusion(s): Visualization of Ce curves for sedation, analgesia and neuromuscular blockade by Navigator facilitated optimal titration of anesthesia. Consequently the Navigator Application Suite must be used for multi-parametric closed loop anesthesia and the choice of anesthetic technique must not only be made purely on medical implications, economical aspect have also to be taken into account for highest quality care.

3AP6-3

Performance of algorithm controllers and devices for target controlled infusion of propofol

N. Bressan, A. Moreira, P. Amorim, C. Nunes

Electrical and Computers Engineering, Faculdade de Engenharia Universidade do Porto, Porto, Portugal

Background and Goal of Study: Target Controlled Infusion (TCI) systems for delivery of propofol are now commercially available. We developed new TCI software and this study test its performance, using 2 different controller infusion algorithms (cia).
Materials and Methods: Software was developed in LabVIEW (National Instruments) to control Asena from Alaris Medical System. Marsh's[1] pharmacokinetic model for propofol was used. Two cia were implemented; the first used 2 equations published by J. M. Alvis[2] [1.1, 1.2] and the second by C. H. Ting[3] [1.3]: The equation [1.1] was used t = 0 to reach the target plasma concentration (Cp) fast and with equation [1.2] when t > 0 to keep the infusion rate (if) constant in maintenance phase. The equation [1.3] represents at t = 0 the initial drug dose to reach the new target and with t > 0 the maintenance equation to keep the target. A 70 kg male patient was considered. Initial propofol Cp target was set at 3 µg/ml and kept until steady state; the target was then changed to 5 µg/ml and kept until the new steady state. Simulation were done with our software and the 2 algorithms and with Orchestra Workstation by Fresenius Kabi and Rugloop© I software. The if were compared.

$$ADDLD = Vc \times Mp \times (NCc - Cc) \quad [1.1]$$

$$u(t) = Ld \times (k10 + k12.e^{-k21t} + k13.e^{-k31t}) \quad [1.2]$$

$$u(t) = \delta(t).Ld + (k10 + k12.e^{-k21t} + k13.e^{-k31t}) \times Ld - (k21.x2(0).e^{-k21t} + k31.x3(0).e^{-k31t}) \quad [1.3]$$

Cc: concentration
NCc: new Cc

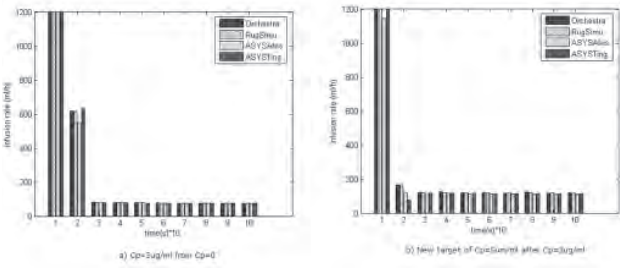
Mp: patient's weight

x_n: drugs amount in compartment n time change target.

u(t): infusion rate

ADDLD: additional loading dose

Results and Discussion: The if observed were presented in Fig1. Software with [1.3] equation resulted in if equal to those obtained with Orchestra and Rugloop© I at all times. System with Alvis's equation results in lower if.



Conclusion(s): Results shows that the new software with the algorithm based on [1.3] performance well as Orchestra and Rugloop©© I. Results also demonstrated that an algorithm based on Alvis's equation does not perform well, probably because it did not take in consideration the initial values for the drug amount on the compartments.
References:
1 British Journal Anaesthesia 67 (1991) 41–8.
2 IEEE Transactions on Biomedical Engineering (1985) 5, 323–9.
3 Computer Methods and Programs in Biomedicine (2004) 75, 127:139.

3AP6-4

Monitoring of oxygen saturation in low perfusion

A. Weinstein, O. Herzenstein, E. Gabis, I. Kagan, P. Singer

General Intensive Care Department and Institute for Nutrition Research, Rabin Medical Center, Petah-Tikva, Israel

Background and Goal of Study: Pulse Oximetry has become standard of care in intensive care units (ICU), operating and recovery rooms, yet it has been known to be unreliable in some of the most acute scenarios. Low blood flow and/or perfusion, e. g. in states of hypovolemia or hypothermia, can result in erroneous Oxygen saturation readings that might lead to mistaken medical decisions. The purpose of this study was to validate the performance of the NBM-200MP system (OrSense Ltd) in monitoring SpO2 during hypoxia, and test its stability in extreme cases of weak pulsation and low perfusion.
Materials and Methods: The NBM-200MP uses a red/near-infrared sensor located at the finger's base. It performs a temporary occlusion of the blood flow, resulting in an enhanced, time dependent, optical signal, which enables the calculation of blood parameters such as SpO2, total hemoglobin and blood glucose. The study was conducted in the Rabin Medical Center, Petah-Tikva, Israel, and included 10 ICU patients, in various levels of hypoxia, and 10 healthy volunteers. Patients in the ICU group were monitored for up to 24 hours, with NBM SpO2 readings every 10 minutes. Reference values were obtained every 30–60 minutes using a blood gas analyzer (Radiometer), and a standard pulse oximeter (Datex-Omehda). The healthy group underwent induced hypoxia (down to 70%) that lasted up to 40 minutes, with NBM SpO2 readings every 50 seconds. Pulse oximeters by Masimo and Datex-Omehda were used for reference values. As an emulation of low perfusion/weak pulse, we used a brachial cuff to reduce and almost occlude the blood flow in the measurement vicinity.
Results and Discussion: In the ICU group we obtained Oxygen saturation values down to 50%. The NBM-200MP monitored the SpO2 values with mean accuracy of 3%, and continued the tracking even when the regular pulse oximeter gave erroneous readings. The mean accuracy in the healthy group was 2.5% (compared with Masimo's oximeter). In the low perfusion emulations, the NBM performed normally and gave reasonable readings, while the standard oximeter failed to work and sometimes gave unrealistic readings. Use of the device did not cause any discomfort for subjects, was safe and well tolerated.
Conclusion(s): This study validates the performance of the non-invasive NBM-200MP, for continual and accurate monitoring of Oxygen saturation levels, even in extreme cases of low perfusion and weak pulsation.

3AP6-5

The abdominal pressure inflated volume relation in pigs

J. Mulier, C. Missant, M. Crombach, E. Vandermeersch

Anaesthesiology, K U Leuven, Leuven, Belgium

Background and Goal of Study: The abdominal pressure inflated volume relation in humans was found earlier to be linear using 100 ml inflated volumes

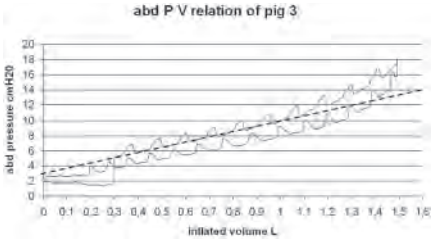
and end expiratory pressure points up to 15 mm Hg.(1) Goal of this study was to measure more accurately the abdominal pressure volume relation in pigs during inflation and deflation to a pressure above 15 mm Hg.

Materials and Methods: Four pigs around 30 kg body weight were evaluated in a supine position with the legs stretched. Two tubes were positoned into the abdominal cavity after anesthesia induction and mechanical ventilation. The abdominal pressures during positive airway pressures are excluded eliminating the respiratory influence. A Flowlab, imtmedical ag, flow meter (resolution 0,001 L/min) was used during inflation and deflation of the abdomen with air at a flow of 2 L/min through the first tube. The inflated volume is calculated by integration of the flow while the abdominal pressure is measured through the second tube in the abdomen connected to the same Flowlab pressure meter (resolution 0,1 cmH20). The abdomen is inflated to maximum 20 cmH20. The pressure at which the inflation curve deviates from linear is found as the last added point giving a linear fit with a r^2 above 0,95.

Results and Discussion: In all pigs the abdominal pressure inflation volume relation is linear till 10 cmH20 as shown in table 1. The abdominal pressure volume relation has hysteresis as shown in graph 1 of pig nr 3. Inflation pressures are higher than the deflation pressures. Continuous and accurate pressure volume measurements during inflation and deflation of a pig abdomen reveals non linearity during inflation above 10 to 13 cmH20. The same measurements should be repeated in humans to known at what pressures the linear relation is not valuable anymore in humans.

Table 1.

	last linear point
pig 1	10
pig 2	13
pig 3	11
pig 4	10
mean	11



Conclusion(s): The pig abdominal pressure volume relation is linear till 10 cmH20 and becomes curved above 13 cmH20.

Reference:

1 The linearity of the abdominal pressure volume relation. Acta Clinica Belgica 2007, 62.

3AP6-6

The thickness of the abdominal muscles rectus in morbid obese patients influences not the abdominal elastance

J. Mulier, B. Dillemans, S. Van Cauwenberge

Anaesthesiology, AZ Sint Jan av Brugge, Bruges, Belgium

Background and Goal of Study: A large variation in abdominal elastance exists in obese patients not correlated with the BMI.(1) Goal of the study is to analyse the hypothesis that thicker abdominal muscles increase the elastance independent of the BMI.

Materials and Methods: Twenty obese patients scheduled for a gastric bypass operation were included in this study with approval of the hospital ethical committee. After anaesthesia induction with Propofol, Sufentanil and Rocuronium, the abdominal rectus muscles thickness is measured echographically at the umbilical level. During the abdominal inflation for a pneumoperitoneum the abdominal pressure volume relation is measured using 3 data points. The elastance, E and the pressure at zero volume PV0 are calculated for each patient under full muscle relaxation. Patient age and BMI are recorded and a correlation analysis is made of the thickness with all the measured and calculated parameters.

Results and Discussion: Table shows the maximum, minimum, mean and standard deviation of the muscles rectus thickness, age, BMI, elastance and PV0 with the correlation factor of each parameter with the muscles rectus thickness. Although there is a large variation in the thickness of the rectus abdominus muscle in morbid obese patients no significant correlation of the thickness was found with the elastance, PV0, the BMI or the age. Other abdominal wall structures like the muscular fascia might be responsible for the abdominal elastance. This is not in contradiction with an earlier finding that muscular relaxation changes the PV0 and not the abdominal elastance (2) and that BMI correlates with the PV0 and not with the elastance (1).

Table.

	thickness mm	age year	BMI	elastance mm Hg/L	PV0 mm Hg
minimum	2,7	21	40	1	4
maximum	21,7	63	70,1	3,3	11
mean	10,6	37,8	47,2	2,0	6,8
stdev	5,5	10,0	7,7	0,7	1,8
correlation		–0,03	–0,14	0,01	–0,03

Conclusion(s): The large variation in the abdominal muscles rectus thickness explains not the difference in elastance and PV0 between obese patients.

Reference:

1 Abdominal pressure volume relation in morbid obese patients. *Obes Surg* 2007; 17:1000.

2 Abdominal pressure volume determinants. *Crit Care* 2007; 11, S2:320.

3AP6-7

In-vitro evaluation of the new PaediSat continuous central venous oxygenation monitoring system

W. Baulig, N. Koepfer, Z. Hassan, L. Tomislav, M. Weiss

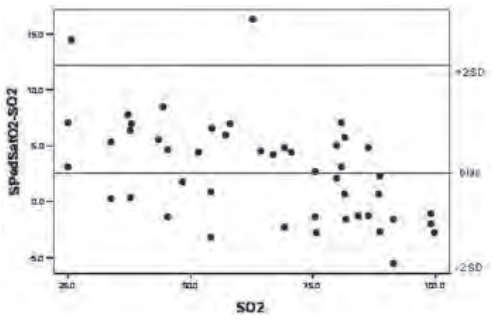
Dapartment of Anaesthesia, Children's Hospital Zurich, Zurich, Switzerland

Background and Goal of Study: This study was designed to investigate the accuracy of a new spectrophotometric based continuous venous oxygenation monitoring system (PediSat) in an in-vitro model.

Materials and Methods: A continuous fiberoptic oximetry catheter (PediSat Oximetry Catheter; Edwards Lifesciences, Irvine, CA) was inserted in a black testing chamber, connected with an extracorporeal circuit and filled with human whole blood. Flow was set at 1000 ml · min^{-1}. After calibration of the PediSat system, blood samples were taken for co-oximetric assessment of oxygen saturation (SO_2) at different PediSat oxygen saturation ($S_{PediSat}O_2$) levels under steady state conditions. Experiments were repeated with two different continuous fiberoptic oximetry catheters at a blood temperature of 27°C. Data are compared with linear regression analysis, Bland-Altman analysis and Whitney-U-Test.

Results and Discussion: Fifty data pairs were recorded: $S_{PediSat}O_2$ and SO_2 ranged from 28 to 98% and from 24.9 to 99.5% respectively. Correlation between $S_{PediSat}O_2$ and SO_2 was high with $r^2 = 0.958$ ($p < 0.0001$). Bias between $S_{PediSat}O_2$ and SO_2 values was +2.9% and precision was 9.7% (limits of agreement: – 6.8/ + 12.6%). The disagreement between $S_{PediSat}O_2$ and SO_2 values was different between SO_2 values above or below 70% with bias of +0.38 and +5.2% and precision on ± 6.6 and ± 10%, respectively. Sensitivity and specificity of the first differences of $S_{PediSat}O_2$ and SO_2 were 1.0 and 0.92 respectively.

Conclusion(s): Based on the preliminary data, the tested PediSat Oximetry Catheter system reliably reflects oximetric assessed SO_2 values above 70% but only moderate at values below 70% in this in-vitro setup. Although the sensitivity and specificity are excellent, it might not be the tool to replace $S_{cv}O_2$ determined by co-oxymetry for values below 70%.



3AP6-8

Initial evaluation of a new continuous noninvasive haemoglobin monitor (pulse Co-Oximeter) in surgical patients

A. Pérez, E. Bisbe, J. Álvarez, S. Tarragón, F. Escolano

Anesthesiology, Hospital del Mar-Esperança, Barcelona, Spain

Background and Goal of Study: Blood haemoglobin (Hb) concentration is a very common and essential test to assess patient well being and the need

for blood transfusion. In the perioperative period this measurement is further more critical mainly due to the acute nature of blood loss and the need for an immediate response. The pulse Co-Oximeter is a noninvasive monitor, for detecting changes in Hb in real time. It uses a sensor in the patient's finger that shows the Hb concentration in a continuous and noninvasive way. Furthermore it gives the SpO2, heart rate, carboxiHb, methaHb, Pleth Variability Index and the Perfusion Index (PI). The aim of the study is to compare the arterial Hb conventional measure with the pulse Co-Oximeter Hb values during the perioperative period.

Materials and Methods: We studied 15 measurements in 8 surgical patients comparing the noninvasive Hb determination of the pulse Co-Oximeter with the laboratory arterial hemoglobin determination in the anesthesic induction, during surgery and in the post-operative period. We also collected epidemiological, clinical and hemodinamical information during the determinations. For evaluating the accuracy we used the interclass correlation coefficient (ICC) and the Bland-Altman graph.

Results and Discussion: The mean age was 68.6 ± 24.7, 6 females/2 males. 6 orthopaedic surgery/2 abdominal surgery. The mean surgical time was 173 ± 93 min. The mean difference between the Hb provided by the pulse Co-Oximeter and the laboratory arterial measure was 0.145 ± 1.04 for intraoperative period and 1.15 ± 0.9 for global measures. The ICC respect the individual arterial Hb was 0.599 (0.018–0.875), the average was 0.75 (0.038–0.933) with a significance of p = 0.024. The ICC between the monitor Hb and the arterial Hb is moderate but acceptable during the intraoperative period. Nevertheless is fundamental a PI upper 2 for a high quality measure of the Hb value and we had worse measures of PI in postoperative period. In surgical patient, due to hypothermia, vasoconstriction and bleeding, the use of a digital sensor conditions due IP measure under 2 and consequently not always the Hb measures are reliable. We think that better adapted sensors to the surgical environment should increase the reliability and precision of the monitor. New software less PI dependent should give more reliable results.

Conclusion(s): It should be necessary large size study for obtaining better conclusions, but the perspective of a noninvasive and continuous Hb monitoring method should be very useful.

3AP6-9

Non-invasive monitoring of absolute cerebral oxygen saturation (Fore-Sight, CASMED) during elective shunting procedure for carotid endarterectomy

S. Lamote, C. De Deyne, W. Lansink, F. Jans, R. Heylen

Department of Anaesthesia & Thoracovascular Surgery, Ziekenhuis Oost-Limbrg, Genk, Belgium

Background and Goal of Study: Cerebral oximetry, based on NIRS, measures regional cerebral tissue oxygen saturation ($SctO_2$) non-invasively at the microvascular level. The FORE-SIGHT absolute cerebral oximeter, a recently introduced monitoring device, uses 4 precise wavelengths to determine absolute $SctO_2$. In pts suffering from acute cerebral symptoms or from bilateral high-grade stenosis, a high risk (to 25%) for insufficient collateral circulation during carotid clamping for carotid endarterectomy (CEA) is reported. Therefore, elective shunting is preferred to avoid intra-operative stroke due to hypoperfusion. As the FORE-SIGHT provides an absolute value of $SctO_2$, we wanted to evaluate threshold $SctO_2$ values during carotid clamping in these high risk patients.

Materials and Methods: Over a 6-months period, 16 pts scheduled for CEA with elective intraluminal shunting were included. In all pts, CEA was performed under general anesthesia. FORE SIGHT was used to measure bilateral SctO2, together with routine EEG monitoring to detect intra-operative cerebral ischemia. During CEA procedure, SctO2 and EEG readings were blinded for interpretation to the anesthesiologist as well as to the surgeon.

Results and Discussion: Mean ipsilateral $SctO_2$ immediately before clamping was 69.% (65%–77%) and decreased significantly (p:0.0039) by a mean of 8.4% (4%–13%) after cross-clamping. In 4 pts, SctO2 decreased below 55%. In 3 of these 4 pts, EEG change indicative of ongoing cerebral ischemia were observed. Mean starting $SctO_2$ in these pts was 65.%, while it was 71% for the other 12 pts (NS). Contralateral $SctO_2$ was not different (66%–76%, m72%) and decreased by m2.7% (0%–7%) after cross-clamping. Ipsilateral mean $SctO_2$ before shunt opening was 61.% and significantly (p:0.0039) increased to mean 68.0% after opening. Contralateral $SctO_2$ increased non-significantly from 70% to 72% after shunt opening (NS). Ipsilateral mean $SctO_2$ before shunt closure was 68% (59%–75%) and decreased significantly (p:0.0039) to mean 63% (54%–70%) after shunt closure. In 3 of 16 pts, $SctO_2$ decreased to 55% or lower, without any change in EEG recordings. Mean $SctO_2$ in those 3 pts before shunt closure was 60%, whereas it was 70% in the other 13 pts. Contralateral $SctO_2$ showed significantly less differences.

Conclusion(s): Absolute non-invasive cerebral oximetry seems most promising for its use during CEA procedures. Critical threshold determination as to cerebral ischemia may be difficult, but at least, unique information as to the adequacy of shunt opening may be obtained.

3AP6-10

Monitoring of brain oxygenation during hyperthermic intraperitoneal chemotherapy (HIPEC) procedures

E. De Troy, C. De Deyne, K. Vanderspeeten, F. Jans, R. Heylen

Department of Anaesthesia & Abdominal Surgery, Ziekenhuis Oost-Limburg, Genk, Belgium

Background and Goal of Study: Hyperthermic intraperitoneal chemotherapy (HIPEC) with intraperitoneal administration of chemotherapy at a temperature of 41.5° has been demonstrated to improve survival for pts with colorectal peritoneal carcinomatosis. As far as today, no data are available on cerebral oxygenation during these rapidly induced increases in body temperature. Therefore, we applied cerebral oximetry, enabling cerebral oxygenation monitoring, during HIPEC procedures.

Materials and Methods: In 8 pts, scheduled for HIPEC procedure, non-invasive cerebral oximetry was applied over the patient's forehead, enabling bilateral brain saturation monitoring. The Fore-Sight monitor is a newly available, near-infrared spectrometer that measures absolute cerebral tissue oxygen saturation (SctO2%). In all pts, between 15 and 45 min of HIPEC (41.5°) procedure was performed. Changes in SctO2 over time were referred to changes in body temperature.

Results and Discussion: We observed a large variation in changes in body temperature during (and after) HIPEC procedure, with a mean body temperature increase of 2.3° (highest observed body temperature between 35.6° and 38.3° within m15min after start of HIPEC). Mean SctoO2 before HIPEC start was m66% (62%–73%). During HIPEC, SctO2 immediately decreased, reaching the lowest SctO2 values (–m6.3%) at m23min after start of HIPEC procedure. In 2 pts, important decreases were observed (>10% decrease) with final SctO2 values below 60%. In both pts, baseline SctO2 values were lower than for the other 6 pts and in both pts, HIPEC procedure lasted for 45min. There was, however, no clear relationship between the extend of SctO2 decrease and the extend of body temperature increase. After HIPEC procedure, SctO2 values exceeded baseline values by a mean of 7.3% after a mean of 53min after HIPEC stop. In none of the pts, any major systemic change occurred during HIPEC procedure, thereby eliminating any possible (other) systemic influence on SctO2 monitoring.

Conclusion(s): This is the first preliminary report on non-invasive, absolute cerebral oxygenation monitoring during HIPEC procedures, where rapid increases in body temperature may be induced. These rapid increases in body temperature may result in mismatches in cerebral perfusion to cerebral metabolism ratio, possible inducing inadequacy of cerebral perfusion. However, more data are required to elucidate the relationship between rapid increases in body temperature and adequacy of cerebral perfusion, as monitored by cerebral oximetry.

3AP6-11

Monitoring of absolute cerebral oxygen saturation (Fore-Sight technology) during endoscopic shoulder surgery: Benchchair positioning compared to conventional positioning

R. Somers, C. De Deyne, F. Jans, J. Oosterbosch, R. Heylen

Department of Anaesthesia & Orthopedic Surgery, Ziekenhuis Oost-Limburg, Genk, Belgium

Background and Goal of Study: Recent technical developments in endoscopic shoulder surgery require benchchair positioning of the patient to provide better surgical conditions. Besides, optimal surgical visualization often requires the use of induced arterial hypotension. Combining benchchair positioning with induced hypotension may not be without any consequence for the maintenance of adequate cerebral perfusion. The FORE-SIGHT absolute cerebral oximeter, a recently introduced monitoring device, uses 4 wavelengths to determine absolute cerebral oxygen saturation (SctO2). In this paper, we wanted to report on the changes in absolute SctO2 occurring during endoscopic shoulder surgery, comparing benchchair positioning (BP) to conventional (side) positioning (CP).

Materials and Methods: Twenty-eight pts scheduled for endoscopic shoulder surgery were included. Benchchair positioning was preferred in 12 pts, while conventional (side) positioning was used in the other 12 pts. All procedures were performed under general anesthesia. After induction of anesthesia, and before positioning of the patient, bilateral SctO2 monitoring was started (sensors applied bilaterally over patient's forehead). Validation studies proved a stable correlation between SctO2 and jugular bulb saturation (SjO2) with SctO2 10% higher than SjO2. As it is accepted that SjO2 has a normal safe limit of 45%, the absolute Fore-Sight SctO2 threshold is estimated to be approximately 55%.

Results and Discussion: Mean SctO2%, before change in body position, was not different between both groups (BP : 73.6% vs CP : 73.7%). Benchchair positioning resulted in a significant and almost immediate decrease (m17.2%) in bilateral SctO2 in all pts. There was no difference in mean arterial blood pressure during procedure between BP and CP pts, but a significantly longer procedure time was observed in BP pts compared to CP (m190min vs 60min). SctO2 monitoring during procedure (with systolic blood pressure between 80 – 90mm Hg) revealed absolute SctO2 values below 55% in 12 of 14 BP patients, while SctO2 values below 55% were observed in no CP patient. Normal positioning at the end of procedure resulted in SctO2 values returning to baseline values in both groups.

Conclusion(s): Non-invasive monitoring of absolute cerebral oxygen saturation might offer new insights in the management of pts positoned in benchchair position for should surgery. Especially, the combined use of induced hypotension and this positoning could result in sometimes dangerous reductions in the adequacy of cerebral perfusion.

Clinical and Experimental Circulation

4AP1-1

Ethyl pyruvate has a myocardial protective effect after regional ischemia-reperfusion injury via suppressing the inflammatory response

I. Shin, Y. Chung, T. Park, J. Sohn

Department of Anesthesiology and Pain Medicine, College of Medicine, Gyeongsang National University, Jinju, Gyeong Sang Nam Do, Korea

Background and Goal of Study: It is known that ethyl pyruvate has been shown to have anti-inflammatory properties and to protect organs from ischemia-reperfusion induced tissue injury. The aim of this study was to investigate whether ethyl pyruvate also provides a protective effect against a regional myocardial ischemia-reperfusion injury in an *in vivo* rat heart model and the anti-inflammatory response is related at the protective effect of myocardium.

Materials and Methods: Rats were subjected to 30 minutes ischemia followed by reperfusion of the left anterior descending coronary artery territory. Animals were randomized received with ethyl pyruvate dissolved in Ringer's solution or lactated Ringer's solution alone was given by intraperitoneal injection 1 h before ischemia. A micromanometer catheter was advanced into the left ventricle via the right internal carotid artery and the hemodynamic function was evaluated after 24 hours of reperfusion. The infarct size was determined by triphenyltetrazolium staining after 24 hours of reperfusion. Nuclear factor-kappa B (NF-kB) was detected by Western blotting. Myocardial MPO activity was studied. Inflammatory cytokines were analyzed by immunoassay kit and RT-PCR.

Results and Discussion: Ethyl pyruvate significantly improved cardiac function and reduced infarct size after regional ischemic-reperfusion injury. In ischemic myocardium, EP was attenuated I/R induced NF-kB translocation. The serum levels of inflammatory cytokines were significantly decreased in EP treated animals. Moreover, EP decreased MPO activity in ischemic myocardium after I/R injury.

Conclusion(s): Ethyl pyruvate had a myocardial protective effect after regional ischemia-reperfusion injury in an *in vivo* rat heart model, and this protective effect of EP is related in part to its anti- inflammatory action.

Reference:

1 Mallet RT. Pyruvate: metabolic protector of cardiac performance. *Proc Soc Exp Biol Med*. 2000;223:136–48.

2 Mallet RT, Squires JE, Bhatia S, Sun J. Pyruvate restores contractile function and antioxidant defenses of hydrogen peroxide-challenged myocardium. *J Mol Cell Cardiol*. 2002;34:1173–84.

4AP1-2

Simultaneous stimulation of endothelial imidazole receptor and α2 adrenoceptor improve post-hypoxic endothelial-dependent vasodilatation

M. Gourdin, O. Ponchau, J. Jamart, M. De Kock

Department of Anesthesiology, Laboratory of Anesthesiology, Clinique Universitaire UCL Saint-Luc, Bruxelles, Belgium

Background and Goal of Study: Clonidine (CL), an α2-adrenoreceptor agonist, reduces perioperative myocardial ischemia in-patients undergoing surgery[1]. In previous study, we have showed that endothelial α2-adrenoceptor stimulation by CL improves post-hypoxic endothelium-dependent vasodilatation (PVD) in young rats. Stimulation of this receptor by a specific agonist, UK14304 (UK), does not restore it. Our experimental study intends to investigate if the agonistic properties of CL on Imidazole receptors or α1 adrenoceptors participate in the CL-induced effect on the PVD.

Materials and Methods: After animal ethic committee approval, 48 rings aorta (12x4) from 12 rats were studied according to a validated methodology[2]. UK+Antazoline (A), an imidazole receptor agonist (10^{-6} M), or UK+phenylephrine (PE), an α1-adrenoceptor agonist (10^{-6} M), were added in two randomized baths and two used as the control group (CTL). After fifteen minutes, all baths were washed and 25 minutes of hypoxia (PpO_2 < 10 mm Hg) was applied. After 40 minutes re-oxygenation (PpO_2 > 400 mm Hg), PVD was assessed by cumulative (10^{-10}–10^{-4}M) acetylcholine concentrations on pre-contracted aorta (PE 10^{-4}M). The statistical analysis used GEE regression, $p < 0.05$ significant.

Results and Discussion: When UK and A were simultaneously added in treated baths, PVD was significantly improved in comparison with the control baths ($p = 0.037$, Figure 1). Whereas, when UK and PE were simultaneously used no more difference was found ($p = 0.079$, Figure 2).

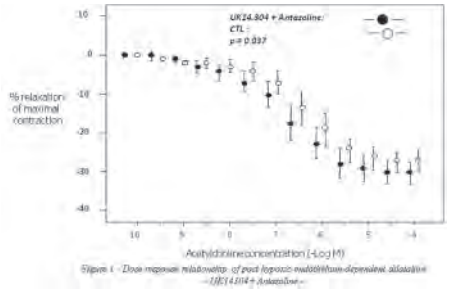


Figure 1 - Dose response relationship of post hypoxic endothelium-dependent dilatation - UK14304 + Antazoline -

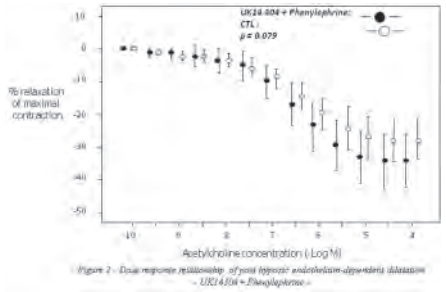


Figure 2 - Dose response relationship of post hypoxic endothelium-dependent dilatation - UK14304 + Phenylephrine -

Conclusion(s): These results suggest that CL-induced improvement of PVD is due to a simultaneous stimulation of endothelial α2 adrenoceptor and imidazole receptors.

References:

1 Wallace A. Cur Opinion Anaesth. 2006; 19(4): 411–17.

2 Besse S. *Eur J Pharmacol*. 2006;531(1–3):187–93.

4AP1-3

Influence of alpha-2 sub-types adrenoceptors stimulation on the clonidine-induced post-hypoxic vasomotricity protection

M. Gourdin, O. Ponchau, J. Jamart, M. De Kock

Department of Anesthesiology, Laboratory of Anesthesiology, Cliniques Universitaires UCL, Bruxelles, Belgium

Background and Goal of Study: Clonidine (CL), an α2-adrenoreceptor agonist, reduces perioperative myocardial ischemia in-patients undergoing surgery[1]. In previous studies, we have showed that CL improves post-hypoxic vasoconstriction (PVC) and endothelium-dependent vasodilatation (PVD) in young rats. Our experimental study intends to understand the sub-types of α2-adrenoceptors underlying this phenomenon.

Materials and Methods: After animal ethic committee approval, 96 rings aorta (4x24) from 24 rats were studied according to a validated methodology[2]. For every aorta, BRL44408, a $\alpha 2_A$ adrenoceptor antagonist, or ARC239, a $\alpha 2_{B/C}$ adrenoceptor antagonist was added in all bath 15 minutes before randomization. CL (10^{-4}M) was added in two randomized baths and two used as the control group (CTL). We have assessed the effect of CL on aorta having beforehand received BRL44408 or ARC239. After fifteen minutes of CL incubation, all

baths were washed and 25 minutes of hypoxia (PpO_2 < 10mm Hg) was applied. After 40 minutes re-oxygenation (PpO_2 > 400 mm Hg), PVC was evaluated by cumulative phenylephrine concentrations (10^{-10}–10^{-4} M) and PVD by cumulative acetylcholine concentrations (10^{-10}–10^{-4} M) on pre-contracted aorta. The statistical analysis used GEE regression, $p < 0.05$ significant.

Results and Discussion: When BRL44408 was added in the treated baths, impairment of PVD in the CL Group was higher than in the CTL group (p=0.001). But, BRL44408 prevented the CL effect on PVC. No difference was found between treated and control groups (p = 0.204). When ARC239 was used, CL do not induce a difference between treated and control group concerning PVD (p = 0.236) or PVC (p = 0.118).

Conclusion(s): CL effects on PVC require the stimulation of at least 2 subtypes of α2 adrenoceptors of which $\alpha2_A$. In other hand, post-hypoxic endothelial dysfunction increases when $\alpha2_A$ adrenoceptor was blocked. But the very stimulation of these receptors was insufficient to induce the effect of clonidine. A simultaneously stimulation of $\alpha2_B$ or $\alpha2_C$ is necessary.

References:

1 Wallace A. *Cur Opinion Anaesth.* 2006; 19(4): 411–17.
2 Besse S. *Eur J Pharmacol*. 2006;531(1–3):187–93.

4AP1-4

Avoiding lungs ischemia-reperfusion and membrane oxygenator during CPB contributes to decrease the inflammatory response

C. Regina da Costa Freitas, E. Negri, A. Benicio, L. Sá Malbouisson, M. Carvalho Carmona

Anesthesiology, São Paulo University (USP), Sao Paulo, Sao Paulo, Brazil

Background and Goal of Study: Pulmonary Dysfunction after cardiac surgery is part of the Systemic Inflammatory Response Syndrome (SIRS), which is thought to be the result of different forms of injury: contact of the blood components with the artificial surface of the bypass circuit, ischemia–reperfusion injury, and operative trauma. We hypothesized that eliminating lung ischemia-reperfusion mechanism as well as the membrane oxygenator during CPB, would diminish the inflammatory response.

Materials and Methods: Twenty seven pigs were randomly divided in three groups: Control–C group (n=8) mechanically ventilated only; Conventional CPB–CB group (n=9); animals in which pulmonary arteries perfusion was maintained and were also ventilated during CPB – CAP group (n=10). The three groups were submitted to: mechanical ventilation, median thoracotomy and right femoral artery catheterization. Data was collected after the sternotomy (time 0), after CPB separation (time 1), and 90 minutes after the end of CPB (time 2). The control group had its data collected 120 minutes after the thoracotomy (Time 1) and 90 minutes after Time 1 (Time 2). Both cardiopulmonary bypasses lasted 90 minutes. In the end, left lungs were displayed and samples obtained. Lung inflammation was studied by classical morphometry. Neutrophil infiltrates and lung parenchyma edema were computed using a grid of 225 points. Ten different fields were studied at a magnification of 400X. Respiratory parameters were submitted to two way ANOVA for repeated measures and for morfometric results we used one way ANOVA along with post hoc Tuckey test.

Results and Discussion: After CPB (Time 1), group CAP and group CB presented a decrease in PaO_2/FIO_2 compared to group C (mean groups: C= 463,95; CB =212,25; CAP= 372,44, $p < 0,05$). At the end of the experiment, group CAP is similar to C (p= 0,11) and CB presents the lowest relation, however, considered normal > 300. Inflammatory infiltrate was higher in group CB compared to C and CAP (mean groups: C =1,9x 10^{-6}, CB= 3,5 x10^{-6}, CAP= 2,1x 10^{-6}, $p < 0,05$).

Conclusion(s): Respiratory parameters did not show any impairment after 90 minutes of CPB. On the other hand, inflammation was significantly different among the groups. Perfused lungs presented a lower inflammatory reaction (group CAP). These findings enlighten the importance of ischemia-reperfusion of the lungs in the patophisiology of ARDS after CPB. Nevertheless, the beneficial effects of maintained lung perfusion may be associated to the exclusion of membrane oxigenator in group CAP.

4AP1-5

Effects of cardiopulmonary bypass and drew-anderson technique on respiratory mucociliary function in a porcine experimental model

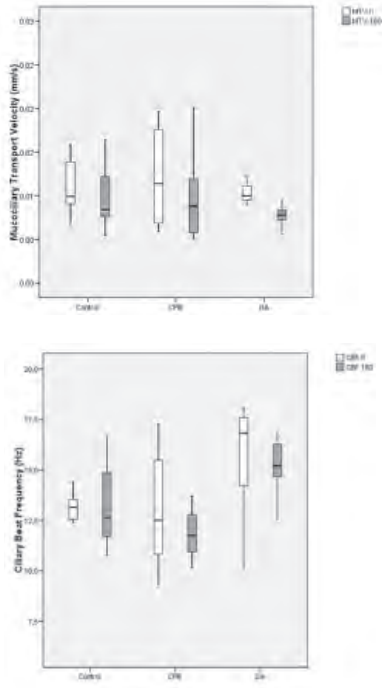
R. Sánchez-Véliz, C. Albertini-Yagi, D. Rivero, M. Carmona, L. Malbouisson

Laboratory of Anesthesiology, School of Medicine, University of Sao Paulo, Sao Paulo, Sao Paulo, Brazil

Background and Goal of Study: Cardiopulmonary bypass (CPB) is an important factor for respiratory dysfunction after cardiovascular surgery such as atelectasias, interstitial lung edema, systemic inflammatory response and worsening of gas exchange. However, the impact of CPB on respiratory mucociliary funtion is still controversial. Autologous lungs as oxygenator in a bilateral circuit (drew-Anderson Technique-DAT), could reduce injuries related to cardiopulmonar bypass, improving clinical respiratory function after cardiac surgery. The objective of this study was to assess the effects of CPB on tracheal ciliary beat frequency (CBF), in-situ mucociliary transport (MCT), in-vitro mucus transportability (MT) and contact angle (CA) measurement in a porcine model.

Materials and Methods: 22 pigs (40 to 45 kg) were randomly assigned to control group (n=10), CPB group (n=12). Animals were anesthetized using propofol, fentanyl, pancuronium, and isoflurane. Tracheostomy was performed and a 0,5cm tracheal tissue sample was excised (T0), second sample was obtained 180 minutes (T1). CPB was performed only in CPB group. Bilateral extracorporeal circulation using porcine lungs as oxygenator was performed in DAT group. Mucus samples were collected from the tracheal passages using a bronchoscope, in tree moments: after a tracheostomy (T0), 90 minutes (T1) and 180 minutes (T2) after extracorporeal circulation.

Results and Discussion: Figure 1 shows a significant decrease in MTV after 180 minutes in all groups, $p < 0.05$. Figure 2 shows a significant interaction between time and group $p < 0.001$ on CBF. DAT was significant different of CPB ($p < 0.01$) and Control ($p < 0.05$). No differences were observed on CA and MT measures.



Conclusion(s): CPB is related to pulmonary dysfunction after cardiac surgery and could compromise mucociliary function by decreasing MTV and CBF along time. DAT could improve therapeutic clinicals results.

4AP1-6

Administration of pravastatin, at the onset of reperfusion, protects human myocardium, in vitro

S. Lemoine, M. Fuardo, M. Massetti, J. Gerard, J. Hanouz

Department of Anesthesiology, University Hospital Caen, Caen, France

Background and Goal of Study: It has become increasingly apparent that the effects of HMG-CoA (3-hydroxy-3-methylflutaryl coenzyme A) reductase inhibitors, or statins extend well beyond their lipid lowering actions, and the unexpected pleiotropic effects have a major role in protecting the myocardium against ischemic injury. And, reperfusion is a double-edged sword and can itself induce severe and also irreversible damage to the myocardium: the reperfusion injury. Interventions at the time of reperfusion by use of pharmacological agents, such as HMG CoA reductase could be cardioprotective. The purpose of this study was to determine whether pravastatin, a HMG CoA reductase, administered during the reperfusion could protect human myocardium against simulated ischemia reperfusion, in vitro.

Materials and Methods: After the approval of local medical ethics committee, right atrial appendages were obtained during cannulation for cardiopulmonary. Right atrial trabeculae (one per appendage) were isolated and the force of

contraction (34°C, stimulation frequency 1 Hz) of these trabeculae was recorded during 30-min hypoxia followed by 60-min reoxygenation (in control group, n=10). In independent groups, pravastatin 10 µM (n=6), pravastatin 50 µM (n=6), pravastatin 75 µM (n=6) were administered during the first 15min of reoxygenation. The results are expressed in% of baseline. Developed force at the end of protocol (FoC60) was compared between groups (mean ± Standard Deviation).
Results and Discussion: Administration of pravastatin 10µM (77 ± 5% of baseline), pravastatin 50 µM (86 ± 6% of baseline) and pravastatin 75 µM (87 ± 14% of baseline) enhanced the FoC60 as compared with Control group (50 ± 9%; $P < 0.0001$). Moreover there is no significant difference between pravastatin's groups.
Conclusion(s): This study shows that in isolated human right atria, pravastatin, administered at the time of the reperfusion, exerts a cardioproctective effect. Moreover, the data demonstrate that pravastatin effect isn't dose-dependent, but it seems that optimal concentration range between 50 and 75 µM. Additional studies are warranted to further define the precise cellular and molecular mechanisms involved in pravastatin mediated cardioprotection.

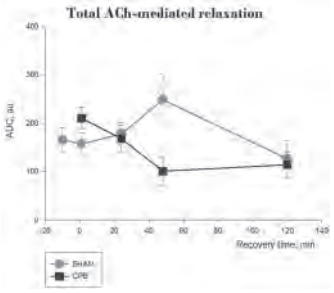
4AP1-7

Changes in vascular reactivity of mesenteric artery after cardiopulmonary bypass in the rat

I. Samarska, H. Mungroop, H. Buikema, R. Henning, A. Epema

Anaesthesiology and Clinical Pharmacology, UMCG, RUG, Groningen, Netherlands

Background and Goal of Study: Cardiopulmonary bypass (CPB) is associated with a decreased postoperative organ function. Several mechanisms including ischemia-reperfusion injury and inflammatory responses have been implicated. As these are known to affect vascular reactivity, we examined contractile and relaxant properties of a small resistant artery (mesenteric) after CPB with postoperative recovery period ranging from 60 min to 5 days.
Materials and Methods: Male Wistar rats receiving sham operation or CPB for 60 min (n=9 per group) were compared to untreated animals (n=6; brief anaesthesia only). Anaesthesia consisted of isoflurane (2,5–3%), followed by fentanyl and midazolam during CPB. After catheterizations of the left femoral and carotid artery and the right heart, normothermic extracorporeal circulation with a targeted CBP flow of 140 $mL \cdot kg^{-1} \cdot min^{-1}$. At sacrification, mesenteric-arteries were obtained and studied in a wired myograph system (Danish Myo Technology). Constriction to phenylephrine (PE) and relaxation to acetylcholine (ACh) were assessed. Relaxation was expressed as% of preconstriction and expressed as area under the curve (AUC). Data were expressed as mean ± SEM and compared using repeated measures ANOVA and student t-test.
Results and Discussion: Contraction to PE was significantly inhibited in both CPB and SHAM, compared to untreated animals, with a maximal reduction of about 50% at 24 h recovery. In contrast, relaxation to ACh was progressively impaired following CPB, with a maximal reduction of about 40% after 2 and 5 days recovery from CPB (fig). The reduction in relaxation was mainly caused by a decrease in its EDHF component, accounting for 75% of the overall reduction. SHAM operation did not affect relaxing properties of the mesenteric artery.
Conclusion(s): Anaesthesia and SHAM surgery decrease the PE evoked contractile response of mesenteric artery up to 48 h after recovery. In addition, CPB selectively affects the relaxant properties of mesenteric artery most prominently at 48 hour of recovery, still without a return to baseline after 5 days. These changes may be involved in the postoperative hemodynamic instability following cardiac surgery with CPB.



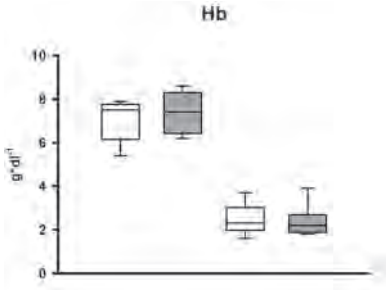
4AP1-8

Influence of beta adrenergic blockade on anemia tolerance in pigs

H. Kertscho, P. Lauscher, F. Gevez, O. Habler, J. Meier

Clinic of Anesthesiology, Intensive Care Medicine and Pain Control, Goethe-University Hospital Center, Frankfurt am Main, Germany

Background and Goal of Study: Surgical patients presenting with mayor cardiac risk factors have been identified to benefit even from short-term initiated perioperative beta blockade[1]. However the impact of this treatment on hemodynamic compensation of acute blood losses has not been elucidated completely yet. Therefore the influence of short-term beta blockade with metoprolol on anemia tolerance has been investigated in an experimental model of extreme normovolemic anemia in anesthetized pigs.
Materials and Methods: After governmental approval 14 anesthetized pigs (BW 21.6 ± 2.7 kg) were randomly assigned to metoprolol treatment (metoprolol group (V), 4 $mg \cdot kg^{-1}$ p.o. and 0.3 $mg \cdot kg^{-1}$ iv.) or placebo (placebo group (P)). Thereafter all animals were hemodiluted by exchange of whole blood for 6% hydroxyethyl starch (MW 130.000/0.4) until their individual critical hemoglobin concentration (Hb_{crit}) was reached. Hb_{crit} was identified by means of an investigator-independent algorithm detecting supply dependency[2]. Main outcome parameters of the study were Hb_{crit} and the individual amount of blood that could be exchanged until Hb_{crit} was reached (EBV).
Results and Discussion: Hb_{crit} did not differ between the metoprolol and the placebo group (2.2 [1.9/2.3] mg/dl vs. 2.3 [2.1/2.8] mg/dl; V vs. P, n.s.). Furthermore there was no difference of EBV between the two study groups (68 [57/81] ml/kg vs. 80 [57/87] ml/kg; V vs. P, n.s.). *Hemoglobin concentration at BL and at Hb_{crit}. Arterial hemoglobin concentration ($g*dl^{-1}$) at BL and at Hb_{crit}. The results are presented as median and descriptive quartiles (Q_1/Q_3). Data from the placebo group are colored in white, data from the metoprolol group are colored in dark grey. No difference between groups could be demonstrated.*



Conclusion(s): Short-term initiated beta blockade has no impact on acute anemia tolerance in healthy anesthetized pigs.
References:
1 London MJ et al., Anesthesiology 2004; 100: 170–175.
2 Meier J et al., Comp Biol Med 2003; 33: 395–405

4AP2-1

A study on effects of verapamil, nicardipine, and nitroglycerin on myocardial ischaemia/reperfusion induced arrhythmias in *in vivo* rabbit hearts

U. Imaizumi, K. Yoshida, M. Furuya, H. Arisaka, T. Yokoyama

Clinical Care Medicine, Kanagawa Dental College, Yokosuka-shi, Kanagawa Prefecture, Japan

Background and Goal of Study: Patients with coronary artery disease are often subjected to coronary reperfusion after interventional recanalization, myocardial infarction, coronary spasm or thrombosis. This study was designed to investigate whether and how verapamil, nicardipine or nitroglycerin can reduce the ventricular arrhythmias during ischaemia and reperfusion in *in vivo* rabbit hearts.
Materials and Methods: Rabbits were initially anaesthetized with ketamine (35mg/kg) and xylazine (5mg/kg) given intramuscularly. And anaesthesia was maintained with ketamine and xylazine solution (ketamine 35 mg/kg per hour, xylazine 5 mg/kg per hour). Rabbits received regional ischaemia by 30 min of the LAD occlusion and followed by 3 hours of reperfusion. The animals were randomly assigned to a control group, and verapamil, nicardipine or nitroglycerin treatment group. A continuous infusion of verapamil (0.1mg/kg/h) or nicardipne (0.06mg/kg/h) or nitroglycerin (0.06 mg/kg/h) was initiated 5 min prior to ischaemia. An electrocardiogram was recorded throughout the experiment *via* lead II of the standard electrocardiogram. At the end of the 3 hrs reperfusion period, area at risk (R) was delineated by Evans blue and infarct size (I) determined by tetrazolium staining.
Results and Discussion: The area at risk showed no significant differences among groups. It was observed that rate pressure product was decreased in nitroglycerin group. It was previously reported from our laboratory that infarct size/area at risk was reduced in verapamil and nitroglycerin group, compared with control group. The incidence of ischaemia-induced arrhythmia was 0% in nicardipine and verapamil groups, 14.3% in nitroglycerin group and 33% in control group. The incidence of reperfusion-induced arrhythmias was 80% in nicardipine group, 60% in verapamil group, 50% in nitroglycerin group and 89% in control group.

Conclusion(s): These results suggest that nicardipine, verapamil and nitroglycerin have antiarrhythmic effects during ischaemia (nicardipine = verapamil > nitroglycerin), as well as infarct limiting effects. On the other hand, only nicardipine has no antiarrhythmic effect during reperfusion.

References:

1 Kazu-ichi Y *et al*. Am J Anesthesiol. 2000, 27(7), 419–23.
2 Munetaka F *et al*. Circ Cont. 1999, 20, 281–87.
3 Munetaka F *et al*. Masui 1999, 48, 1074–82

4AP2-2

Myocardial dysfunction during moderate hypothermia in a porcine model

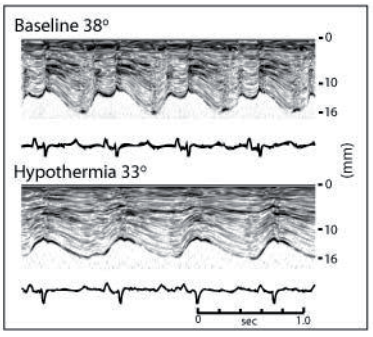
A. Espinoza, V. Kerans, H. Skulstad, P. Halvorsen, J. Bugge

The Interventional Centre, Rikshospitalet University Clinic, Oslo, Norway

Background and Goal of Study: Moderate hypothermia is used in patients for neuroprotection after cardiac arrest. We have studied the effects on myocardial function caused by hypothermia in a porcine model. We hypothesized that also diastolic dysfunction occurs in moderate hypothermia.

Materials and Methods: 6 anesthetized open-chest pigs were cooled from 38° to 33° C using an intravascular cooling catheter in the femoral vein. Left ventricular (LV) pressure was obtained by a micromanometer-tipped catheter. LV dP/dt was used for global function assessment. An ultrasonic transducer (10 MHz) was sutured to the anterior LV wall, giving continuous M-mode recordings. Wall thickness at end-diastole and end-systole was registered. Early wall thinning fraction in diastole was calculated as ($\Delta_{\text{wall thickness}}$ before ECG P-wave/ total $\Delta_{\text{wall thickness}}$ in diastole). Systolic duration was calculated from R-peak in ECG to $dP/dt_{min.}$ ECG QTc-interval was calculated. Registrations were made at 38° and 33°.

Results and Discussion: Spontaneous heart rate decreased from 92 ± 14 (mean, SD) at 38° C to 80 ± 12 min^{-1} at 33° C (P = 0.03). LV pressure decreased (P = 0.01), while EDP increased (7 ± 3 to 11 ± 3 mm Hg, P = 0.04). LV dP/dt_{max} decreased (P = 0.01). LV wall dimensions did not change in end-diastole or end-systole during cooling. Systolic duration increased from 0.33 ± 0.03 to 0.46 ± 0.03 s (P < 0.01). Diastolic duration decreased from 317 ± 60 to 263 ± 71 ms (p = 0.01) corresponding to the increase in ECG QTc-interval (0.43 ± 0.04 to 0.54 ± 0.04 s, P < 0.01). M-mode recordings at 38° demonstrated that 81 ± 5% of the diastolic wall thinning occurred before the ECG P-wave, in contrast to 12 ± 11% at 33° (P < 0.01)suggesting a reduced passive filling and greater dependency on the atrial contribution during LV filling in hypothermia.



Conclusion(s): Moderate hypothermia induced diastolic as well as systolic dysfunction. During hypothermia the duration of the diastole was shortened, even when heart rate decreased. Change in diastolic M-mode pattern suggests a compromised LV filling more dependent on atrial function.

4AP2-3

Electrophysiologycal effects of remifentanil under sevoflurane anaesthesia. Study in an experimental porcine model

M. Zaballos, B. Del Blanco, C. Jimeno, J. Almendral, J. Anadón

Anaesthesia, Hospital Gregorio Marañon, Madrid, Spain

Background and Goal of Study: Several clinical reports have implicated remifentanil as causing intraoperative severe bradyarrhythmias. In a previous study, developed in a closed-chest porcine model, remifentanil associated with propofol, depresses significantly sinus node function and AV nodal conduction.1To exclude a possible electrophysiologic interaction between propofol and remifentanil, we performed additional experiments substituting propofol by sevoflurane.

Materials and Methods: Seven Landrace-Large white pigs were premedicated with ketamine and anesthetized with intravenous propofol 4.5 mg. kg^{-1} and maintained with sevoflurane 1 MAC [2.66%]2 Femoral arterial and venous catheters were placed, and an electrophysiologic evaluation was performed under sevoflurane anaesthesia and repeated after remifentanil (bolus of 1 $\mu g \cdot kg^{-1}$, followed by an infusion of 0.5$\mu g \cdot kg^{-1} \cdot min^{-1}$). We evaluated sinus node function [sinus node recovery time (SNRT) and sino-atrial conduction time (SACT)], atrioventricular (AV) nodal function, Wenckebach cycle length (WCL) and effective refractory periods (ERP)]. Significant changes between sevoflurane protocol and sevoflurane + remifentanil protocol, were evaluated by Student's t-test for paired data.

Results and Discussion: Remifentanil caused a significant increase in sinus cycle length (23%, p = 0.01) and a significant prolongation of SNRT (82%, p = 0.04), corrected SNRT (225%, p = 0.01), SACT (55%, p = 0.01), and in WCL (21%, p = 0.01). There was a tendency towards a prolongation of AV nodal refractoriness. The main finding of this study is that remifentanil, in doses typical of clinical practice in humans and added to sevoflurane, depresses sinus node and AV nodal function, in comparison to sevoflurane alone. Similar findings were noted with propofol-remifentanil, excluding a synergistic effect of propofol and remifentanil as an explanation for the observed effects.

Conclusion(s): In this closed-chest porcine model, remifentanil depresses sinus node function and most parameters of AV nodal function. This contributes to an explanation for clinical observations of remifentanil-related severe bradiarrhythmias.

References:

1 Zaballos M et al. Eur J Anaesthesiol 2006; 23 (suppl 37):63.
2 Holmstrom A et al. J Neurosurg Anesthesiol 2003; 15:90–7.

4AP2-4

Effects of intravenous anesthetic agents on hepatosplanchnic microcirculation in rats revealed by Sidestream Dark-field (SDF) imaging

Z. Turek, V. Cerny, R. Parizkova

Department of Anesthesia and Intensive Care, University Hospital Hradec Kralove, Charles University in Prague, Hradec Kralove, Czech Republic

Background and Goal of Study: Effect of intravenous anesthetic agents on macrohemodynamics including blood pressure, cardiac output, heart rate or vascular resistance with venous return has been in details described frequently. Immediate effects of these agents in hepatosplanchnic region at microcirculatory level are subject of intensive research.[1] The goal of this study was to evaluate microcirculatory alterations in hepatosplanchnic region in rat after induction dose and during continuous sedative dose of selected anesthetics when using Sidestream Dark-field (SDF) imaging.

Materials and Methods: Male Wistar rats (n = 20) were anesthetized intravenously either with propofol (n = 4), ketamine (n = 4), midazolam (n = 4) or thiopental (n = 4) after preceding initial maximal dose of intraperitoneal pentobarbital (60mg/kg) to ensure 90 minutes of surgical anesthesia also in control group (n = 4), where only normal saline of corresponding volume instead of additional anesthetic was given. All animals were tracheostomized and mechanically ventilated, upper midline laparotomy was performed and distal part of ileum was exteriorized, liver lobes were kept in situ. Microcirculatory parameters of the intestinal wall (functional capillary density–FCD of longitudinal and circular muscle layer) and of the liver (functional sinusoidal density–FSD and postsinusoidal venular velocity–PSVV) were assessed by SDF imaging at the baseline, just after induction dose and after 30 and 60 minutes of sedation using an appropriate anesthetic agent. Macrohemodynamic data were monitored throughout the study.

Results and Discussion: Clear, stable and high contrast images were obtained both from the surface of the liver and of the small intestine. When compared to baseline, statistically significant increase of both FSD (p < 0.01, + 25%), PSVV (p < 0.05, + 15%) and intestinal FCD (p < 0.05, + 15%) was observed in propofol group after induction dose, the same increase was confirmed when compared to control group. Statistically significant decrease of intestinal longitudinal (p < 0.05, – 12%) and circular FCD (p < 0.05, – 10%) was observed in ketamine group after induction dose. These results are consistent with previous findings of hepatosplanchnic blood flow and mucosal barrier preservation under propofol anesthesia in cardiac surgery.[2]

Conclusion(s): Hepatosplanchnic blood flow is preserved under propofol anesthesia in rats when assessed by SDF imaging.

Acknowledgements: Research Project MZO 00179906

References:

1 Brookes et al. *BJA*, 88 (2):255–63, 2002.
2 Christiansen et al. *J Cardiothorac Vasc Anesth,* 12(4):418–21, 1998

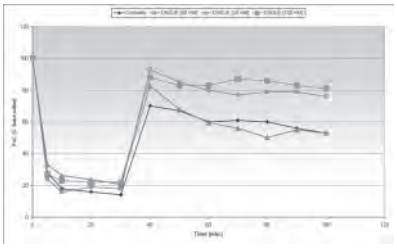
4AP2-5

DADLE induced postconditioning in human myocardium, *in vitro*.

M. Fuardo, S. Lemoine, C. Lo Coco, J. Hanouz, M. Massetti

Department of Anaesthesiology, University Hospital, Caen, France

Background and Goal of Study: Lethal reperfusion injury is defined as myocardial injury caused by restoration of coronary blood flow after an ischemic episode. Ischemic Postconditioning, during primary percutaneous coronary intervention, reduces the size of myocardial infarct and shows the importance of the reperfusion's phase for cardioprotecion. Goal of the study: *delta 2 opiod D-Ala-2-Leu5 enkephalin* (DADLE) are synthetic agonists of δ opioid, capable of cardioprotection if admistrated after an ischemic episode.
Materials and Methods: After the approval of local medical ethics committee, right atrial appendages were obtained during cardiac surgery (aorto-coronary bypass and valvulopathy). Exclusion criteria are: atrial fibrillation, left ventricular ejection fraction < 30% and diabetic patients. The force of contraction (34°C, stimulation frequency 1 Hz) of human right atrial trabeculae was recorded during 30-min hypoxia followed by 60-min reoxygenation (in control group, n = 6). In independent groups, DADLE 10 nM (n = 6), DADLE 50 nM (n = 6) and DADLE 100 nM (n = 6) were administered during the first 15-min of reoxygenation. The results are expressed in% of baseline. The force of contraction at the end of 60-min reoxygenation period (FoC_{60}) was compared (mean ± Standard Deviation) between the groups by a variance analysis.
Results and Discussion: DADLE 50 nM (FoC_{60}: 76 ± 11% of baseline) and DADLE 100 nM (FoC_{60}: 81 ± 4% of baseline), increase significantly (P < 0.0001) the FoC_{60} as compared to control group (FoC_{60}: 53 ± 7% of baseline). There is no difference in the FoC60 measured in the control group and DADLE 10 nM (P = 0.94 *vs.* control group); and in DADLE 50 nM (P = 0.36 *vs.* DADLE 100 nM) and DADLE 100 nM.



Conclusion(s): *In vitro*, specific activation of delta opioid receptors by DADLE in early reoxygenation protects human myocardium against hypoxia reoxygenation injuries, and DADLE induced postconditioning is dose dependant effect.

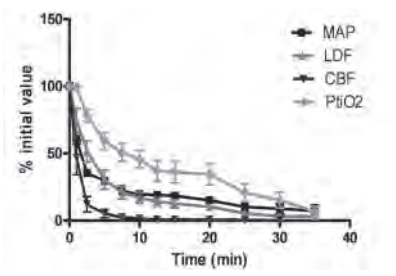
4AP2-6

Cerebral perfusion and anaphylactic shock: Experimental study

M. Lambert, I. Alb, J. Davidson, G. Audibert, P. Mertes

Anesthésie – Réanimation, Centre Hospitalier Universitaire – Hôpital Central, Nancy, France

Background and Goal of Study: Anaphylactic shock is a serious complication of immediate hypersensitivity reactions. In its most severe form the circulatory failure is critical and it threatens the blood flow of vital organs, especially the brain. The aim of the study was to measure the cerebral tissue oxygenation and perfusion parameters during anaphylactic shock.
Materials and Methods: Brown-Norway rats (n = 11) were sensitized at days 0, 4 and 14 by subcutaneous injections of a mixture of egg albumin and aluminum hydroxide. Rats were anesthetized with isoflurane and ventilated after muscle relaxant administration. For fluid replacement 0.9% saline solution was infused (basal needs–10 ml/kg/h). PtiO2 electrode and Laser-Doppler probe were positioned in the right cerebral hemisphere under stereotactic guidance. We measured: rate of survival, mean arterial pressure (MAP), heart rate, right carotid artery blood flow (CBF), cerebral PtiO2 (PtiO2) and Laser-Doppler cerebral flow (LDF). Data are given ad mean ± SD.
Results and Discussion: A sharp fall of brain perfusion and oxygenation was observed. At 30 minutes, as compared with the initial value, MAP was 8.8% ± 10.6, the carotid flow was 0.25% ± 0.4, Laser-Doppler flow was 3.2% ± 4.9 and the PtiO2 was 15.2% ± 16.2. The survival rate was 36% (4/11) at 30 minutes and 18% (2/11) at 60 minutes.



Conclusion(s): During anaphylactic shock, there is a dramatic and early decrease in CBF, followed by a decrease in brain tissue oxygenation. The animal model of Brown-Norway rat, sensitized with egg albumin, allows the study of brain perfusion during the severe forms of anaphylactic shock.

4AP2-7

Changes in electrocardiogram (ECG) during intravasal application of three different test solutions of bupivacaine and epinephrine – A pilot animal study

J. Mauch, A. Kutter, C. Madjdpour, N. Koepfer, M. Weiss

Anaesthesia, University Children's Hospital, Zurich, Switzerland

Background and Goal of Study: Detection of accidental systemic (intravasal, intraosseous) injection of local anaesthetics (LA) by ECG is important in anaesthetised children, since cerebral symptoms are missing and other means of detection are required. In the past, origin of LA induced ECG alterations were controversially discussed (1). Aim of this study was to elucidate causes of ECG changes from intravasal injection of LA solutions.
Materials and Methods: In 17 neonatal pigs (median weight 5 kg, range 4.1–5.9 kg) general anaesthesia was induced with sevoflurane. After peripheral venous cannulation the trachea was intubated, the lungs artificially ventilated and anaesthesia maintained by sevoflurane. Non-invasive standard anaesthesia monitoring was applied. The pigs were randomised into 3 groups: (1) bupivacaine 0.125%, (2) bupivacaine 0.125% + epinephrine 1:200'000 and (3) plain epinephrine 1:200'000. Under steady conditions 0.2 ml/kg of the test solution were intravenously applied, following by 0.4 ml/kg injected 10 minutes later. ECG was continuously printed and thereafter analysed for changes in heart rate and T-elevation. Data are presented as range and median.
Results and Discussion: Changes in heart rate and T-elevation after intravenous injection of 0.2 ml/kg and 0.4 ml/kg test solution are given in table 1 and 2.

Table 1: effects after intravenous application of 0.2ml/kg test solution

	group 1	group 2	group 3
Delta heart rate [1/min]	– 13 – 12 (–5)	27– 116 (89)	73 – 122 (85)
Delta heart rate [%]	– 10 – 9 (–3)	17– 94 (49)	42 – 98 (68)
T-elevation [yes/no]	0/7	4/5	5/5

Table 2: effects after intravenous application of 0.4ml/kg test solution

	group 1	group 2	group 3
Delta heart rate [1/min]	–16 – 0 (–6)	60– 115 (91)	97 – 136 (99)
Delta heart rate [%]	– 10 – 0 (–4)	42– 92 (54)	55 – 100 (76)
T-elevation [yes/no]	1/7	5/5	5/5

Conclusion(s): Tachycardia and T-elevation in the ECG during intravasal application of a bupivacaine test dose was caused by epinephrine. Whether higher doses of bupivacaine alone can cause similar ECG-changes or not, requires further animal studies.
Acknowledgements: Study supported by a donation. The donation was made by UBS AG by order of a client. This study was realised in collaboration with the Equine Department Vetsuisse Faculty, Zurich, Switzerland.
Reference:
1 Tobias JD. Anesth Analg 2001;93:1156–61.

4AP2-8

Moderate hypothermia reduces global and regional myocardial function in the pig

V. Kerans, H. Skulstad, A. Espinoza, P. Halvorsen, J. Bugge

Clinic of Anaesthesiology, Rikshospitalet University Hospital, Oslo, Norway

Background and Goal of Study: Hypothermia is widely used as a neuroprotective treatment after cardiac arrest. However, there is little knowledge about the effect of this treatment on the heart and circulation. We hypothesized that hypothermia would reduce cardiac performance.
Materials and Methods: In seven anesthetized open-chested pigs a micromanometer-tipped catheter was introduced into the left ventricle (through the carotic artery) to measure left ventricular pressure (LVP). A pulmonary artery catheter was inserted to measure cardiac output (CO) by thermodilution; systemic vascular resistance (SVR) was calculated. Regional myocardial function was measured by strain Doppler echocardiography (SDE) in the middle segment of septum and lateral wall (SW and LW, respectively). Negative strain represents regional shortening, thus an increased strain value represents reduced myocardial function. Blood temperature was reduced from 38° to 33° C by intravascular cooling. To compare measurements atrial pacing were performed at a frequency of 100 beats per minute both during normothermia and hypothermia before registrations were performed.

Results and Discussion: Values are given as mean + standard deviation. The spontaneous heart rate decreased during hypothermia (88 ± 12 to 79 ± 14 min^{-1} ($p < 0.05$)). At a paced frequency of 100 beats per minute, hypothermia reduced CO from 5.1 ± 0.8 to 3.9 ± 0.6 l min^{-1} ($p < 0.05$). Peak LVP were reduced from 86 ± 3 to 64 ± 10 mm Hg ($p = 0.05$). Regional myocardial function was also reduced as strain in both SW and LW altered from – 31.6 ± 7.3 to – 18.1 ± 4.9% ($p < 0.05$) and from – 29.3 ± 9.4 to – 18.7 ± 4.8% ($p < 0.05$), respectively. SVR and left ventricular end-diastolic pressure (LVEDP) were not significantly changed: SVR from 904 ± 141 to 896 ± 140 dyn·s·cm^{-5} and LVEDP from 9 ± 1 to 10 ± 3 mm Hg.
Conclusion(s): Moderate hypothermia reduces global and regional myocardial function. This is most likely caused by temperature effects on the myocardium because there were only minor changes in pre- and afterload estimated as LVEDP and SVR, respectively.

4AP3-1

Can troponin I and N-terminal pro-brain natriuretic peptide predict outcome following emergency surgery?

A. Oscarsson, M. Fredrikson, A. Gupta, E. Swahn, C. Eintrei

Anesthesiology and Intensive Care, Faculty of Health Sciences, Linköping, Sweden

Background and Goal of Study: The aim of this study was to determine the incidence of myocardial damage and left ventricular myocardial dysfunction and their influence on outcome in high risk patients undergoing non-elective surgery.
Materials and Methods: In this prospective observational study 211 patients with ASA classification 3 or 4 undergoing emergent or urgent surgery were included. Troponin I (TnI) was measured preoperatively, 12 hours and 48 hours postoperatively. Preoperative NT-proBNP as a marker for left ventricular systolic dysfunction was analyzed. The diagnostic thresholds were set to TnI > 0.06 µg l^{-1} and NT-proBNP > 1800pg·ml^{-1} respectively. Perioperative cardiac events, 30 days and 3 months mortality were recorded.
Results and Discussion: Elevated TnI levels were detected in 33% of the patients. A TnI elevation increased the risk of cardiac events (35% versus 3% in patients with normal TnI levels, $p < 0.001$) and 30 days mortality (23% versus 7%, $p = 0.003$). Increased concentrations of NT-proBNP were seen in 60% of the patients. Elevated NT-proBNP was an independent predictor of myocardial damage 12 hours postoperatively, OR: 6.2 (95% CI 2.1–18.0) and resulted in an increased risk of postoperative cardiac events (21% versus 2.5% in patients with NT-proBNP ≤ 1800pg·ml^{-1}, $p < 0.001$).
Conclusion(s): Myocardial damage is common in a high risk population undergoing unscheduled surgery. These results suggest a close correlation between myocardial damage in the postoperative period and increased concentration of NT-proBNP prior to surgery. The combination of TnI and NTproBNP are reliable markers for monitoring patient at risk in the perioperative period as well as useful tools in our risk assessment preoperatively in emergency surgery.

4AP3-2

Perioperative morbidity and mortality in patients with coronary stents

A. Villalonga, C. Hernández, F. Parramon, S. Sabaté, N. Estanyol

Anesthesiology, Hospital Universitari de Girona Dr. Josep Trueta, Girona, Spain

Background and Goal of Study: To study patient characteristics, perioperative morbidity and mortality in patients with (CSP) or without (NCSP) coronary stents scheduled for non-cardiac surgery.
Materials and Methods: A prospective multicenter cohort study (ANESCARDIOCAT study) was performed in 23 hospitals during 6 randomized weeks in 2007–2008. Eligible subjects were patients aged 40 yr or older undergoing non-cardiac surgery. The sample included patients undergoing elective and emergency surgery (excluding obstetrics) under general or regional anaesthesia. We collected demographic data, preoperative patient' characteristics, type of surgery and anaesthesia, procedure characteristics, perioperative events and in-hospital mortality. χ^2 test was used to compare qualitative variables and t test to compare quantitative variables.
Results and Discussion: 3387 patients were included in this study, 67 (2%) of them were CSP. Types of stent were: 28 (41.8%) bare metal stent, 7 (10.4%) drug eluting stent and 32 (47.8%) unknown. Time between placement of stent and surgery were: 3 (4.5%) less than 6 weeks, 2 (3%) 6 weeks–6 month, 8 (11.9%) 6 month–1 year, and, 54 (80.6%) more than a year. Median age of CSP and NCSP were 69 and 67 yr respectively. 54 were male and 13 were female. ASA physical status was poorer in CSP than NCSP. Surgical risk was higher in CSP than NCSP, 29.9% vs. 15.1%. Patients with coronary stents had more risk factors than patients without them. 76.1% and 31.3% of CSP took aspirin and clopidrogrel respectively. In the other hand, 13.2% and 4.3% of NCSP took aspirin and clopidogrel respectively. Withdrawal of aspirin was in 15 (29.4%) of CSP and 230 (52.8%) of NCSP. Withdrawal of clopidogrel in CSP and NCSP were in 18 (85.7%) and 121 (85.2%) respectively. 11.1% and 14.3% of CSP was discharged without aspirin or clopidogrel respectively. 13 (19.4%) out of 67 CSP experienced perioperative complications (10 cardiac cases) and 2 (2.98%) died (due to cardiac complications). 311 (9.82%) NCSP had complications (127 cardiac) and 60 (1.89%) died, 8 of them due to cardiac events.
Conclusion(s): Incidence of CSP is high and its morbidity and mortality is higher than NCSP. Mortality is related to cardiac events. Antiplatelet therapy is withdrawn in a high percentage of patients and it is not reintroduced postoperatively in many cases.

4AP3-3

Anaesthetic cardioprotection in coronary artery surgery: The results of the Volatile Anaesthetics and Cardioprotection Multicentre ANalysis (VACMAN)

J. Huys, P. Wouters, S. De Hert, VACMAN Study Group

Anaesthesia, University Hospital Ghent, Ghent, Belgium

Background and Goal of Study: We hypothetized that the use of a volatile anaesthetic regimen in coronary artery surgery is associated with a lower postoperative troponin T release.
Materials and Methods: In 8 participating centers, 673 coronary surgery patients were randomized in three groups: a control group (group 1) receiving total intravenous anesthesia and two groups that received either sevoflurane (group 2) or desflurane (group 3), according to the following regimen: starting at a minimum end-tidal concentration of 0.5 MAC at least 30 minutes before the initiation of myocardial ischemia, continuing over the entire ischemic period to at least 10 minutes after the beginning of reperfusion. The primary outcome variable was postoperative troponin T release, secondary outcome variables were hospital length of stay and 1-year mortality. A mixed model multivariate analysis was performed to assess the effect of volatile anaesthetics on primary and secondary outcomes.
Results and Discussion: Postoperative troponin T values varied significantly but did not differ between groups (mean (SD) for cumulative 24hr enzyme release in group 1 = 9.4 (12.2), group 2 = 9.1 (15.0) and group 3 = 7.7 (10.9) ng·hr·mL^{-1}). The additive EuroSCORE ($p = 0.0362$) and the number of distal anastomoses ($p = 0.0387$) were the only independent predictors of postoperative troponin T release. The independent predictors of hospital length of stay were diabetes mellitus ($p = 0.0386$), the EuroSCORE ($p < 0.001$), and group assignment ($p = 0.0213$) with a clear benefit for patients treated with volatile anaesthetics as compared to the control group. One-year mortality was 7.4% in group 1, 2.5% in group 2, and 2.8% in group 3 but the EuroSCORE ($p = 0.0328$) was the only significant independent predictor of mortality in the multivariate analysis.
Conclusion(s): With the present study protocol neither sevoflurane nor desflurane lowered postoperative troponin T release compared to a total intravenous anaesthetic regimen. However, hospital length of stay was reduced and there was even tendency for a lower one-year mortality.

4AP3-4

Postoperative cardiac events in intermediate and high surgery-specific risk of noncardiac surgery: ANESCARDIOCAT study

S. Sabate, A. Mases, A. Rodriguez, J. Canet, C. Orrego

Anaesthesiology, Fundacio Puigvert (IUNA), Barcelona, Spain

Background and Goal of Study: The aim of this study was to evaluate risk factors for postoperative cardiac events in patients undergoing intermediate and high surgery-specific risk of noncardiac surgery.
Materials and Methods: A prospective multicentre cohort study (ANESCARDIOCAT study) was performed in 23 hospitals during 6 randomized weeks in 2007–2008. Eligible subjects were patients aged 40 yr or older undergoing intermediate-high surgery-specific risk of noncardiac surgery. The sample included patients undergoing elective and emergency surgery (excluding obstetrics) under general or regional anaesthesia. We collected demographic data, preoperative active cardiac conditions, clinical risk factors (ischemic heart disease, congestive heart failure, cerebrovascular disease, diabetes mellitus, renal insufficiency), minor predictors (age > 70, abnormal ECG, dysrhythmia and uncontrolled HTA), high-risk surgery as well as preoperative haemoglobin. Dependent variables were postoperative cardiac events (until hospital discharge) and in-hospital mortality. χ^2 test was used to compare qualitative variables and t test to compare quantitative variables. Multivariable stepwise regression model was performed.
Results and Discussion: 3387 patients were enrolled in this analysis. 48.3% were male. Median age (percentile 10–90) was 67 yr (47–81). 7.1% underwent

emergent surgery and 15.4% had high-risk surgery. Cardiac events occurred in 4% of cases and cardiac related mortality was 0.3%. Risk factors for postoperative cardiac events are shown in table 1.

Table 1. Significant risk factors for cardiac events

	Bivariable analysis	Multivariable analysis
	OR (95% CI)	OR (95% CI)
High-risk surgery	2.56 (1.75–3.72)	1.75 (1.10 – 2.76)
Preoperative haemoglobin (g/dL)	0.79 (0.73–0.86)	0.87 (0.78 – 0.97)
Congestive heart failure	4.24 (2.75–6.56)	2.19 (1.26 – 3.82)
Renal insufficiency	4.51 (2.93–6.94)	2.51 (1.46 – 4.31)
Abnormal ECG	3.80 (2.60–5.55)	2.49 (1.59 – 3.90)
Cerebrovascular disease	3.09 (1.93–4.94)	2.35 (1.36 – 4.07)
Diabetes insulindependent	2.56 (1.46–4.48)	1.91 (1.01 – 3.63)

Conclusion(s): The incidence of cardiac events was low, but led to important consequences. High-risk surgery, congestive heart failure, renal insufficiency, cerebrovascular disease, diabetes mellitus and the abnormal ECG were risk factors for cardiac complications in the perioperative period. It is important to highlight the preoperative haemoglobin level as a protective risk factor for cardiac events.

4AP3-5

Patients with coronary artery stents and cardiac surgery: Preliminary results of POSTENT (Prospective Observational STENT) study

Z. Vichova, C. Bléry-Court, Y. Attof, M. Cannesson, J. Lehot

Anesthesiology-Intensive Care, Louis Pradel Hospital-HCL-ERI 22, Lyon, France

Background and Goal of Study: The management of patients with coronary artery stents (CAS) : bare metal stents (BMS) and/or drug eluting stents (DES) is one of the most important subject of patient safety in anaesthesiology. These patients are exposed to in-stent thrombosis resulting from the withdrawal of antiplatelet drugs (AD) or to bleeding in case of their continuation. The goal of the POSTENT study is to create a large multicenter international registry of patients with CAS undergoing cardiac and non cardiac surgery to assess the incidence of perioperative morbidity and mortality. We report the preliminary results of this registry in the cardiac surgery group.

Materials and Methods: All patients with BMS and/or DES undergoing cardiac surgery are prospectively enrolled. Demographics and cardiovascular risk factors and diseases are recorded. Coronary stents are analysed with respect to the nature, number and parameters of stents deployed. The date of stent placement is recorded for each patient. The perioperative management of AD therapy is detailed. Troponin levels are monitored before surgery, on the first and the second postoperative day. Postoperative bleeding, thrombosis and cardiac complications and the patient outcome are analyzed up to 60 days after surgery.

Results and Discussion: Between October 2005 and August 2008, 219 patients were enrolled. The surgery was conducted under cardiopulmonary bypass (CPB) in 68.5%, off-pump in 31.5% of cases. Aspirin was discontinued before surgery in 7.9% and clopidogrel in 94.4% of patients with a mean duration of preoperative withdrawal of 5 ± 3 and 8 ± 5 days respectively (mean value ± SD). Unusual postoperative bleeding occurred in 22% of patients requiring a secondary intervention in 6.4% and blood transfusion in 27% of patients. Two patients developed in-stent thrombosis with myocardial infarction. Five patients (2.3%) died within 60 days after surgery. A withdrawal of clopidogrel < 5 days was identified as a risk factor of perioperative bleeding. Female sex, urgent surgery or under CPB favoured all type of complication.

Conclusion(s): These preliminary results of 219 patients enrolled in the multicenter trial POSTENT are currently the largest sample of patients with CAS undergoing cardiac surgery. No similar data are available in the medical literature. It is important to estimate the perioperative morbidity/mortality of these patients with regard to the strategies of management of AD therapy. Excessive bleeding seems to be the major problem in cardiac surgery.

4AP3-6

Patients with coronary artery stents and non cardiac surgery: Preliminary results of POSTENT (Prospective Observational STENT) study

Z. Vichova, G. Godet, Y. Attof, M. Cannesson, J. Lehot

Anesthesiology-Intensive Care, Louis Pradel Hospital-HCL-ERI 22, Lyon, France

Background and Goal of Study: Anesthesiologists have frequently to manage patients with both types of coronary artery stents (CAS): bare metal stents (BMS) and/or drug eluting stents (DES). However, the incidence of perioperative adverse events has only been evaluated by a few studies with small sample size. These patients are exposed to instent thrombosis resulting from the withdrawal of antiplatelet drugs (AD) or to bleeding in case of their continuation. The goal of the POSTENT study is to create a large multicenter international registry of patients with CAS undergoing cardiac and non-cardiac surgery to assess the incidence of perioperative morbidity and mortality. We report the preliminary results of this registry in the non cardiac surgery group.

Materials and Methods: All patients with BMS and/or DES undergoing non cardiac surgery are prospectively enrolled. Patient demographics and cardiovascular risk factors are recorded. Coronary stents are analysed with respect to their nature, number and parameters. The date of stent placement is recorded for each patient. The perioperative management of AD therapy is detailed. Troponin levels are monitored before surgery, on the first and the second postoperative day. Postoperative bleeding, thrombosis and cardiac complications and the patient outcome are analyzed up to 60 days after surgery.

Results and Discussion: Between January 2003 and August 2008, 355 patients were enrolled. Aspirin was discontinued before surgery in 53.2% and clopidogrel in 82.7% of patients with a mean duration of withdrawal of 6 ± 4 days and 7.5 ± 4 days respectively (mean value ± SD). Cardiovascular complications occurred in 22.7% of patients. Unusual postoperative bleeding occured in 17.3% of patients. Eight patients (2.3%) developed instent thrombosis with fatal outcome in four cases. All in-stent thrombosis were late or very late thrombosis of BMS. Vascular surgery and age were the only risk factors of unusual bleeding. Bleeding complications potentialized the risk of instent thrombosis. The 60-day mortality was 4.5%.

Conclusion(s): These results point out the high rate of perioperative morbidity/mortality of patients with CAS undergoing non cardiac surgery. The risk of late DES thrombosis is now recognized. The results in case of BMS are of particular interest because indicating a persistent risk of perioperative instent thrombosis even several years after stent placement. The problem of perioperative management of AD is still not resolved but a withdrawal <5 days didn't seem to increase postoperative bleeding.

4AP3-7

Is sevoflurane cardioprotective in noncardiac surgery?

J. Barbary, M. Feige, D. Leblanc, M. Laffon, J. Fusciardi

Anesthesiology and Critical Care, University Hospital, Tours, France

Background and Goal of Study: Sevoflurane may exert cardioprotective effects in cardiac surgery since it is associated with a decrease in cardiac troponin I (cTnI) concentrations and a marked reduction in 1-year cardiac events [1]. We hypothesized that sevoflurane would also reduce abnormal cTnI values and 1-year cardiac events in intermediate and high cardiac risk patients undergoing noncardiac surgery.

Materials and Methods: After local ethics committee approval and informed consent, 147 patients with at least 2 risk factors of the Revised Cardiac Risk Index (RCRI) [2] scheduled for infrainguinal bypass surgery were randomized to receive either total sevoflurane (S group; n = 74) or total propofol (P group; n = 73) anaesthesia. Perioperative clinical care was standardized. cTnI measurements were obtained on the first 3 postoperative days and values > 0.20 ng/mL considered abnormal [3]. The 1-year cardiac events including unstable angina, myocardial infarction, congestive heart failure and cardiac death were recorded by 2 investigators blinded to the anaesthetic agent used. Based on a 75% decrease in 1-year cardiac events, as previously reported in cardiac surgery [1], and risks $\alpha = 0.05$ and $\beta = 0.20$, 73 patients were required in each group. χ^2 test was used to compare percentages between groups. Data are presented as percentage and relative risk [95% CI]. A P value < 0.05 was considered statistically significant.

Results and Discussion: There were no significant differences between groups for patients with a RCRI ≥ 3 (S: 43%, P: 47%; 0.93 [0.27–1.45]; $P = 0.81$), or preoperative treatments with β-blockers (S: 36%, P: 36%; 1.02 [0.41–1.67]; $P = 1.0$) or statins (S: 64%, P: 62%; 1.03 [0.55–1.57]; $P = 0.95$). The occurence of intraoperative systolic blood pressure < 80 mm Hg (S: 31%, P: 23%; 1.33 [0.91–2.33]; $P = 0.38$), or heart rate > 80 bpm (S: 27%, P: 22%; 1.23 [0.71–2.17]; $P = 0.73$) did not differ between groups. There were no significant differences between groups for patients with at least one abnormal cTnI value (S: 12%, P: 10%; 1.27 [0.47–2.55]; $P = 0.81$) or 1-year cardiac event (S: 18%, P: 23%; 0.75 [0.32–1.25]; $P = 0.51$).

Conclusion(s): Our study failed to demonstrate any major improvement in postoperative cardiac morbidity by total sevoflurane anaesthesia in noncardiac vascular surgery, as previously described in cardiac surgery.

References:

1 Garcia C, Julier K, Bestmann L, et al. Br J Anaesth 2004;94(2):159–65.
2 Lee T, Marcantonio E, Mangione C, et al. Circulation 1999;100:1043–49.
3 Le Manach Y, Perel A, Coriat P, et al. Anesthesiology 2005;102:885–91.

4AP3-8

Myocardial damage after coronary artery bypass grafting. A risk factor analysis

C. Di Lorenzo, R. Brandolini, D. Albanese, F. Petrini, A. Calafiore

Anaesthesiology and Intensive Care, University of Chieti, Chieti, Italy

Background and Goal of Study: It has been clearly demonstrated that postoperative increment of CK-MB release can reduce significantly early and midterm survival, even in absence of a clear picture of perioperative myocardial infarction (MI). This retrospective analysis was aimed to identify pre- and operative risk-factors yielding higher myocardial damage after coronary artery bypass grafting (CABG).

Materials and Methods: From January 1995 to December 2002, 4634 patients underwent isolated CABG. CK-MB release was assessed each postoperative day and the peak value was used for the analysis. Receiver operating characteristic (ROC) curve was used to identify a cut-off value of CK-MB peak > 30UI/L (specificity and sensitivity of 75%) associated with a significant increment of 30-day mortality cardiac-related. Pre- and operative variables were entered in a binary logistic regression having as primary end-point the CK-MB release > 30UI/L (100 bootstrap samples). The results were reported as odds ratio (OR), 95% confidence interval (CI) and p-value.

Results and Discussion: A CK-MBpeak > 30UI/L was found in 1624 (35%) patients. Thirty-day cardiac mortality in this subset of patients was 2.6% versus 0.8% in 3010 patients with a CK-MB peak ≤ 30 UI/L ($p < 0.001$). Table 1 reports the results of logistic regression.

Conclusion(s): Age and urgency were unmodifiable variables which might produce higher CKMB release after CABG. The use of cardiopulmonary bypass produces an ischemic-reperfusion damage yielding stunned and/or necrotic myocardium. In the second case, CK-MB release increases in postoperative period along with left ventricular dysfunction. Furthermore, stunned myocardium cannot solve with time, producing apoptosis with further impairment of myocardial function. It is clear that the longer CPB time, the higher CKMB release. Finally, it is very important for both surgeon and anaesthesiologist to keep the patient stable over the operation and immediately after, to avoid hypotension or arrhythmias that can produce deeper myocardial damage.

4AP3-9

The impact of estimated functional capacity on perioperative cardiovascular events in non-cardiac surgery. Results from the ANESCARDIOCAT study

A. Mases, S. Sabaté, N. Guilera, A. Sabaté, M. Sadurní

Anaesthesia, Hospital del Mar, Barcelona, Spain

Background and Goal of Study: To assess the value of functional capacity as a measure of risk stratification for perioperative cardiac complications and all-cause mortality in non-cardiac surgery.

Materials and Methods: A prospective multicentre cohort study (ANESCARDIOCAT study) was performed in 23 hospitals during 6 randomized weeks in 2007–2008. Eligible subjects were patients aged 40 yr or older undergoing intermediate or high non-cardiac surgery according to cardiac risk stratification for non-cardiac surgical procedures. The sample included patients undergoing elective and emergent surgery (excluding obstetrics) under general or regional anaesthesia. We collected demographic data, preoperative clinical risk factors according to ACC/AHA guidelines[1] as well as ASA physical status. Functional capacity was recorded as MET level ≥ 4, < 4 METS (with cardiac symptoms) and unknown due to functional impairment (UK). Dependent variables were perioperative cardiovascular events until hospital discharge. Fisher test or χ^2 test were used to compare qualitative variables and t test to compare quantitative variables.

Results and Discussion: We analyzed 3387 patients of whom 92.9% underwent nonemergent surgery. Cardiac events occurred in 4% of cases and cardiac related mortality was 0.3%. There were 1994 (57.5%) patients classified with ≥ 4 METS, 98 (2.9%) with < 4 METS, 330 (9.7%) UK METS and 1010 (29.9%) not available. We grouped < 4METS and UK METS for the analysis (428 patients, 12.7%). Results are shown in tables.

Conclusion(s): Our data confirm results from previous studies where poor functional capacity is associated with worst outcome. According to our results, measurement of functional capacity would be valuable to discriminate a subgroup of patients classified as ASA III and those with 1–2 clinical risk factors who are at greater risk of complications.

Reference:

1 Fleisher LA et al. Circulation 2007; 116(17):1971–96

Table 1. Demographics and preoperative morbidities

	≥ 4 METS	< 4METS or UK	P value
Age	63.7±12.2	72.07±11.9	<0.001
Heart failure	3.7%	14.7%	<0.001
Myocardial infarction	3.4%	13.3%	<0.001
Angina	2.7%	7.9%	<0.001
Cerebrovascular disease	3.7%	13.7%	<0.001
Renal insufficiency	3.1%	14.2%	<0.001
Diabetes mellitus	14.5%	26.8%	<0.001
High risk surgery	12.4 %	27.1%	<0.001
Intermediate risk surgery	87.6%	72.9%	<0.001

Table 2 Perioperative cardiovascular events in ≥ 4 METS and <4METS

	≥ 4 METS	< 4METS or UK	P value
All cardiovascular events*	2.9%	7.7%	<0.001
Cardiac death*	0.1% (1)	0.7% (3)	0.020
Noncardiac death*	0.8% (15)	4.2% (18)	<0.001
Nonfatal cardiac arrest	0.1% (2)	0.2% (1)	0.45
Angina*	0.7% (13)	2.3% (10)	0.004
Acute myocardial infarction	0.1% (2)	0.5% (2)	0.151
Congestive heart failure*	0.7% (14)	2.8% (12)	0.001
Arrhythmia or AV block	1.4% (27)	2.6% (11)	0.088
Acute cerebrovascular event	0.3% (6)	0.5% (2)	0.64

Absolute number of cases in brackets. *Statistically significant

Table 3 Perioperative cardiovascular events stratified by ASA and number of clinical risk factors in ≥4 METS and <4METS

	≥ 4 METS	< 4METS or UK	P value
ASA I	0.5% (1)	0% (0)	1
ASA II	2% (24)	0.8% (1)	0.721
ASA III*	5.1% (26)	9.7% (22)	0.023
ASA IV	20% (5)	13.35 (10)	0.518
0 clinical risk factors	2.2% (32/1454)	4% (8/202)	0.139
1-2 clinical risk factors*	3.4% (14/416)	9.6% (17/178)	0.004
≥ 3 clinical risk factors	26.7% (8/30)	18.6% (8/43)	0.566

Absolute number of cases in brackets. *Statistically significant

4AP4-1

Helium-induced postconditioning in the rat heart *in vivo*

G. Oei, R. Huhn, M. Hollmann, B. Preckel, N. Weber

Laboratory of Experimental Intensive Care and Anaesthesiology (L.E.I.C.A.), Academic Medical Centre, University of Amsterdam, Amsterdam, Netherlands

Background and Goal of Study: Administration of 70% helium 24 h or directly before prolonged coronary artery occlusion and reperfusion induces cardioprotection, and is referred to as late preconditioning (LPC) or early preconditioning (EPC), respectively [1,2]. From a clinical point of view the question arises whether helium application after the ischaemic episode induces postconditioning and if a cardioprotective effect of postconditioning can be enlarged by addition of LPC or LPC plus EPC.

Materials and Methods: Male, chloralose-anaesthetised Wistar Kyoto rats underwent thoracotomy and, after pericardiotomy, a snare occluder was passed around a major branch of the left coronary artery. All rats were subjected to 25 min of myocardial ischaemia, followed by 2 h of reperfusion. Controls were not further treated (CON). Helium was applied during early reperfusion (15 min, PostC), in a concentration of 70%. In two additional groups, rats received 15 min of helium 24 h before ischaemia and during early reperfusion (LPC + PostC) or next to that 3*5 min of helium directly before the ischaemic episode, interspersed with 2*5 and one final 10 min washout period (LPC + EPC + PostC). At the end of reperfusion, hearts were excised and myocardial infarct size (IS) as percentage of the area at risk (AA) was determined by triphenyltetrazoliumchloride staining. Statistical analysis was performed with a Student's *t*-test followed by a Bonferroni's correction for multiple comparisons.

Results and Discussion: Administration of 15 min of helium during early reperfusion reduced myocardial infarct size from 46 ± 5% in CON to 29 ± 6% in PostC ($p < 0.05$). Compared with PostC alone (29 ± 6%), the combination of PostC with LPC (30 ± 9%) or LPC plus EPC (32 ± 7%) did not further reduce infarct size.

Conclusion(s): These results show that helium is able to induce postconditioning in the rat heart *in vivo*. Additionally, the cardioprotective effect of postconditioning cannot be enlarged by addition of LPC and EPC.

Reference:

1 Anesth Analg, 2007;105:562–569 [2] Anesth Analg, 2008;106:S-21.

4AP4-2

Comparative effects of volatile anaesthetics on myocardial ischaemia/reperfusion injury and incidence of arrhythmias in *in vivo* rabbit model

K. Yoshida, U. Imaizumi, M. Furuya, H. Arisaka, T. Yokoyama

Clinical Care Medicine, Kanagawa Dental College, Yokosuka-shi, Kanagawa Prefecture, Japan

Background and Goal of Study: Myocardial ischaemia/reperfusion injury and its prevention have recently become the focus of considerable attention. This study was designed to investigate the effects of three inhalational anaesthetic agents, halothane, sevoflurane, isoflurane on myocardial infarction and the incidence of arrhythmias during ischaemia and reperfusion in *in vivo* rabbit model.

Materials and Methods: Rabbits received regional ischaemia by 30 min of the LAD occlusion and followed by 3 hours of reperfusion under general anaesthesia. The anaesthetics studied were: ketamine/xylazine (35 mg/kg/h and 5 mg/kg/h respectively), halothane (0.8 ~ 1.0%), sevoflurane (2.1%), and isoflurane (1.4%). An electrocardiogram was recorded throughout the experiment *via* lead II of the standard electrocardiogram. At the end of the 3 hrs reperfusion period, area at risk (R) was delineated by Evans blue and infarct size (I) determined by tetrazolium staining.
Results and Discussion: It was observed that rate pressure product was decreased in the halothane group. R revealed no significant difference among all groups. I/R values of each group were 59.3 ± 15.3% in ketamine/xylazine group (control group), 36.9 ± 8.1% in halothane group, 23.0 ± 7.8% in sevoflurane group, 39.1 ± 11.6% in isoflurane group. Compared with control group, myocardial protective effect was observed in halothane, sevoflurane and isoflurane group. The duration of arrhythmias during myocardial ischaemia was 99.7 ± 110.8 sec in control group, 0.8 ± 2.0 sec in halothane group, 0.8 ± 2.0 sec in sevoflurane group, 0 ± 0 sec in isoflurane group. As for the duration of arrhythmias during reperfusion was 67.5 ± 84.6 sec in control group, 2.3 ± 3.8 sec in halothane group, 0.2 ± 0.4 sec in sevoflurane group, 10 ± 24.0 sec in isoflurane group.
Conclusion(s): These results suggested that halothane, sevoflurane, and isoflurane have antiarrhythmic effects during ischaemia (isoflurane > halothane = sevoflurane) and reperfusion (sevoflurane > halothane > isoflurane), as well as infarct limiting effects (sevoflurane > halothane > isoflurane). It was suggested that sevoflurane has the most powerful cardioprotection regardless of myocardial oxygen consumption, though cardioprotection by halothane was related to decrease in myocardial oxygen consumption.
Reference:
1 Hisao M *et al*. Circ Cont. 1999, 20, 288–93.
2 Cope DK *et al*. Anesthesiol. 1997, 86, 699–709.

4AP4-3

Sevoflurane preconditioning increases glycogen content and glycogen synthase kinase 3 beta phosphorylation during ischaemia in isolated in rat hearts

K. van Deutekom, N. Hamdani, S. Loer, R. Bouwman, R. Lamberts

Department of Anesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: Volatile anaesthetics can protect the myocardium from ischaemic injury via activation of survival kinases, such as phosphorylation of glycogen synthase kinase 3 beta (GSK3β). During myocardial ischemia, glycogen becomes the principal substrate for ATP production, which is regulated by GSK3β. Whether cardioprotective effects of volatile anaesthetics are related to alterations in glycogen content has not been established. Therefore, we hypothesize that sevoflurane preconditioning improves cardiac glycogen content during ischaemia via phosphorylation of GSK3β.
Materials and Methods: Isolated Langendorff-perfused hearts from male Wistar rats were subjected to 35 minutes of global ischaemia. Hearts were divided into 2 groups: 1. control; 2. sevoflurane preconditioning receiving three times 5-minute of sevoflurane (2,5 vol%) before ischaemia. Myocardial samples were homogenized and digested with perchloric acid and amyloglucosidase respectively and glycogen content was subsequently measured with a glucose oxidase assay kit. Phosphorylation of GSK3β was measured by Western blot analysis and ischaemic cellular injury was determined by 2,3,5-triphenyltetrazolium chloride staining.
Results and Discussion: After ischaemia, sevoflurane increased cardiac glycogen content compared to the control group (sevoflurane: 22.3 ± 8.3 vs. control 1.7 ± 12.9 mmol/g dry weight, n = 4). This was accompanied by an increased phosphorylation of GSK3β in the sevoflurane group (sevoflurane: 2.1 ± 0.3 vs. control 1.1 ± 0.3 p-GSK3β/α-actin, $p < 0.05$, n = 4). Sevoflurane preconditioning reduced infarct size (sevoflurane: 17.8 ± 2.4 vs. control 26.9 ± 2.5%, $p < 0.05$, n = 5).
Conclusion(s): Sevoflurane preconditioning increases myocardial glycogen content and phosphorylation of GSK3β after ischaemia. This indicates that sevoflurane preconditioning improves cardiac cellular energy status during ischaemia and provides additional insight in the cellular mechanism of cardioprotection induced by volatile anaesthetics.

4AP4-4

Volatile anaesthetic sevoflurane and local anaesthetic bupivacaine exert their cardioprotective effects against ischaemia and reperfusion injury via different intracellular signaling pathways

R. Bouwman, N. Hamdani, J. Vreden, S. Loer, R. Lamberts

Anesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: Volatile anaesthetics protect the myocardium from ischaemia and reperfusion (I/R)-injury via activation of signalling kinases, such as 5' AMP activated protein kinase (AMPK) and glycogen synthase kinase 3 beta (GSK3β). Local anaesthetics also posses cardioprotective properties; however the exact signal transduction mechanism has not been established. We therefore determined whether the cardioprotective effects of bupivacaine are mediated via activation of AMPK and GSK3β.
Materials and Methods: Isolated Langendorff-perfused hearts from male Wistar rats were subjected to 35 minutes of global ischaemia followed by 60 minutes of reperfusion. Hearts were divided into 3 groups: 1) Control; 2) SEVO: receiving three times 5-minute episodes of sevoflurane (2,5 vol%) prior to ischaemia; 3) BUPI: bupivacaine (0.125mg/ml) 30 minutes prior to ischaemia. Ischaemic cellular injury was determined by 2,3,5-triphenyltetrazolium chloride staining. Phosphorylation of AMPK- and GSK3β was measured by Western blot analysis (expressed in arbitrary units).
Results and Discussion: Sevoflurane- and bupivacaine pretreatment both reduced infarct size after I/R (SEVO 23 ± 7%, BUPI 27 ± 2% vs. Control 59 ± 6%, $p < 0.05$, n = 6). Sevoflurane preconditioning was accompanied by increased phosphorylation of AMPK (SEVO 1.5 ± 0.1 vs. Control 0.9 ± 0.1, $p < 0.05$) and GSK3β (SEVO 1.5 ± 0.2 vs. Control 1.0 ± 0.1, $p < 0.05$). In contrast, bupivacaine preconditioning decreased GSK3β phosphorylation (BUPI 0.4 ± 0.1, $p < 0.05$), whereas no change in AMPK phosphorylation (BUPI 0.8 ± 0.1) was observed. The AMPK-inhibitor Compound C (10μM) effectively abolished sevoflurane-, but not bupivacaine-induced reduction of infarct size.
Conclusion(s): Sevoflurane- and bupivacaine preconditioning both reduced cellular injury after I/R, however their cardioprotective properties rely on different intracellular signalling pathways. This result provides important insight in the cellular mechanism of cardioprotection induced by volatile and local anaesthetics.

4AP4-5

Cardiac proteome alterations during the time course of desflurane preconditioning *in vivo*

N. Dyballa, C. Schuh, H. Vogt, S. Metzger, N. Weber

Biological Medical Research Center, University of Duesseldorf, Duesseldorf, Germany

Background and Goal of Study: Current strategies investigating the molecular mechanisms of anaesthetic preconditioning focus on the analysis of specific signalling targets with known function in ischaemic preconditioning. Using a proteomics approach we analyse **global** protein profile changes in response to desflurane-preconditioning (DES-PC).
Materials and Methods: *In vivo* DES-PC of Wistar rats was induced by two 5-min periods of desflurane, interspersed with two 10-min washout phases. Hearts of untreated control and preconditioned animals were excised at six different time points. Cardiac proteins were separated into cellular factions and further analysed by two-dimensional gel electrophoresis and mass spectrometry. Determination of proteomic alterations was carried out with the *Image Master* software using biological variation analysis by overlapping measures. A relative abundance ratio [Vol.%] > 2-fold for spot pairs was used to identify differentially expressed proteins with high confidence. Spots with $P < 0.05$ (t-test) were finally considered to be significantly altered.

List of identified proteins with altered protein expression during DES-PC.

Classification	Protein
TCA Cycle	syccinyl-CoA ligase
	citrate synthase
	isocitrate dehydrogenase homologue
Respiratory Chain	cytochrome C reductase
	mitochondrial malate dehydrogenase
	NADH dehydrogenase
	succinate dehydrogenase
Glycolysis	aldolase A
Proliferation	elongation translation factor 1α and 1α2
Others	selenium-binding protein
	Albumin
	complement component 1q binding protein
	inorganic pyrophosphatase
	mitochondrial aldehyde dehydrogenase
	aspartate aminotransferase 2
	carboanhydrase 1
	dihydroliponamide acetyltransferase

Results and Discussion: The analysed proteome profiles show 40 protein spots differentially expressed in DES-PC. In total, 18 protein candidates

were identified by mass spectrometry and bioinformatics. Many of these proteins are involved in bioenergetics and metabolism, mechanisms postulated to play an important role in the signalling pathway of preconditioning. We actually could identify proteins not been shown to be expressed differentially during the process of cardiac preconditioning, like aldolase A and aminotransferase 2.

Conclusion(s): We provide for the first time results of a proteomic characterisation of time-dependent protein expression changes during DES-PC *in vivo*. Our findings contribute to broadening the underlying knowledge of DES-PC whereby selected candidate proteins will be further analysed in pharmacologic blocker studies to elucidate functional implications.

4AP4-6

Effects of the association of endothelial nitric oxide synthase with heat shock protein 90 on the cardiac sarcolemmal ATP-sensitive potassium channel

A. Tampo

Anesthesiology & Critical Care Medicine, Asahikawa Medical College, Asahikawa, Japan

Background and Goal of Study: Nitric oxide and nitric oxide synthase (NOS) appear to have pivotal roles in the cardioprotection against ischemia-reperfusion injury. Recent studies have reported on the critical role of endothelial NOS (eNOS) phosphorylation in ischemic and pharmacological preconditioning. The association of eNOS with heat shock protein 90 (hsp90) has also been shown to contribute to cardioprotection. However, the resulting impact of this association on the ATP-sensitive potassium (KATP) channel is unknown. In the present study, we investigated the effects of inhibition of hsp90 on the sarcolemmal (sarc) channel using geldanamycin (GA), radicicol (RA), or TSB 2, a decoy peptide derived from eNOS that specifically blocks the association of hsp90 with eNOS. We tested the hypothesis that dissociation of hsp90 from eNOS attenuated opening of the sarcKATP channel. In addition, we tested the effect of NOS inhibitor, L-NAME, on the KATP channel.

Materials and Methods: The whole-cell configuration of the patch clamp technique was used to record sarcKATP current (IKATP) from ventricular myocytes enzymatically isolated from Wistar rat hearts. The myocytes were divided into five groups: control (CTL), GA (2 μM), RA (10 μM)), TSB 2 (20 μg/ml)), and L-NAME (100 μM). Myocytes were incubated for 2-4 hours in Tyrode solution in the absence or presence of the inhibitors and peptides. Pinacidil (50 μM) was used to elicit IKATP in the presence of 50 μM intracellular ATP. IKATP density at a test potential of 60 mV was monitored and reported as mean ± SEM.

Results and Discussion: In the control group, pinacidil readily elicited IKATP with a density of 14.4 ± 4.1pA/pF. However, in the GA and RA groups, pinacidil elicited IKATP with densities of 3.0 ± 1.9 and 2.4 ± 1.2 pA/pF, respectively ($p < 0.05$ vs. CTL group). In contrast, in both the TSB 2 and L-NAME groups, pinacidil elicited a robust IKATP with densities of 10.8 ± 3.4 and 11.4 ± 2.4pA/pF, respectively.

Conclusion(s): Inhibition of hsp90 by GA and RA prevented the opening of the sarcKATP channel. Surprisingly, the TSB 2 had no effect on sarcKATP channel opening. Also, the inhibition of NOS by L-NAME did not affect the opening of the sarcKATP channel. Thus, the inhibition of hsp90 prevented sarcKATP channel activity, and this effect appeared to be independent of eNOS. Though eNOS plays a critical role in cardioprotection, including anesthetic-induced preconditioning, our results suggest that the sarcKATP channel may not be an end effector of the eNOS-mediated pathway.

4AP4-7

The impacts of isoflurane-induced preconditioning on cardiac voltage-gated ion channels following ischemia

A. Tampo

Anesthesiology & Critical Care Medicine, Asahikawa Medical College, Asahikawa, Japan

Background and Goal of Study: Anesthetic-induced preconditioning (APC) is well known to have the cardioprotective effect. A lot of study showed the APC effect, such as reducing infarct size, functional recovery after prolonged ischemia. However, few reports have been shown the effect of APC on the voltage-gated ion channels after ischemia. In this study, we simulated ischemia for investigating the APC effect on the cardiac L-type calcium current (ICa, L), which is responsible to control the cytosolic calcium concentration and the duration of cardiac action potential.

Materials and Methods: The study was approved by the Institutional Animal Care and Use Committee. Single ventricular myocytes isolated from adult Wistar rats were used for the whole-cell patch clamp experiment to record ICa, L. Rats were divided into three groups, control (CTL), ischemia (ISC), and APC + ischemia (APC + ISC). In the APC + ISC, rats were preconditioned by inhalation of 1.4% isoflurane (1 MAC) for 30 minutes with 30-minute recovery period prior to thoracotomy. In the ISC and APC + ISC, isolated hearts were exposed to 30-minute global ischemia on the Langendorff apparatus by stopping the perfusion. Current-voltage relationships, steady-state activation and inactivation, and recovery from inactivation were obtained using standard voltage protocols. Data are reported as means ± SEM. One-way ANOVA followed by Scheffe' test was used for statistical analysis and $P < 0.05$ was considered as significant. N = 7–11/group.

Results and Discussion: In the APC + ISC, significant hyperpolarizing shift was shown in the steady-state inactivation curve compare with the CTL and ISC. The potential at which half the available channels were inactivated were – 35.4 ± 1.6 mV (APC + ISC), – 29.0 ± 1.6 mV (CTL), and – 29.8 ± 0.9 mV (ISC). The time constants for the recovery from inactivation were also significantly increased in the APC + ISC (118.1 ± 7.5 ms) compare with the CTL (83.3 ± 4.7 ms) and ISC (89.5 ± 5.4 ms). No significant difference were observed between the CTL and ISC.

Conclusion(s): In this study, 30-minute global ischemia didn't affect on ICa, L profiles. However, APC resulted in persistent changes on the steady-state inactivation and recovery from inactivation. These changes might confer the cytosolic calcium concentration and cardiac rhythm.

4AP4-8

Sevoflurane-induced preconditioning in the isolated mouse heart: Role of the adenosine pathway

M. Damm, S. Stehr, A. Heintz, T. Koch, A. Deussen

Anaesthesiology and Intensive Care Medicine, Medical Faculty Carl Gustav Carus, University Hospital Dresden, Dresden, Saxony, Germany

Background and Goal of Study: Sevoflurane-induced preconditioning in the isolated mouse heart depends on ecto-5'-nucleotidase (CD73) [1]. CD73 converts extracellular adenosine monophosphate (AMP) to adenosine (ado), which can then signal through any of four extracellular adenosine receptors (AR) [2]. Sevoflurane (sevo) increases coronary flow in the isolated mouse heart [1]. This study addressed the role of A_{2B}-adenosine receptors (A_{2B}-AR) in sevo- and ado-induced preconditioning by activation of CD73.

Materials and Methods: Experiments were performed with isolated hearts from 46 6-wk-old male C57BL/6 mice. Controls were matched to hearts subjected to 15 min of 2.8 vol.% sevo. Infarction was induced by 60 min of ischemia of the left coronary artery followed by 30 min reperfusion. Ado (10 μmol/l) and PSB1115 (5 mg/kg/h; inhibitor of A_{2B}-AR; n = 6 each) were infused. In six hearts AOPCP (40 mg/kg/h; inhibitor of CD73) was given. In ten additional constant flow experiments, sevo-induced CD73 activity (ε-AMP/ε-adenosine conversion) was investigated. Ventricular pressure (LVP), + dP/dt_{max}, heart rate, coronary flow and coronary perfusion pressure were continuously measured. Arterial and venous perfusate samples were collected. The area at risk (AAR) and the infarct size were determined with microspheres and propidium iodide. Data analysis was performed using Two-Way-ANOVA and post-hoc analysis by Bonferroni.

Results and Discussion: Infusion of PSB1115 blunted preconditioning of sevo (62.3 ± 1.2% vs. 65.1 ± 1.5%) and ado (67.0 ± 2.3% vs. 58.9 ± 1.8%). Application of 2.8 vol.% sevo and of 10 μmol/l ado significantly increased coronary flow by 100.7 ± 13.6% and by 267.7 ± 34.4% respectively. This sevo- and ado-induced coronary flow increase was not affected by PSB1115, whereas it was completely abolished by AOPCP. Sevo significantly increased ε-AMP/ε-adenosine conversion (+ 57.7 ± 16.1%; $p \leq 0.05$) within 15 min.

Conclusion(s): Inhibition of A_{2B}-AR completely blunts sevo- as well as ado-induced preconditioning. A_{2B}-AR contribute neither to sevo- nor ado-induced coronary flow increase. Exposition of the isolated mouse heart to sevo increases CD73 activity.

References:

1 M. Damm, A. Heintz, P. Panousis, T. Koch, S.N. Stehr. Sevoflurane-induced preconditioning in the isolated mouse heart: a role of caveolin-1 and ecto-5'-nucleotidase. Eur J Anaesth. 2008;25: suppl. 44 ESAPC 1-6.

2 Thompson LF et al. Crucial role for ecto-5'-nucleotidase (CD73) in vascular leakage during hypoxia. J Exp Med. 2004;200:1395–1405.

4AP4-9

Hypoxia-induced late preconditioning in the rat heart *in vivo*

R. Huhn, N. Weber, B. Preckel, M. Hollmann, M. Berger

Anaesthesiology, Academic Medical Centre (AMC), University of Amsterdam, Amsterdam, Netherlands

Background and Goal of Study: Both volatile anaesthetics [1] and the noble gas Xenon induce cardioprotection by late preconditioning.[2] As suggested by *in vitro* experiments, late preconditioning can also be induced by hypoxia, but it is unknown whether hypoxic late preconditioning is a concentration dependent

process. We aimed to investigate if hypoxia induces late preconditioning *in vivo* and if so whether cardioprotection is concentration dependent.

Materials and Methods: Animals were treated in compliance with institutional and national guidelines. Male Wistar rats were randomly assigned to one of four groups (each n = 8). Control (Con), animals were not further treated. In the preconditioning groups animals received 16% oxygen (LPC 16), 12% oxygen (LPC 12) or 8% oxygen (LPC 8) for 4 hours 24 hours before I/R. Animals underwent 25 minutes ischaemia followed by 120 minutes reperfusion. At the end of reperfusion, hearts were excised for infarct size measurement by TTC staining. Statistics: One-way ANOVA followed by Tukey's post hoc test. Data are Mean ± SD.

Results and Discussion: There were no significant differences in heart rate (bpm) and mean aortic pressure (mm Hg) between the experimental groups during baseline ischaemia and reperfusion. In the control group, infarct size was 62 ± 6% of the area at risk. All three different oxygen concentrations significantly reduced infarct size (LPC 16: 36 ± 11%, LPC 12: 38 ± 10%, LPC 8: 39 ± 11%; each $P < 0.05$ vs. Con). The differences between 8%, 12% and 16% were not statistically different.

Conclusion(s): These data show for the first time that: 1) hypoxia induces late preconditioning *in vivo* and 2) 16% oxygen induces cardioprotection in the same range as 12% or 8%.

References:

1 Anesthesiology 2004;100:547–54.
2 Anesth Analg 2008;107:1807–13.

4AP5-1

Cardiac troponin I as specific prognostic marker of serious complications after elective abdominal aneurysm repair

J. Hillova Mannova, Z. Silhart, P. Sevcik

Department of Anaesthesiology and Intensive Care, Faculty Hospital, Brno, Czech Republic

Background and Goal of Study: Abdominal aortic aneurysm (AAA) repair is associated with higher rate of perioperative and postoperative mortality and morbidity. The most frequent complications are cardiac complications–myocardial infarction (MI) and heart failure which results in increasing postoperative mortality. Cardiac troponin I (cTnI) is a highly sensitive and specific marker for myocardial injury. Troponin I is the standard biomarker for the diagnosis of myocardial infarction and useful tool for risk stratification in patients with acute coronary syndromes. Levels of cardiac troponins may also be raised in other clinical conditions and have similar prognostic value. Even minor increases in cardiac troponin, below the diagnostic criteria for myocardial infarction, are indicative of increased clinical risk[1].

Materials and Methods: We studied 70 patients undergoing elective abdominal aortic aneurysm repair to examine relationship between releasing cTnI and frequency of serious complications. Blood of 70 patients was obtained for assays (immunoassay MAYO) of cTnI 8 and 24 hour after surgery.

Results and Discussion: Peak postoperative cTnI concentrations above the lower detection limit of the immunoassay (0,1 ng/ml) occurred in 18 patients. 12 of these patients (cTnI levels: 0,2–10,2 ng/ml) displayed symptoms of clinically significant complications within first 5 days. 7 patients (cTnI levels: 0,48–10,2) had serious complications (2x MI, 2x heart failure, 2x bronchopneumonia – respiratory failure, 1x sepsis). 30 days mortality was 1,4%.

Conclusion(s): More than a quarter of patients undergoing elective aortic surgery suffered myocardial necrosis as determined by detectable cTnI levels. A cTnI rise was associated with a clinically significant events in 66% of the cases and all serious postoperative complications were preceded by increase in cTnI concentration (0,48–10,2 ng/ml). These data suggest that patients with postoperative raised in cTnI levels would be classified as patients with higher risk of postoperative complications and the specific cardioprotective treatment, the invasive monitoring and the longer ICU stay could be required in these cases.

Reference:

1 Relos RP, Hasinoff IK, Beilman GJ Moderately elevated serum troponin concentrations are associated with increased morbidity and morality rates in surgical intensive care unit patients, Crit Care Med 2003; 31:2598–2603.

4AP5-3

Anesthesia management in abdominal aortic aneurysm surgery based on stroke volume variation measured by FloTrac/Vigileo™ tends to be hypovolemic

H. Sakamoto, K. Harasawa, Y. Morimoto, H. Wakisaka

Department of Anesthesia, Cardiovascular Center Hokkaido Ohno Hospital, Sapporo, Hokkaido, Japan

Background and Goal of Study: Measurement of ventilation-induced left ventricular stroke volume variation (SVV) is useful to optimize preload in surgical patients. FloTrac/Vigileo™ system (Edwards Lifescience, USA) calculates continuous cardiac output and SVV on arterial pressure waveform characteristics and patients' demographic data. In this study, we compared outcome after anesthetic management with and without SVV measured by FloTrac/Vigileo™ system in patients undergoing abdominal aortic aneurysm resection and graft replacement surgery (GR).

Materials and Methods: With IRB approval and written informed consent, 90 patients scheduled for GR were enrolled in this study. Arterial cannulation was placed in right radial artery and FloTrac/Vigileo™ system (software v1.10 and v1.14) was connected. Anesthesia was introduced and maintained with propofol, fentanyl, vecuronium and epidural anesthesia with 1% ropivacaine. All patients were ventilated in a volume-controlled mode with a tidal volume of 7–9 ml/kg of body weight at a frequency of 10–12 cycles/min. In 59 patients, anesthesia management was based on arterial blood pressure, heart rate, arterial blood gas analysis and central venous pressure (SVV(–) group). In 31 patients, anesthesia management was based on arterial blood pressure, heart rate, arterial blood gas analysis and SVV (SVV(+) group). Volume of infusion and urine output during surgery, the first 3 hours and 12 hours in ICU, and results of arterial blood gas analysis at the arrival in ICU was compared. Unpaired t-test was performed and $p < 0.05$ was considered significantly different.

Results and Discussion: Patients' demographic data showed no significant difference except duration of operation and anesthesia. Duration of operation and anesthesia in SVV(+) group was significantly longer than SVV(–) group. Volume of infusion during surgery in SVV(+) group was significantly larger than that of SVV(–) group. Other infusion and urine output data showed no significant difference. Blood pH, calcium ion, base excess and bicarbonate ion in arterial blood at the arrival in the ICU showed significant difference. Blood pH was 7.383 ± 0.039 and 7.360 ± 0.042, base excess was – 1.3 ± 1.6 mmol/l and – 2.7 ± 1.8 mmol/l and bicarbonate ion was 23.2 ± 1.7 mmol/l and 21.9 ± 1.6 mmol/l, respectively. These results suggest that anesthesia management based on SVV tends to be slightly hypovolemic.

Conclusion(s): We found anesthesia management based on Stroke Volume Variation measured by FloTrac/Vigileo™ has a tendency to be hypovolemic.

4AP5-4

Anaesthesist's current practices for the management of perioperative myocardial ischemia following major orthopaedic surge

N. Donat, G. Pelee de Saint Maurice, J. Daban, J. Konopacki, S. Ausset

Anesthésie Réanimation, Hôpital d'Instruction des Armées Percy, Clamart, France

Background and Goal of Study: Postoperative myocardial ischemia (PMI) with Troponin Ic (TnIc) elevation after major orthopedic surgery is correlated with long term cardiac outcome (1) and serial postoperative TnIc can be used as a tool for detecting PMI. Nonetheless, there are no guidelines defining a clear policy concerning the treatment of PMI.

Materials and Methods: During three years, the incidence of postoperative myocardial ischemia was measured through TnIc serial measurements in all patients undergoing major orthopedic surgery in a multidisciplinary hospital, and patients were followed-up for one year (2). Medical records of patients with TnIc elevation were studied, and care for therapeutic and diagnosis purpose were analysed.

Results and Discussion: 387 patients were included, 58 (15.3%) presented a TnIc elevation in the three first postoperative days, in 21 cases (6.6%) TnIc elevation reached the significance threshold (ST) – ie the value specified by the manufacturer to be the 99th percentile concentration of a reference population. The one year follow-up according to TnIc elevation has been reported elsewhere (2) (mortality and adverse cardiac event rates were respectively 5.9% and 4.4% for the overall population, 13.4% and 13.8% for patients with any TnIc elevation and 19% and 33.3% for patients wich TnIc were > ST). 55 medical records were exploitable. 6 patients (10.3%) were visited by a cardiologist (17.4% when TnIc > ST vs 5.8% TnIc < ST, $p < 0.0001$). 14 (24.1%) were transferred to an intensive care unit (43.5% when TnIc > ST vs 11.4% TnIc < ST, $p < 0.0001$), and among 35 (60%) their survey were tightened. 15 (25.9%) patients had a new anti ischemic pharmacological treatment (87% when TnIc > ST vs 13.3% when TnIc < ST, $p < 0.0001$): beta-blockers in 8 cases, anti platelets in 8 cases, statins in 4 cases, and anticoagulants for 8 cases. Only 4 (7%) cases required a coronarography.

Conclusion(s): In this study, we found a high PMI rate after major orthopaedic surgery. In the majority of cases, the behavior of attending physicians was to strengthen the monitoring. By contrast, the use of specific anti ischemic therapies varied widely according to the amount of TnIc released.

References:

1 Ausset. S, et al. Eur J Anaesthesiol 2008;25:158–64.
2 Cirodde. A, et al. Ann Fr Anesth Reanim 2008;S198:R092.

4AP5-6

Positive end-expiratory pressure as a test to predict fluid responsiveness in patients after coronary surgery

V. Kuzkov, A. Smetkin, L. Katysheva, M. Zemtsovsky, M. Kirov

Department of Anesthesiology and Intensive Care Medicine, Northern State Medical University, Arkhangelsk, Russian Federation

Background and Goal of Study: Fluid responsiveness (FR) is referred to the ability of fluid load to increase actual preload and cardiac output [1]. Despite many FR predictors have been suggested, some of them require special monitoring tools and are applicable to the controlled mechanical ventilation only. The aim of our study was to compare the reliability of the test with increased positive end-expiratory pressure (PEEP) with other predictors of FR, including passive leg raising test (PLR) [2] and pulse pressure variation (PPV).

Materials and Methods: Upon the transfer to ICU after off-pump coronary artery bypass grafting, 12 patients were enrolled into the study (3 females, 9 males aged 59 ± 8 yrs, ejection fraction 0.57 ± 0.12). The patients were ventilated with a tidal volume 8 ml/kg and PEEP 5 cm H_2O. Invasive arterial pressure (AP), central venous pressure (CVP), PPV, and respiratory mechanics were registered throughout the consecutive tests including short periods of increased PEEP (15 cm H_2O) and PLR. A bolus of gelatin (6 ml/kg) was infused regardless the registered hemodynamic changes. Among the suggested predictors of FR, we compared the changes in systolic, diastolic, mean, and pulse AP as well as in CVP to the increased PEEP and PLR. Data were analyzed by multiple regression method (stepwise approach, $p < 0.05$ was required to enter variable).

Results and Discussion: The most reliable predictor of FR as judged by absolute increase in pulse AP following the fluid loading was the absolute decrease in pulse AP due to increased PEEP ($r^2 = -0.69$, $p = 0.005$). The PLR-test was registered as a competing predictor ($r^2 = 0.41$, $p = 0.038$). Other suspected values including baseline PPV and changes in CVP induced by PEEP and PLR did not reach the entrance threshold and were excluded. The PEEP-induced changes in systolic and mean AP may also be used as an acceptable alternative ($r^2 = -0.57$, $p < 0.0001$; $r^2 = -0.47$, $p = 0.002$, respectively) to pulse AP.

Conclusion(s): In emerging post coronary surgery patients, the absolute changes in pulse or systolic arterial pressures induced by moderately increased PEEP or passive leg raising may be considered as simple and acceptable predictors of fluid responsiveness.

Acknowledgements: We highly appreciate the assistance of Drs. Lenkin AI, Paromov KV, and Slastilin VY.

References:

1 Pinsky MR, Payen D. Functional hemodynamic monitoring. Crit Care 2005;9:566–572.
2 Monnet X, Teboul JL. Volume responsiveness. Curr Opin Crit Care 2007;13:549–553.

4AP5-7

Anesthetic management and outcome of total arch repair with brachiocephalic bypass and concomitant endovascular stent graft placement

C. Saeki, Y. Taniguchi, A. Uchida, R. Nakazawa, M. Takinami

Department of Anesthesiology, Jikei University, Tokyo, Japan

Background and Goal of Study: With advancement of endovascular stent graft technique, total arch repair can be accomplished by a hybrid procedure with conventional extra-anatomic bypasses with subsequent thoracic endovascular grafting. The purpose of this study is to describe the anesthetic management and perioperative outcome of this group of patients (hybrid or HY group) and to compare them with a control group of patients who had undergone thoracic endovascular aneurysm repair (TEVAR) only (TE group).

Materials and Methods: Of 111 patients treated with thoracic endovascular grafting for different thoracic aortic pathologies from August 2006 to November 2008, we identified 57 patients in HY group. Following IRB approval, a retrospective database and medical record review was performed to evaluate comorbidities, anesthesia and surgery time, intraoperative blood loss, anesthetic technique as well as perioperative complications, length of ICU stay, length of hospitalization, and 30-day mortality. Fisher's exact test were used for comparison of the two groups. $P < 0.05$ was considered as statistically significant.

Results and Discussion: The demographics of the patients in each group are similar. Significant comorbidities included hypertension (83% vs. 80%, HY group vs. TE group) and coronary artery disease (33% vs. 13%). General anesthesia was the predominant type of anesthesia in HY group (79%), whereas regional anesthesia alone was employed in most of the patients in TE group (61%). Surgical and anesthesia times were significantly longer in the HY group. Blood loss was also significantly greater in the HY group than TE group. The incidence of postoperative neurological complications, cardiac events, temporary renal failure, and prolonged ventilatory support was greater in HY group. The ICU stay and hospitalization was also longer in HY group. The overall perioperative thirty-day mortality was slightly higher in HY group (7% vs. 4%), but did not reach statistical significance.

Anesthetic management

	group TE	group HY	P, Value
Anesthesia time (min)	223 ± 56	400 ± 201	0.001
Surgical time (min)	150 ± 48	310 ± 176	0.001
Blood loss (ml)	226 ± 252	1837 ± 4262	0.0065

mean ± SD

Conclusion(s): Although hybrid arch repair is feasible for patients otherwise considered prohibitively high risk for traditional open arch repair, those patients require long and complex anesthetic management. Unfortunately these challenges were often translated into postoperative periods.

4AP5-8

Revised cardiac risk index (Lee) and perioperative cardiac events as predictors of long-term mortality in patients undergoing endovascular abdominal aortic aneurysm repair

S. Archan, C. Roscher, R. Fairman, L. Fleisher

Department of Anesthesiology and Critical Care, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania, USA

Background and Goal of Study: While a substantial reduction in perioperative cardiac morbidity and mortality has been demonstrated for endovascular repair of abdominal aortic aneurysms as compared to open surgical repair, randomized trials failed to show a late survival benefit. Consequently, stratification of patients by risk of long-term all-cause mortality has become a more important factor in clinical decision-making.

Materials and Methods: We hypothesized that the Revised Cardiac Risk Index (Lee) would predict perioperative myocardial ischemic injury as well as long-term all-cause mortality in a retrospective analysis of 225 patients admitted to the Hospital of the University of Pennsylvania for endovascular aortic aneurysm repair from 1998 to 2006.

Results and Discussion: There were no in-hospital cardiac deaths. The major adverse cardiac event (MACE) rate in the perioperative period was 6.2%. Long-term all-cause mortality was 23%. Univariate analysis demonstrated that history of CAD (LR 7.6, $p = 0.02$), history of CHF (LR 4, $p = 0.042$) and a RCRI > = 3 (LR 8.6, $p = 0.004$) were significant predictors for perioperative cardiac events. History of CAD (LR 10.7, $p = 0.002$), echocardiographic evidence of MI (LR 8.5, $p = 0.006$), exercise tolerance of only 1 block (LR 8.4, $p = 0.005$), RCRI > = 3 (LR 5.6, $p = 0.022$), and perioperative cardiac events (LR 15.9, $p < 0.0001$) were significantly associated with long-term all-cause mortality. Perioperative cardiac events remained highly significant in predicting long-term mortality within the RCRI > = 3 subgroup (LR 6.1, $p = 0.019$).

Conclusion(s): Our results confirm that long-term mortality remains high after EVAR. The Lee index may be a useful tool for stratification of high-risk patients from both a short- and long-term perspective in the setting of endoluminal graft repair.

References:

1 Lee TH, Marcantonio ER, Mangione CM, et al.: Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. Circulation 100:1043–1049, 1999.
2 de Virgilio C, Tran J, Lewis R, et al.: Factors affecting long-term mortality after endovascular repair of abdominal aortic aneurysms. Arch Surg 141:905–909; discussion 909–910, 2006.
3 Aziz IN, Lee JT, Kopchok GE, et al.: Cardiac risk stratification in patients undergoing endoluminal graft repair of abdominal aortic aneurysm: a single-institution experience with 365 patients. J Vasc Surg 38:56–60, 2003.

4AP5-9

Acute renal failure in coronary artery bypass grafting

C. Di Lorenzo, A. Manzi, M. Reggi, F. Petrini, A. Calafiore

Anaesthesiology and Intensive Care, University of Chieti-Pescara, Chieti, Italy

Background and Goal of Study: Cardiopulmonary bypass (CPB) produce a systemic inflammatory response with activation of alternative complement pathway (C3a, C5a), cytokine release and neutrophil-mediate tissue and endothelium injury [1]. It, along with atherosclerosis emboli due to aortic manipulation, can yield postoperative acute renal failure [1,2]. The aim of this retrospective analysis was to evaluate the impact of CPB on ARF rate in patients with normal preoperative renal function undergoing isolated coronary artery bypass grafting (CABG).

Materials and Methods: From January 1995 to December 2002, 2866 pazients wiht normal preoperative creatinine value (<1.5mg/dl) underwent isolated CABG to revascularize more than one coronary territory. Applying propensity score, 1888 patients were selected (944 on-pump and 944 off-pump) with similar preoperative and operative characteristics.
Results and Discussion: ARF rate was 5.5% (3.0% off-pump vs 8.0% on-pump, $p < 0.001$). Multivariate analysis confirmed CPB to be a risk factor for ARF rate increment (OR = 3.4, $p < 0.0001$). ROC curve found out that CPB duration was predictive for ARF (AUC = 0.79, $p < 0.001$), with a cut-off of 60 minutes. Preoperative creatinine was identical in both groups (1.03 ± 0.21 mg/dl). In the postoperative period peak of creatinine was 1.27 ± 0.60 mg/dl, significantly higher the the preoperative one ($p < 0.001$); in off-pump group it rose to 1.20 ± 0.50 mg/dl ($p < 0.001$), whereas in the on-pump group it rose to 1.34 ± 0.70 ($p < 0.001$). Thus, percentage increment of creatinine from pre- to postoperative period was significantly higher in the on-pump group (30.5% vs 16.7%, $p < 0.001$).
Conclusion(s): CPB employment yields a significant increment of ARF rate. Moreover, a CPB longer than 1 hour produces a deeper damage. Creatinine increases also in off-pump patients, likely due to temporary hypotension during lateral wall exposure [3]. However, even if creatinine increases in both groups, renal injury is greater in on-pump patients and this causes higher rate of postoperative ARF.
References:

1 Wehlin L, Vedin J, Vaage J, Lundahl J. Activation of complement and leukocyte receptors during on- and off pump coronary artery bypass surgery. Eur J Cardiothorac Surg 2004;25:35– 42.
2 Doty JR, Wilentz RE, Salazar JD, Hruban RH, Cameron DE. Atheroembolism in cardiac surgery. Ann Thorac Surg. 2003;75:1221–6.

4AP5-10

Angiotensin-converting enzyme inhibitors during non-cardiac surgery: How do they affect morbidity and mortality?

E. Pujol, G. Fita, S. Sabaté, R. Pujol, J. Castaño

Anaesthesia, Hospital Clinic, Barcelona, Spain

Background and Goal of Study: The use of Angiotensin-Converting Enzyme (ACE) inhibitors during the immediate preoperative period is controversial. Some studies relate this treatment with higher haemodynamic instability, while certain guidelines recommend its maintenance throughout the perioperative period. The objective of this study was to determine the prevalence of ACE inhibitor treatment in the studied population, as well as its association with morbidity and mortality in the perioperative period.
Materials and Methods: A randomized 6-week prospective multicentre cohort study (ANESCARDIOCAT study) was carried out in 23 hospitals in Catalonia in 2007–2008. Eligible population were patients aged 40 or older, undergoing medium or high risk non-cardiac surgery, whether elective or emergency surgery, excluding obstetrics, performed under general or regional anaesthesia. We collected demographic data, type of surgery and anaesthesia, perioperative events, and in-hospital mortality. χ^2 test was used to compare qualitative variables and t test to compare quantitative variables.
Results and Discussion: We analyzed a sample of 3381 patients (age 67.22, range 40–100; 51.7% male, 48.3% female). 770 (22.8%;) were being treated with ACE inhibitors (ACE inhibitors group); 2611 (72.4%) were not (control group). In 220 of these patients (28.6%), the treatment was suspended at least 24 hours before surgery; for the remaining 550 (71.4%) patients, treatment was maintained. The presence of hemodynamic instability (arterial hypotension or hypertension) during surgery was analyzed. 147 patients of the ACE inhibitor group (19.1%) presented hemodynamic instability, with 425 patients (16.3%) presenting in the control group. ($p = 0.71$). Analyzing the postoperative period, we found 43 patients in the ACE inhibitor group suffering cardiovascular complications (5.58%), and 94 (3.6%) in the control group ($p = 0.165$). Overall mortality was 2.07% in the ACE inhibitor group (25% due to cardiac events), and 1.8% in the control group (13.1% due to cardiac events). During postoperative period we analyzed the reintroduction of the treatment after the surgery.

ACEI REINTRODUCTION

	ACEI REINTRODUCTION
NO REINTRODUCTION	68 (9.8%)
DURING HOSPITALIZATION	539 (77.8%)
ON RELEASE	58 (12.3%)
TOTAL	692
MISSING DATA	78

Conclusion(s): 22.7% patients scheduled for noncardiac surgery are under Angiotensin-Converting Enzyme inhibitors therapy. We found no significant differences in perioperative morbidity and mortality between patients receiving ACE inhibitors and those who did not.

4AP6-1

The effect of dexmedetomidine on propofol amount and hemodynamic parameters at anesthesia induction

G. Demir, G. Asik Eren, Z. Cukurova, O. Hergunsel

Anesthesiology, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Istanbul, Turkey

Background and Goal of Study: In this study, the effect of single dose dexmedetomidine usage before anesthesia induction on propofol requirement and hemodynamic changes appearing against laryngoscopy and intubation; and the degree of sedation provided is investigated.
Materials and Methods: 80 patients scheduled for surgery under general anesthesia were randomly assigned into two groups (Group DXM, and Group PLS). 30 minutes before induction 1 μg kg^{-1} dexmedetomidine in 100ml saline was administered to Group DXM and 100ml saline-only was administered to Group PLS in ten minutes. Anesthesia induction was performed by 2 μg kg^{-1} fentanyl, propofol infusion at a rate of 600 ml h^{-1} until loss of verbal contact and eyelash reflex; and 0.1 mg kg^{-1} vecuronium. Blood pressures and heart rates before premedication, before and after induction, after laryngoscopy and intubation and 5 minutes after intubation and Ramsay scores before and after premedication were evaluated.
Results and Discussion: While group PLS required 2.27 ± 0.43 mg kg^{-1} propofol at induction, this quantity was 1.27 ± 0.22 mg kg^{-1} in group DXM ($p < 0.001$). Mean blood pressure and heart rate decreased significantly in group DXM after premedication compared to group PLS ($p < 0.01$). In group PLS, MBP decreased by 15,59% ± 17,01 after induction compared to before induction and increased by 10,63% ± 19,72 after intubation. In Group DXM, MBP decreased by 9,65% ± 11,31 after induction and increased by 3,48% ± 18,63 after intubation. The decrease in MBP after induction in Group DXM was significantly lower ($p < 0.05$).

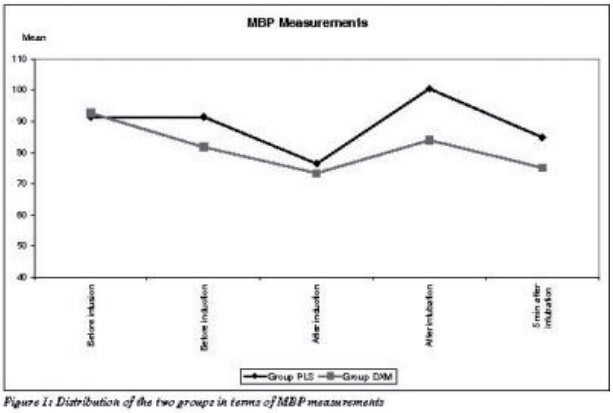


Figure 1: Distribution of the two groups in terms of MBP measurements

Conclusion(s): Dexmedetomidine usage before induction decreases the required amount of propofol significantly. Although 1 μg kg^{-1} dexmedetomidine decreases blood pressure and heart rate markedly, this decrease is not big enough to compromise hemodynamics. By using dexmedetomidine sedation is provided effectively before induction, hemodynamic changes generated against induction, laryngoscopy and intubation become more stable.

4AP6-2

Cardiovascular and arousal responses to laryngoscopy and tracheal intubation in spinal cord-injured patients

K. Yoo, S. Chung, S. Kim, C. Jeong, S. Jeong

Anesthesiology and Pain Medicine, Chonnam National University Medical School, Gwangju, Korea

Background and Goal of Study: Laryngoscopy and tracheal intubation elicits arousal and hemodynamic responses. We determined whether the arousal and autonomic responses to intubation were altered in patients with spinal cord injury (SCI).
Materials and Methods: One-hundred sixteen patients with traumatic complete SCI were grouped according to the time elapsed after the injury (less than 3 days and more than 9 months) and the level of injury (above T5 and below T5): acute high (AH, n = 25), chronic high (CH, n = 26), acute low (AL, n = 20), and chronic low (CL, n = 45). Twenty-five patients without SCI served as control. Bispectral index (BIS) to detect arousal response, systolic arterial pressure (SAP), heart rate (HR), and plasma concentrations of catecholamines and arginine vasopressin were measured.

Results and Discussion: CH and CL groups showed a greater reduction in BIS values after anaesthesia induction with thiopentone than the control ($P < 0.05$). However, the intubation similarly increased BIS values from the value measured just before starting laryngoscopy (arousal) among the groups. Although the intubation increased SAP in AL and CL groups as in control, it was without effect on SAP in AH and CH groups. HR was significantly increased in all groups; however, the magnitude of which was smaller in AH than the other groups. Plasma noradrenaline concentrations increased in every except AH group. Vasopressin concentrations were not affected in any groups.

Conclusion(s): Arousal response to intubation, as measured by BIS, is not altered in SCI, while the cardiovascular and catecholamine responses may be changed as a function of the time elapsed and the level of the injury. However, an identical dose of thiopentone may reduce BIS value following intubation more profoundly in chronic SCI patients.

4AP6-3

Levosimendan in congenital cardiac surgery

M. Momeni, A. Matta, M. Rennotte, J. Rubay, T. Detaille

Anesthesiology, Cliniques Universitaires Saint Luc, Brussels, Belgium

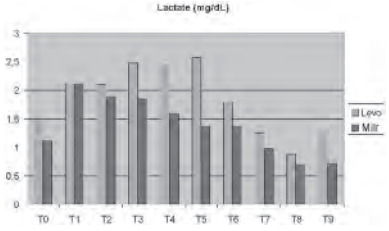
Background and Goal of Study: Low cardiac output syndrome (LCOS) after congenital cardiac bypass surgery is predictable, requiring inodilators. Levosimendan (Levo) increases contractility without increasing oxygen consumption. We hypothesized that Levo would be more suitable than Milrinone (Milr) to decrease the incidence of LCOS.

Materials and Methods: With parental informed consent 9 patients (0–5 years) were allocated in a randomized, double-blind fashion to Levo 0.05 or Milr 0.4µg/kg/min started at the onset of cardiopulmonary bypass (CPB); doubled if necessary. Epinephrine was started at 0.02µg/kg/min after aortic cross clamp (ACC) release. Additional inotropic support was allowed. Study drug was stopped after 48 hours. Parameters were recorded at: postinduction T0 and T1, T2, T3 & T4 respectively 10,30,45 and 60 min post CPB; T5, T6, T7, T8 & T9 respectively 1,4,12,24 &48 hours postoperatively. Table 1 shows patient characteristics. Primary end point was a significant decrease of lactate at T6. Student t-test was used to compare lactate levels beween both groups. $P < 0.05$ was considered significant.

Patient characteristics

	Levo: n = 5	Milr: n = 4	P
Age, days, median (range)	52 (8–753)	101 (51–186)	0.48
Weight, kg, median (range)	3.7 (3.2–10.8)	3.9 (3.5–4.2)	0.38
Study medication, total dose (µg/kg) #	173 ± 84	1517 ± 382	
Epinephrine, total dose (µg/kg) #	39 ± 65	3 ± 1	0.31
Milr 48h, total dose (µg/kg) #	53 ± 49	14 ± 29	0.21
Intubation, hours #	99 ± 65	41 ± 27	0.14
CPB, min #	138 ± 39	76 ± 29	0.03*
ACC, min #	70 ± 13	41 ± 15	0.01*
Surgery			
Arterial switch	2	0	
ALPACA	1	0	
VSD	1	3	
CAVC	1	1	

Results and Discussion: There was no mortality. In the Levo group CPB and ACC time were significantly longer. There was no significant difference between lactate levels at T6. Figure 1 shows mean lactate at different intervals.



Conclusion(s): Preliminary results show no difference between Milr and Levo in the incidence of LCOS. Levo seems safe. However patients in the Levo group underwent more complex surgery. Therefore results should be taken with caution.

4AP6-4

Comparison between bispectral index and cerebral oximetry during carotid endarterectomy

K. Nguyen, P. Baele, C. Watremez, P. Forget, M. Momeni

Anesthesiology, Cliniques Universitaires Saint Luc, Brussels, Belgium

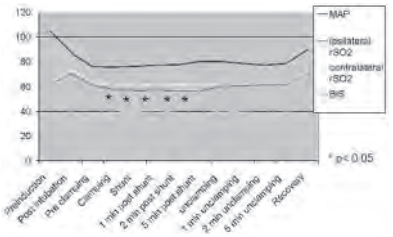
Background and Goal of Study: Detecting cerebral hypoperfusion during carotid endarterectomy remains challenging. Cerebral oximetry by monitoring regional oxygen saturation (rSO_2) could help so[1]. Bispectral index (BIS), a processed EEG parameter, has shown reductions during cerebral hypoperfusion[2]. This study observed how BIS and rSO_2 correlated during surgery with risk of hypoperfusion.

Materials and Methods: 40 consecutive patients were selected; 2 excluded for lack of space to put both devices. Anesthesia was induced using propofol TCI keeping BIS:40–60. BIS and rSO_2 were recorded at the following intervals: preinduction T0, post intubation T1, pre carotid clamping T2, clamping T3, shunt placement T4, T5, T6 & T7 respectively 1, 2 & 5 min post shunt, unclamping T8, T9, T10 & T11 respectively 1, 2 & 5 min after unclamping, recovery T12. Table 1 shows patient characteristics. MANOVA was used to compare BIS and rSO_2 at each time point with preclamping values. $P < 0.05$ was considered significant.

Patient characteristics

	n	%
Age,Yr, mean (SD)	71 (8)	
Male	26	68
Clamping time, min, mean	26 (7)	
Contralateral stenosis	12	32
Symptomatic	15	39
Coronary disease	6	16
Hypertension	34	89
Diabetes	10	26
Hyperlipidemia	26	68
Current smoker	8	22
Previous smoker	12	32

Results and Discussion: Shunt placement occurred in 22 patients. One patient showed a delayed recovery and a concomitant low BIS due to a thrombus removed immediately. Figure 1 shows mean values of BIS, rSO_2 and mean arterial blood pressure. Carotid clamping resulted in a significant drop of ipsilateral rSO_2 resolving after unclamping. Shunt placement did not reverse the drop. BIS did not change significantly after clamping.



Conclusion(s): Statistically significant rSO_2 changes occurred after clamping uncorrelated to BIS. A rSO_2 decrease is not necessarily associated with a clinical relevant cerebral hypoperfusion under anesthesia.

References:

1 Cuadra SA, Zwerling JS, Feuerman M, et al. Cerebral oximetry monitoring during carotid endarterectomy : effect of carotid clamping and shunting. Vasc Endovasc Surg 37: 407–413; 2003.

2 Merat S, Levecque JP, Le Gulluche Y, et al. BIS monitoring may allow the detection of severe cerebral ischemia. Can J Anaesth 48: 1066–1069; 2001.

4AP6-5

Influence of intrathecal morphine on target controlled infusion (TCI) anesthesia using remifentanil-propofol for the on-pump cardiac surgery

R. Chatti, R. Plat, S. Lemaire, J. Morin, G. Boccara

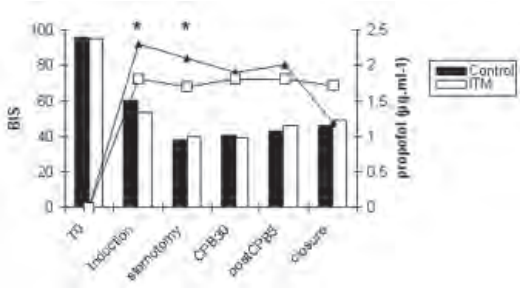
Anaesthesia and Intensive Care Unit, Saint-Joseph Hospital, Paris, France

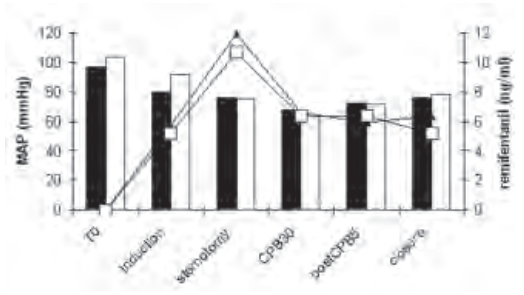
Background and Goal of Study: TCI using propofol and remifentanil is proposed to perform anaesthesia for cardiac surgery [1]. For the postoperative analgesia, intrathecal morphine (ITM) was suggested efficiently and safely [2]. We studied the influence of ITM on the TCI parameters.

Materials and Methods: We studied prospectively the patients scheduled for cardiac surgery under cardioplumonary bypass (CPB) and receiving propofol-remifentanil TCI anaesthesia. Patients having ITM contraindication were excluded. Before induction, 5 $\mu g \cdot kg^{-1}$ morphine was administred intrathecally via L3–L4. TCI anaesthesia was used through Primea device: propofol titration from 2 $\mu g \cdot ml^{-1}$ (Schneider formula) and remifentanil from 5 $ng \cdot ml^{-1}$ (Minto formula). Bispectral analysis (BIS Aspect) was used to obtain 40–60 range values. Myorelaxation consisted on cisatracurium. Postoperative analgesia was started

before closure using i.v paracetamol, NSAIds and 0.15 mg·kg^{-1} morphine, then iv morphine PCA. We compared the TCI parameters and haemodynamics to control group without ITM. Data are expressed in means (SD) and% of patients and compared using Student't test or ANOVA. * P < 0.05.

Results and Discussion: Demographic and surgical data were comparable. Induction parameters (Intubation 7.2 ± 1.2 vs 8.1 ± 1.3 min) and haemodynamics were similar. Postoperative analgesia was better in ITM without delayed respiratory depression.





	ITM group (n = 20)	Control group (n = 20)
Extubation before H4 (n)	18/20	15/20
Maximal Cardiac troponin I (µg/l)	1.7 ± 1.2	1.6 ± 0.9
Post-CPB vasopressor support (n)	2/20	1/20
24-hours morphine PCA (mg)	1.2 ± 2.5 *	21.6 ± 15.5
$PaCO_2$ at H4	45.2 ± 6.7*	37.5 ± 5.7

Conclusion(s): TCI remifentanil and propofol parameters were not modified by ITM. Otherwise, ITM did not influence intraoperative and postoperative haemodynamics.

References:

1 Ouattara et al. Br J Anaesth. 2003; 90: 617
2 Zarate et al. Anesth Analg. 2000; 91: 283.

4AP6-6

Follow up of central catheter venous colonization after prosthetic heart valve surgery

A. De la Chapelle, A. Mihoubi, P. Dellamonica

Anesthesie et Reanimation Cardiaque, Arnault Tzanck, Saint Laurent du Var, France

Background and Goal of Study: Prosthetic valve endocarditis (PVE) is associated with significant mortality and morbidity. Central venous catheter (CVC) infection especially with Coagulase-negative staphylococci (CoNS) is incriminated as cause of secondary endocarditis. These bacteria are part of the commensal flora of human skin. One of challenges of daily diagnostic practice is to distinguish clinically significant CVC infection from contaminant strains. At our institution, in the post operative period of prosthetic heart valve surgery, patients with infected CVC are given a 10 days regimen of antibiotics adapted to the antibiogram, even if there is no clinical sign of systemic infection. The aim of this study was to evaluate this strategy.

Materials and Methods: We conducted a 3 years prospective observational study of post operative prosthetic heart valve surgery patients. Patients with a positive CVC were included from jan 2006 to dec 2008. The following data were collected: sign of systemic infection, microbiology, demography, antibiotherapy strategies and adverse effects of therapy. Long term follow up was made at one and two years by phone call, and patients suspect of PVE were invited to have an echocardiography, and a blood analysis.

Results and Discussion: 820 patients had a prosthetic heart valve surgery at our institution during this period. 49 (6%) CVC positive were identified. 30 after aortic valve replacement (60%), 75% were men, age 68 ± 9 years. All CVC were implanted in subclavian vein. Staphylococcus coagulase negative was the most common organism isolated (61%)(85% Meti Resistant MR), followed by gram-negative bacilli (GNB)(20%) and staphylococcus aureus (SA)(6%). In 5 patients blood cultures were positive. 15 patients had one other sign of sepsis. 23 CVC colonized by CoNS were not associated with any sign of sepsis. 75% MR CoNS were treated by the combination vancomycin/rifampicin (V/R). 2 patients were not treated. All colonization with GNB and SA were treated by effective antibiotherapy during 10 days. All minor side effects 40%(9) occured with the association V/R. No complication followed the placement of a new CVC for antibiotic administration. Positive CVC was responsible of 207 supplementary days of hospitalization. One year follow up: we overviewed 10% of patients, and 2 has been convened, investigations were negative. Two years follow up: 50% were overviewed but none was suspect of PVE.

Conclusion(s): Our strategy seems to be effective for preventing PVE but at a cost of a longer hospital stay that should be improved.

4AP6-7

Comparison of albumin 5%, hydroxyethyl starch 130/0.4 (6%) and Ringer's lactate for volume replacement during cardiac surgery

K. Skhirtladze, B. Birkenberg, A. Schiferer, A. Lassnigg, E. Base

Department of Anaesthesia, Div. of Cardiothoracic and Vascular Anaesthesia, Medical University of Vienna, Vienna, Austria

Background and Goal of Study: Conflicting results are in the literature regarding the effect of Hydroxyethyl starch (HES) solutions on platelet aggregation and blood coagulation. In a prospective, randomized trial we compared the effects of HES 130/0.4 6%, Human Albumin 5% (HA) and Ringer's Lactate (RL) on blood coagulation parameters in patients undergoing cardiac surgery.

Materials and Methods: Patients (n = 180) undergoing cardiac surgery were randomly assigned to receive either HES (n = 60), HA (n = 60) or RL (n = 60). The amount of cardiopulmonary bypass prime solution was 1500 mL in each group. Fluid management was guided by haemodynamic parameters. Since 50mL/kg/d are the maximum dose of HES recommended, all study solutions were given up to this amount. If additional volume was needed, RL was given in each group. Coagulation was monitored with intrinsic and extrinsic ROTEM®, InTEM and ExTEM, respectively. Coagulation time (CT) and clotting formation time (CFT) were determined at baseline (after induction of anaesthesia), at the end of surgery and on POD1. ANOVA was used for statistical analysis (Sigma Stat, San Jose, USA). A P-value of < 0.05 was considered significant. Data are given as means ± SD.

Results and Discussion: InTEM and ExTEM CT as well as InTEM CFT and ExTEM CFT were significantly prolonged in the HES group at the end of surgery compared to RL and HA. InTEM and ExTEM CFT was also significantly longer in the HA group after surgery. With exception of ExTEM CFT in the HA group all other parameters returned back to normal on POD1 (Table 1).

Table 1.

	RL	HA	HES
InTEM CT (s)			
Baseline	178 ± 46	171 ± 40	178 ± 37
End of surgery	215 ± 65	221 ± 60	233 ± 75*
POD1	169 ± 42	180 ± 32	179 ± 37
ExTEM CT (s)			
Baseline	61 ± 28	56 ± 13	60 ± 19
End of surgery	69 ± 30	75 ± 21	90 ± 30#
POD1	78 ± 43	73 ± 33	69 ± 27
InTEM CFT (s)			
Baseline	88 ± 73	73 ± 27	71 ± 22
End of surgery	114 ± 40	152 ± 63¤	195 ± 103#
POD1	90 ± 26	113 ± 40	92 ± 32
ExTEM CFT (s)			
Baseline	89 ± 23	82 ± 22	86 ± 27
End of surgery	119 ± 38	160 ± 65¤	206 ± 92#
POD1	100 ± 25	131 ± 41¤	115 ± 58

*P<.05 HES vs. RL; # P<.05 HES vs. RL and HA; ¤P<.05 HA vs. RL

Conclusion(s): Both colloid solutions induce prolonged In and ExTEM CTs and CFTs at the end of surgery, which were more pronounced in the HES group. Prolongation of ExTEM CFT, however, persisted until POD1 only in the HA group. These data indicate that both colloids could negatively affect coagulation when given at this dosage during cardiac surgery.

4AP6-8

Continuous monitoring of regional cerebral oxygen saturation during and outcome after OPCAB surgery

C. Verborgh, C. Pregardien, D. Oubaha, S. Beckers, J. Poelaert

Anesthesiologie, UZ Brussel, Brussels, Belgium

Background and Goal of Study: Using regional cerebral oxygen saturation (SrO2) monitoring to manage anesthesia in elderly patients can avoid brain hypoxia and hence reduce length of stay (LOS) (1). Active monitoring of SrO2 was also shown to correlate negatively with LOS in cardiac surgery with use of cardiopulmonary bypass (2). We wondered whether active monitoring of SrO2 during installation of the different positions of the heart in OPCAB surgery, would likewise reduce LOS.
Materials and Methods: After Institutional approval, 44 informed patients scheduled for off-pump CABG agreed to take part in this study. SrO2 (Invos®, Somanetics Corporation) was recorded via sensors placed on both frontoparietal areas. Patients were randomly allocated to a group in which SrO2 was actively monitored and not allowed to decrease more than 20% (Group I) or to a group in which the anesthesiologist and surgeon were blinded to the values of the SrO2 (group II). Hemodynamic variables were obtained with the heart in neutral position and different modified positions to allow sutures on the diseased coronaries. If lower limits of 60% for the SvO2 and 60 mm Hg for the mean blood pressure were exceeded, prompt treatment was initiated with vasoactive medications, alteration in table position and fluid administration. Mann-Whitney U-test and Wilcoxon's test was performed with Statistica®.
Results and Discussion: Weight, length and age were similar in both groups. Ejection fraction as evidenced by ventriculography was 56(3)% in group I and 57(3)% in group II. Decreases in SrO2 were not symmetric and generally more pronounced at the right side. The lowest mean SrO2 encountered in group I was 60(3)% at the left side and 52(2)% at the right side, during anastomosis of the posterior branch of the right coronary artery. This corresponded to a 9(2)% and 16(4)% decrease respectively. LOS at the intensive ward was 80 (19) hours in group I and 74 (15) hours in group II. Hospital LOS was 256 (32) hours and 265 (37) hours respectively. These differences are not significant. Using SrO2 with a 20% decrease limit next to classical active hemodynamic monitoring did not seem to lead to a shorter LOS as compared to classical active hemodynamic monitoring alone.
Conclusion(s): The supplemental use of the Invos® regional cerebral oximeter does not seem to have a large impact on hospital or intensive ward LOS in OPCAB patients, actively monitored with conventional hemodynamic variables.
References:
1 Casati A et al. Anesth Analg 2005; 101: 740–7.
2 Murkin JM et al. Anesth Analg 2007; 104: 51–58.

4AP6-9

Anaerobic threshold determined by cardiopulmonary exercise testing as a predictor of complications after major vascular surgery

C. Farrow, D. Pryor, Z. Ridgeway, S. Turvill, S. Howell

Academic Unit of Anaesthesia, The General Infirmary at Leeds, Leeds, United Kingdom

Background and Goal of Study: The primary objective of this prospective observational study was to determine the association between an anaerobic threshold (AT) of less than 8.5 ml/kg/min determined by cardiopulmonary exercise (CPX) testing and the occurrence of postoperative complications in patients undergoing major vascular surgery.
Materials and Methods: Patients presenting for open (AAA) or endovascular abdominal aortic aneurysm repair (EVAR) and those presenting for surgery for peripheral vascular disease (PVD) underwent a submaximal CPX test before surgery. The AT was determined by the V-slope method and confirmed using dual criteria. In-hospital postoperative complications were recorded. The relative risk (RR) and 95% confidence interval for the association between an AT of less than 8.5ml/kg/min and postoperative complications was determined.
Results and Discussion: CPX testing was performed in 77 patients and AT was determined in 69 patients (58 men, median (range) age 74.6 (51.6–87.3) years. Surgery was open AAA repair n = 46, EVAR n = 11 and surgery for PVD n = 12. 30 patients suffered postoperative complications including pneumonia n = 7, MI n = 9, LVF n = 3, extended respiratory support n = 4, extended circulatory support n = 1, AF n = 1, ARDS n = 1, bleed requiring intervention n = 3, and ischaemic colitis n = 1. Three patients died within 30 days. All three had undergone open aortic surgery. The RR (95% CI) for the association between AT less than 8.5ml/kg/min and complications was 2.7 (1.1–6.6), p = 0.012.
Conclusion(s): These data support an association between a low anaerobic threshold and the occurrence of postoperative complications. Larger studies are needed to characterise robustly the strength of this association but CPX testing may be of value for identifying patients who require preoperative optimisation and assessing the risks of surgery.

4AP6-10

Cerebral oxygen indices impairment during off-pump coronary revascularization and its relevance to early intellectual dysfunction

G. Tsaousi, A. Pitsis, D. Deliaslani, K. Karakoulas, D. Vasilakos

Anesthesiology and ICU, AHEPA University Hospital, Thessaloniki, Greece

Background and Goal of Study: Heart displacement during off-pump coronary artery bypass grafting (OPCAB) is notorious for engendering hemodynamic deterioration, which may implicate global cerebral perfusion and oxygenation. Aim of the study was to elucidate the magnitude of cerebral oxygen indices impairment during OPCAB surgery and its clinical relevance to early cognitive outcome.
Materials and Methods: Prospective study enrolling 30 consecutive candidates scheduled for OPCAB surgery. Blood samples from jugular bulb and arterial catheters for cerebral oxygen indices determination, were collected on six time points: anesthesia induction (T1), anastomosis of anterior, inferior and posterior wall (T2, T3 and T4, respectively), after sternal closure (T5) and 6 hours post operation (T6). Neurocognitive status was assessed with MMSE on 2nd and 7th day post OPCAB. Data were analyzed by repeated measures ANOVA and stepwise logistic regression.
Results and Discussion: During the study course measured (PjO_2, $PjCO_2$ and SjO_2) and estimated [arterio-jugular venous O_2 content ($AjDO_2$) and arterio-jugular venous pCO_2 ($AjDpCO_2$) differences, oxygen extraction ratio (O_2ER), and estimated respiratory quotient (eRQ)] cerebral oxygen indices changed significantly ($p < 0.001$). Data (mean ± SD) are shown in the Table. Cognitive status deteriorated in 8 patients on 2nd day post CABG, but it was almost fully recovered on 7th day. $AjDpCO_2$ [OR: 1.245 (95%CI: 1.097–1.413)] and $AjDO_2$ [OR:0.557 (95%CI: 0.369–0.841), were the most powerful determinants of the early (2nd day) cognitive impairment.
Conclusion(s): Abeit exposure and stabilization of three main coronary artery systems during OPCAB surgery, is implicated with cerebral oxygen indices derangement, which is more pronounced during vertical heart dislocation, this seems to be transient, remains within normal or near normal range and is almost completely reverted with heart re-positioning. $AjDpCO_2$ and $AjDO_2$ widening seems to be predictive of the detectable intellectual impairment, which occurs in the early postoperative period.

Table.

	T1	T2	T3	T4	T5	T6
PjO_2(mm Hg)	34 ± 4	33 ± 4	31 ± 4¨	29 ± 4†	32 ± 3*	33 ± 3
$AjDO_2$(ml/dL)	5.6 ± 1	5.9 ± 1	6.1 ± 1	6.9 ± 1¨	5.5 ± 1	5.3 ± 1
O_2ER (%)	35 ± 8	38 ± 9	42 ± 7¨	45 ± 8†	39 ± 7	37 ± 5
$PjCO_2$ (mm Hg)	40 ± 4	45 ± 3†	47 ± 4†	48 ± 3†	43 ± 4¨	44 ± 5¨
$AjDpCO_2$ (mm Hg)	–7.6 ± 2	–10.9 ± 4†	–12.1 ± 6†	–14.0 ± 4†	–10.2 ± 3*	–10.6 ± 4¨
eRQ (mm Hg/ml/dL)	1.4 ± 0.5	1.8 ± 0.5*	2.1 ± 0.5¨	2.2 ± 0.4†	1.8 ± 0.4	1.7 ± 0.4
SjO_2(%)	64 ± 8	62 ± 9	59 ± 8*	55 ± 8†	60 ± 7	62 ± 5

*p<0.05, ¨p<0.01, †p<0.001. p refers to time point T1

4AP6-11

Influence of the differential lung ventilation on stroke volume variation

A. Usami, H. Takahashi, T. Terada, Y. Kotake, R. Ochiai

Anesthesiology, Toho University, School of Medicine, Oomori-nishi, Oota-ku, Tokyo, Japan

Background and Goal of Study: Many clinical studies have demonstrated the value of arterial pulse pressure variation or stroke volume variation (SVV) to estimate fluid responsiveness or cardiac preload in mechanically ventilated patients, while the filling pressures such as CVP or PCWP do not necessarily represent the cardiac preload. However, during positive pressure ventilation, ventilatory settings could modify SVV by affecting transmural pressure of the major vessels. The present study was conducted to clarify whether differential lung ventilation (DLV) could affect SVV, compared with the values during two-lung ventilation immediately before DLV, while the airway pressure of mechanical ventilation was maintained constant throughout the study.
Materials and Methods: Twenty-one adult patients, who underwent video-assisted thoracic surgery (VATS), were enrolled, and the measurement was done before and during DLV in lateral decubitus position. FloTrac/Vigileo monitor was used to estimate cardiac output (CO), stroke volume and its variation (SV and SVV). Mean arterial pressure (MAP), pulse pressure (PP) and heart rate (HR) were also measured 5 min before DLV as well as 5 min immediately after the onset of DLV, while the ventilatory settings such as peak inspiratory pressure

and ventilatory frequency were maintained constant. Student's t-test was used to determine statistical significance (p,0.05).

Results and Discussion: Patient's characteristics were: Age 66 ± 7.5, height 159.3 ± 5.2 cm, weight 54.9 ± 7.5 kg. During DLV, SVV decreased significantly (13.8% to 9.6%), and PP increased significantly (51 to 55 mm Hg), while there were no significant changes in CO, HR and MAP.

Conclusion(s): Since the measurement was continued before and after the initiation of DLV, it is most likely that no major changes in blood volume or myocardial contractility were expected to induce such changes in SVV. It is suggested that the hemodynamic parameter, such as SVV, can be affected by ventilatory condition, resulting in the underestimation of fluid responsiveness during mechanical ventilation.

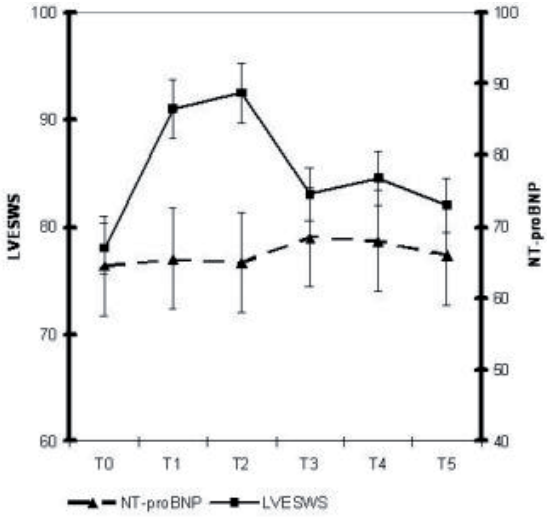
4AP7-1

The influence of pneumoperitoneum and trendelenburg on plasmatic levels of NT-proBNP

A. Russo, E. Di Stasio, D. Viviani, S. Colicci, E. Marana

Anesthesiology, Anesthesiology and Intensive Care Medicine, Rome, Italy

Background and Goal of Study: a known concern centres on the profound cardiovascular changes induced by the positive-pressure CO_2 pneumoperitoneum and the head down tilting. The augmented intra-abdominal pressure raises principally the systemic vascular resistance. Increased systemic vascular resistance results from a higher venous resistance, compression of the abdominal aorta, and increased afterload due to humoral factors. In the present study we investigated the hypothesis that the higher afterload could affect the myocardial secretion of the B-Type Natriuretic peptide.



[Figure 1]

Changes in the LVESWS (kdyn/cm2) and NT-proBNP (pg/ml) during laparoscopic hysterectomy. Asterisk indicates statistically significantly (P < .05) from T0.

Materials and Methods: ten female patients with ASA physical status I undergoing laparoscopic hysterectomy were enrolled into the study. A standardized general anesthetic and surgical technique was used for all patients. We used transthoracic echocardiography to calculate the Left Ventricular end-systolic Wall Stress (LVESWS) as an estimation of the afterload. Samples for measuring serum concentrations of the peptide were performed: in a preoperative time (T_0) and repeated 5 (T_1) and 10 (T_2) minutes after the creation of pneumoperitoneum, 5 (T_3) and 10 (T_4) minutes after a 30° of head-down positioning and at the end of surgical procedure (T_5).

Results and Discussion: five minutes after the onset of pneumoperitoneum (T_1), we observed a 61.8% ± 4.7% (mean ± standard deviation) increase in LVESWS, a 35.4% ± 11.9% increase in mean arterial pressure. At T_2 these variables did not modify in respect of T_1. The Trendelenburg position did not induce any further change of echocardiographic measurements. Although the augmented afterload resulted from CO_2 insufflation, the plasmatic levels of the NT-proBNP did not differ from preoperative values.

Conclusion(s): it has been well reported that NT-proBNP serum concentration increases in conditions of myocardial wall stretching. Our results suggest that neither CO_2 pneumoperitoneum nor Trendelenburg position could represent a powerful stimulus for the secretion of this peptide.

4AP7-2

Effects of the positive end expiratory pressure on systolic and diastolic left ventricular function determined by transoesophagical echocardiography

R. Alvarez-Rementería, M. Fajardo, J. Arcas, M. Aranzubía, E. Herrera

Servicio de Anestesiología y Reanimación, Fundación Jiménez Díaz., Madrid, Spain

Background and Goal of Study: Positive end expiratory pressure (PEEP) should improve lung compliance, decrease dead space, and decrease the intrapulmonary shunt effect. But PEEP is not an innocuous mode of therapy and it can lead to serious hemodynamic consequences. The purpose of our study is to evaluate by transesophageal echocardiography (TEE) the effects of differents levels of PEEP on the left ventricular (LV) function.

Materials and Methods: 11 patients undergoing cardiac surgery under cardiopulmonary bypass (sinus rhythm, no mitral disease or aortic regurgitation) were studied. The patients were ventilated with volume control ventilation (FIO_2:0.6, f:12 min^{-1}, appropiate tidal volume to achieve $ETCO_2$ of 4–4,6 kPa, PEEP:0), then PEEP was successively applied to PEEP 7, PEEP 15 and again PEEP 0 while arterial pressure (AP), central venous pressure (CVP) and TEE ventricular function were recorded. TEE evlaluation of LV systolic function was performed by determination of the LV-end diastolic area (EDA), LV end-systolic area (LVESA) and area ejection fraction (AEF) measured on short axis transgastric view of the LV. Diastolic function was evaluated by analysis of transmitral and pulmonary venous flow velocity pattern. The procedure was performed prior to the start of the surgery and was repeated at the end of it. Data are expressed as means values and standar deviation (statistical analysis: Student's t-test; significance value P < 0.05)

Results and Discussion: 21 sets of measurements were performed. Data are shown in the table

	Basal, PEEP 0	PEEP 7	PEEP 15	Final, PEEP 0
LVEDA (cm^2)	20.9 ± 6.8	20.5 ± 6.7	15.5 ± 5.8†	21 ± 7.3
LVESA (cm^2)	11.3 ± 6.5	11.3 ± 6.7	8.5 ± 4.9†	11.5 ± 6.6
CFA (%)	48.6 ± 13.9	48,1 ± 13,7	48,9 ± 11,6	48 ± 12,7
E Mitral inflow (cm/s)	59.1 ± 14.1	58.1 ± 13.8	43.7 ± 9.8†	59.1 ± 13.1
A mitral inflow (cm/s)	59.1 ± 14.1	59.1 ± 14.1	59.1 ± 14.1†	59.1 ± 14.1
E/A	1.1 ± 0.4	1.1 ± 0.4	1.2 ± 0.4	1.1 ± 0.4
S pulmonary vein inflow (cm/s)	53.9 ± 28.6	47.9 ± 25.2†	33.1 ± 20.2†	49.6 ± 21
D pulmonary vein inflow (cm/s)	44.9 ± 21.6	42.2 ± 19.3†	28.1 ± 11.2†	42.9 ± 17.4
PAM (mm Hg)	79.8 ± 14.6	75.7 ± 12.3	68.1 ± 12.2†	77.9 ± 13.8
PVC (mm Hg)	14.1 ± 5.2	14.5 ± 4.9	16.6 ± 5.2†	13.7 ± 5.2
Paw (peak) (cm H_2O)	21.4 ± 4.3	25.6 ± 3.3†	31.4 ± 2.4†	20 ± 4.6
Paw (media) (cm H_2O)	6.3 ± 1.3	11.5 ± 1.2†	19.3 ± 0.7†	6.2 ± 1.5

†P < 0.05

Conclusion(s): Our study shows that high levels of PEEP (15 cm H_2O) do not modify the systolic function of the LV evaluated by AEF, however at these levels of PEEP a decrease is produced in the values of LVEDA and the trasmitral and pulmonary vein blood flow velocity.

4AP7-3

Accuracy of pulmonary venous diastolic deceleration time derived data to estimate left atrial pressure

P. Wijnandts, E. De Beaumont, B. Preckel, J. Van Dijk, S. De Hert

Department of Anesthesiology, Academica Medical Center, Amsterdam, Netherlands

Background and Goal of Study: The clinical gold standard for estimation of mean left atrial pressure (LAP) is the pulmonary artery wedge pressure. It has recently been suggested that left atrial pressure can reliably be estimated using data derived from pulsed-wave Doppler echocardiographic analysis. (1) We hypothetized that measurement of the deceleration time of the pulmonary venous diastolic flow would also allow to correctly estimate LAP during cardiac surgery.

Materials and Methods: This prospective observational study was performed in 5 elective cardiac surgery patients. LAP was measured using a fluid-filled catheter positioned in the left atrium before and after cardiopulmonary bypass. Data were obtained at end-expiration. LAP data were compared to simultaneously measured pulmonary artery wedge pressure and to LAP estimation based on the deceleration time of the diastolic left superior pulmonary vein flow using pulsed-wave Doppler echocardiography. Data derived from these measurements were included in the regression equation to estimate LAP: (1). LAP = 53.236 – [0,302*Dtd] + [0,000484(DTd^2)] (DTd = diastolic deceleration time). Correlation between the variables was calculated using the Pearson correlation

coefficient en Bland-Altman analysis was performed. Statistical significance was accepted at $p < 0.05$.

Results and Discussion: There was no relation between directly measured LAP and its echocardiographic estimation ($R = 0.10$, $p = 0.79$). Bland-Altman analysis showed a bias of 6 ± 8 mm Hg (95% limit of agreement from – 9 to 22 mm Hg). Correlation coefficient R, between LAP and PCWP was 0.54 ($p = 0.13$). Bias between these variables was 4 ± 5 mm Hg (95% limit of agreement from – 7 to 14 mm Hg).

Conclusion(s): The present preliminary data suggest that LAP can not reliably be estimated using the deceleration time of the diastolic left superior pulmonary vein. Further observations are ongoing to determine whether anatomical (site of echocardiographic sampling) or physiological (alterations in ventricular loading and compliance conditions) variations may influence the results.

Reference:

1 Kinnaird TD, et al: J Am Coll Cardiol 2001; 37: 2025–30

4AP7-4

Restoration of homodynamics with "SCD EXPRESS venous compression system" during sitting position under adequate anesthetic level

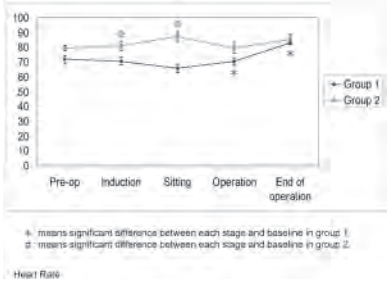
S. Hsin, J. Liu, C. Sheng

Anesthesiology, Chang-Hwa Hospital, Chang-Hwa, Taiwan

Background and Goal of Study: Shoulder joint operation performed under sitting position may cause unstable hemodynamic situation, cerebral blood flow reduced, and venous air embolism will be also easily complicated. We designed the experiment to investigate the effect of SCD EXPRESS venous compression system during sitting position surgery.

Materials and Methods: 30 patients, aged 18–65, ASA physical status grade I–II, receiving shoulder joint operation under general anesthesia with sitting position were enrolled to this study. 15 didn't use SCD EXPRESS venous compression system under general anesthesia, as contrast group; 15 received SCD EXPRESS venous compression system, as the experiment group. All patients in the experimental group received SCD EXPRESS venous compression system application before the induction of general anesthesia. After endotracheal tube intubation, we used sevoflurane under guidance of BIS readings to maintain the depth of anesthesia. Demographic and hemodynamic parameters are collected when patients arrive the operation room (time 1), 10 minutes after GA induction in supine position (time 2), patients are put in sitting position for 10 minutes (time 3), 10 minutes after skin incision (time 4), 10 minutes after patients were put in supine when the operation finished (time 5).

Results and Discussion: Diminished vigorous change of homodynamics with SCD EXPRESS venous compression system application during sitting position under adequate anesthetic level. Less blood loss and ephedrine dose consumption were also noted in the experimental group.



Conclusion(s): Use of SCD EXPRESS venous compression system may create stable hemodynamic state, less intraoperative blood loss and ephedrine dose consumption during sitting position operation. It might provide cardiovascular protective effect to the patients with cardiovascular disease or aged.

4AP7-6

Relationship between exhaled carbon monoxide and oxidative stress in ischemic-reperfusion injury during living donor liver transplantation

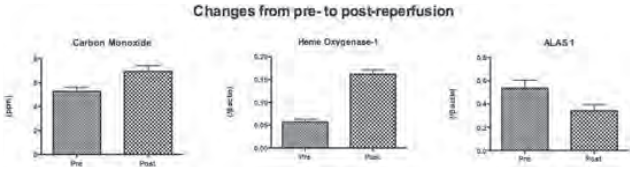
J. Matsumi, H. Morimatsu, H. Shimizu, T. Takahashi, K. Morita

Department of Anesthesiology and Resuscitology, Okayama University Hospital, Okayama, Japan

Background and Goal of Study: We previously reported that carbon monoxide (CO) concentration in exhaled air markedly increased immediately after reperfusion of the graft liver in patients undergoing living donor liver transplantation (LDLT). In the present study, we measured hemeoxygenase (HO) – 1 gene expression at pre and post-reperfusion of the graft liver and examined its relationship to exhaled CO concentration.

Materials and Methods: We studied consecutive 19 cases of LDLT. Liver samples were obtained from the graft liver at the time of the resection of the graft from the donor and at the end of surgery of the recipient. We analyzed expression of HO – 1 as well as the non-specific delta-aminolevulinate synthase (ALAS1), the rate-limiting enzyme in heme catabolism and biosynthesis, respectively by RT-PCR. We also measured exhaled CO concentration after induction and 1 hour after reperfusion during the anesthesia of the recipients using a newly developed gas sensor (CARBOLYZER mBA-2000TM, TAIYO Instruments INC. Osaka, Japan). Analyses were conducted using paired t test. A $p < 0.05$ was considered statistically significant.

Results and Discussion: Hepatic HO – 1 mRNA was markedly increased after reperfusion of the graft liver compared with those of pre-reperfusion. The average level of HO – 1 mRNA showed almost 3-fold increase in post-reperfusion value compared with the pre-reperfusion. In contrast to HO – 1 gene expression, gene expression of ALAS1, which is known to be suppresed by heme, was markedly decreased after reperfusion compared with those of pre-reperfusion. Exhaled CO levels are robustly and rapidly increased after reperfusion of the graft liver and the increased CO level significantly correlated with HO – 1 gene expression ($r^2 = 0.19$, $p = 0.0078$).



Conclusion(s): Following reperfusion of the graft liver, there is a marked up-regulation of HO – 1 gene expression which is significantly correlated with the increase in exhaled CO concentration. In contrast, ALAS1 expression is down-regulated after reperfusion of the graft liver. These findings may reflect an increase in intracellular free heme concentration the graft liver after reperfusion which incites enhanced heme breakdown, ultimately leading to the increase in exhaled CO concentration.

4AP7-7

Multicenter prospective study for hemodynamic changes during anesthetic induction: Remifentanil vs fentanyl

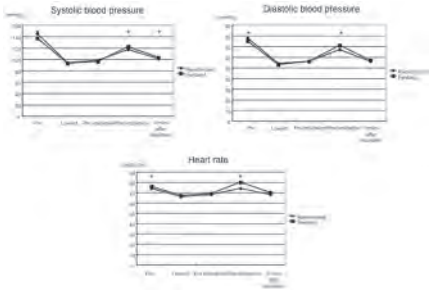
H. Morimatsu, K. Sato, H. Nakatsuka, M. Yokoyama, K. Morimta

Department of Anesthesiology and Resuscitology, Okayama University Hospital, Okayama, Japan

Background and Goal of Study: Choice of opioids might affect hemodynamic changes during anesthetic induction. We conducted this prospective observational study to determine what is a current practice of anesthetic induction, and whether there are different hemodynamic effects between remifentanil and fentanyl based anesthetic induction.

Materials and Methods: This prospective observational study conducted in 25 centers around Okayama area in Japan. Inclusion criteria were those who were age > 20 years old and undergoing general anesthesia with tracheal intubation. Prospectively implemented case sheet was used to collect demographics and anesthetic information. Systolic and diastolic blood pressure (SP and DP), and heart rate (HR) were recorded in 5 time points; before induction, lowest during induction, just before intubation, just after intubation, and 5 minutes after intubation. We also collected the incidences of serious adverse events including severe hypotension and bradycardia. Then, we compared these variables between remifentanil and fentanyl groups. Because each group was not well balanced, propensity score analyses were conducted using age, ASA PS, departments, epidural use, and hypertension as matching variables.

Results and Discussion: During 3 months study period, 2476 patients were included in this study. Demographic variables were well balanced between the groups. Surgical departments were different between the groups, more remifentanil in orthopedics, otolaryngology, and neurosurgery, less remifentanil in gynecology. The means of lowest values of SP, DP, and HR were not different between the groups, but all were significantly higher after intubation in the fentanyl group than in the remifentanil group. The incidence of hypotension was not different between the groups. However, the remifentanil group was associated with more bradycardia than the fentanyl group. Propensity score analyses revealed that the trends of hemodynamic changes were similar to non-matched analyses, but the difference of the incidence of bradycardia disappeared.



Conclusion(s): Modified remifentanil based anesthetic induction was not associated with hemodynamic deterioration compared to conventional fentanyl based method.

4AP7-8

Effects of a staggered tourniquet release on acute metabolic changes following surgery of the lower limb

J. van der Velde, G. Iohom

Anaesthesia and Intensive Care Medicine, Cork University Hospital, Cork, Ireland

Background and Goal of Study: To compare two thigh tourniquet release strategies in terms of acute metabolic and hemodynamic changes associated with limb reperfusion following lower limb surgery.
Materials and Methods: Following Ethics Committee approval and having obtained written informed consent from each, 16 adult ASA I and ASA II patients undergoing semi-elective open reduction and internal fixation of bimalleolar ankle fractures were randomly assigned to one of two groups. In the standard release group (R, n1 = 6), the tourniquet was suddenly completely deflated at the end of surgery. In the staggered release group (SR, n2 = 10), the tourniquet was completely deflated for 30s and re-inflated to 300mm Hg. Three minutes later the tourniquet was deflated for a second time for a period of 30s and re-inflated to 300mm Hg. Three minutes following this secondnd deflation, the tourniquet was deflated for a third time and completely removed. Hemodynamic measurements and blood biochemistry samples were obtained from an indwelling arterial catheter immediately prior to initial tourniquet deflation (T0) and thereafter at 1, 4, 7 and 15 minutes.
Results and Discussion: Groups were similar in terms of demographics and the average total tourniquet time was 66min 37s. There was no difference between groups in serum Na and K concentrations at any time point. Serum Ca concentrations demonstrated a biphasic rise and fall in both groups, with Ca fluctuation notably less in the SR group. Serum lactate was greater in group R compared to group SR at one (1.75 ± 0.19 vs 1.33 ± 0.31 mmol/l, p = 0.005) and four min (1.98 ± 0.23 vs 1.48 ± 0.39 mmol/l, p = 0.007) respectively. Although this was not reflected by changes in pH or BE, $ETCO_2$ was less in in group SR compared to group S at the same time points (4.82 ± 0.45 vs 5.68 ± 0.26 kPa, p = 0.0004 at one min and 5.01 ± 0.59 vs 5.68 ± 0.35 kPa, p = 0.01 at four min respectively). Importantly, at 15 min, group SR had less hypotension and bradycardia compared to group R.
Conclusion(s): A staggered tourniquet release appears to reduce the rate of acute systemic metabolic changes associated with limb reperfusion. Re-application of a tourniquet seems to halt further reperfusion, offering periods for patient evaluation and management. This may be of particular benefit to patients at high risk of developing a reperfusion injury.

4AP7-9

Anaesthetic management of percutaneous transfemoral aortic valve replacement in elderly high-risk patients with severe symptomatic aortic stenosis

R. Basciani, S. Trachsel, C. Zobrist, S. Windecker, B. Eberle

Department of Anaesthesiology and Pain Therapy, University Hospital Bern, Inselspital, Bern, BE, Switzerland

Background and Goal of Study: Percutaneous transfemoral aortic valve replacement (PAVR) emerges as an alternative to surgery for patients with a high perioperative risk. In experienced hands, morbidity and mortality decreased significantly to levels comparable to surgery. Despite the involvement of cardiovascular anaesthesiologist in most PAVR programs, no relevant information is allocated on indications, benefits, risks, and limitations of different anesthetic strategies. The aim of our study was to report the characteristic of anaesthetic management of PAVR at our institution.
Materials and Methods: With IRB approval and informed consent, 57 patients (32 f; mean age 84 ± 4 y), presenting with severe symptomatic (NYHA class II&IV: 46 (80%)) aortic stenosis (AVA 0.58 cm^2 [0.2–1.0]) at high-risk for surgical valve replacement (logistic EuroSCORE: 27 ± 15%, STS score 9 ± 7), underwent PAVR between 08/2007 and 12/2008 using the CoreValve Revalving™ System (n = 48) or the Edwards-SAPIEN™ valve (n = 9). PAVR was performed in general anesthesia with intubation (GA), or in local anaesthesia supplemented with light analgosedation (LA-MAC: Monitored Anesthesia Care).
Results and Discussion: Indications for elective GA are given in Table 1, other characteristics of anaesthetic management in Table 2. Total procedural duration was 108 ± 38 min. In 53 patients (93%), device success was achieved (immediate decrease in aortic valve mean gradient from 50 ± 12 to 7 ± 6 mm Hg).

Table 1.

Elective indications for GA: n = 18 (32% of all PAVR)	
series start (learning curve)	n = 4
femoral surgical access + TEE	n = 9
subclavian surgical access	n = 1
pulmonary edema	n = 1
preoperative on mechanical ventilation	n = 1
psychiatric disorder	n = 1
orthopedic positioning problem/request	n = 1

Anaesthetic characteristics of PAVR

	n (%)	Vasopressor infusion (%)	Conversion to GA	CPR intraprocedural (%)	Extubated (%)	Mortality (%)
LA-MAC	39 (68)	13 (33)	3 (8)	4 (10)	36 (92)	3 (7.7)
GA	18 (32)	18 (100)	n/a	1 (6)	16 (89)	1 (5.6)
Total	57 (100)	31 (54)	n/a	5 (9)	52 (91)	4 (7)

Conclusion(s): Our experience of PAVR in high-risk elderly patients with severe aortic stenosis demonstrates good hemodynamic results and rapid post-interventional recovery. PAVR can be done in LA-MAC in up to 90% of cases (if no TEE is needed). GA is safe, but associated with more vasopressor use. LA-MAC is not better than GA, but is less expensive. Up to 10% of LA-MAC patients will be converted to GA and/or CPR. More than 90% of patients are fit for Coronary Care/IMC immediately after PAVR regardless of GA or MAC.

4AP7-10

Does aortic valve area in patients with aortic valve stenosis indicate the difficulty of anesthetic management during aortic valve replacement surgery?

T. Nomura, T. Oda, A. Yamasaki, Y. Takahama, N. Yabuta

Department of Anesthesiology, Hayama Heartcenter, Hayama, Kanagawa, Japan

Background and Goal of Study: The severity of aortic valve stenosis (AS) has been usually diagnosed according to the aoltic valve area (AVA) and/or the pressure gradient between left ventricle and aorta (PG). In pre-anesthetic evaluation of patients scheduled aortic valve replacement (AVR) due to AS, AVA or PG has also major factor to assess the patient condition. The smaller AVA or the higher PG has been thought as the higher risk factor of anesthetic management. However, little was proven the correlation between AVA and the difficulty of anesthesia. This study was conducted to examine how small AVA or high PG affected the anesthesia management during AVR surgery due to AS.
Materials and Methods: Peri-operative records of patients undergoing simple AVR surgery due to AS in past five years were retrospectively reviewed. AVA and PG were calculated at pre-operative ultrasound examination. The patient characteristics, the other pre-operative values obtained by echocardiography and standard hemodynamic were also examined. Anesthesia was induced propofol, fentanyl and vecronium, and maintained sevoflurane and fentanyl in all patients. After immediate anesthesia induction, hemodynamic value obtained by pulmonary artery catheter was examined additionally. The correlation between AVA and each parameter value was analyzed by liner regression test and $P < 0.05$ was defined significant.
Results and Discussion: Data of 59 consecutive AS patients were analyzed. AVA was negatively correlated with PG ($p < 0.0001$, $R = 0.520$), while there was no correlation with the other value of pre-operative echocardiography. By comparison with the each hemodynamic parameter after anesthesia induction, AVA was positively correlated with stroke volume index (SVI) only ($p < 0.0191$, $R = 0.304$). There was no correlation between pre-operative systolic cardiac function i.e. ejection fraction and post-induction hemodynamic value. AVA or PG as the well known risk factor in AS patient may not suitable for the anesthetic risk.
Conclusion(s): Our study demonstrated that AVA nor PG did not the direct factor to indicate the anesthetic difficulty during AVR surgery in patients with AS. Further study has been needed to identify the risk factor of the AS anesthesia.

4AP8-1

FloTrac/Vigileo™ system can not replace pulmonary artery catheter in patients with arteriovenous fistulae on chronic hemodialysis

H. Sakamoto, K. Harasawa, Y. Morimoto, H. Wakisaka

Department of Anesthesia, Cardiovascular Center Hokkaido Ohno Hospital, Sapporo, Hokkaido, Japan

Background and Goal of Study: FloTrac/Vigileo™ system (Edwards Lifescience, USA) calculates continuous cardiac output (CO). Because it calculates CO based on arterial pressure waveform and its internal database, it is unclear whether it can estimate CO precisely in patients on chronic hemodialysis (HD). In this study, we compared CO measured by pulmonary artery catheter (PAC) and FloTrac/Vigileo™ system in patients with arteriovenous fistulae to clarify whether less invasive FloTrac/Vigileo™ system can replace invasive PAC.

Materials and Methods: With IRB approval and written informed consent, 9 patients scheduled for aortic valve replacement and/or mitral valvuloplasty were enrolled in this study. Swan-Ganz CCOmbo Volumetrics Pulmonary Artery Catheter/Vigilance™ system (Edwards Lifescience, USA) and FloTrac/Vigileo™ system was placed. Software version of Vigileo™ was v1.10 and v1.14. CO calculated by Vigilance™ with stat mode (CO_{PAC}) and by Vigileo™ (CO_{FT}) was stored in a personal computer every minute. Anesthesia was introduced and maintained with propofol, fentanyl and vecuronium. Anesthesia management was based on CO_{PAC}. Correlation between CO_{PAC} and CO_{FT} was determined by linear regression analysis. Modified Bland Altman analysis for repeated measurement was used to compare the bias and precision of CO_{PAC} vs. CO_{FT}. Percentage of limits of agreement (PLA) was also calculated.

Results and Discussion: Patients were 5 male and 4 female. Patients' age was 66 ± 12 y.o., height was 161 ± 11 cm, and weight was 58 ± 10 kg. Before valvular repair, CO_{PAC} was 4.3 ± 0.7 l/min and CO_{FT} was 3.7 ± 1.0 l/min. Correlation coefficient was 0.17. Bias was –0.54 and precision was 1.11. PLA was 51.8%. After valvular repair, CO_{PAC} was 4.4 ± 1.5 l/min and CO_{FT} was 4.1 ± 0.9 l/min. Correlation coefficient was 0.34. Bias was 0.38 and precision was 1.57. PLA was 71.5%. Critchley and Critchley demonstrated that the new method is clinically acceptable when PLA is less than 30%. Our data showed PLA of FloTrac/Vigileo™ system exceeds 30% before and after valvular repair.

Conclusion(s): We conclude that FloTrac/Vigileo™ system is not an alternative to CO measurement with PAC in patients with arteriovenous fistulae as blood access for chronic hemodialysis.

References:

1 Bland JM, Altman DG. Comparing method of measurement: Why plotting difference against standard method is misleading. Lancet 1995; 346: 1085–9.

2 Critchley LAH, Critchley JAJH. A meta-analysis of studies using bias and precision statistics to compare cardiac output measurement techniques. J Clin Monit Comput 1999; 15: 85–91.

4AP8-2

In vitro measurement of human plasma-induced stress pathways in H9C2 cardiomyocytes after cardiopulmonary bypass

E. Redout, J. Romijn, H. Niessen, S. Loer, C. Boer

Department of Anesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: Cardiopulmonary bypass (CPB) is known for its induction of systemic inflammation and stress pathways, both playing a central role in postoperative complications. The systemic stress condition may also affect cardiomyocyte function in the postoperative phase, but this is difficult to study in patients. We therefore hypothesized that the blood imprint of systemic inflammation and stress may directly affect cardiomyocyte function. We therefore designed a method in which in vitro cardiomyocyte cultures were exposed to plasma from patients undergoing cardiothoracic surgery using CPB.

Materials and Methods: To investigate the effects of CPB-induced systemic inflammation and stress on cardiomyocytes, we stimulated H9C2 rat cardiomyocytes with plasma samples of patients undergoing Coronary Artery Bypass Grafting *(CABG)* before and after CPB. We analysed the stimulated cardiomyocytes for the activation of inflammation-related stress markers, i.e., p38 and Akt. Furthermore, we evaluated whether plasma samples were able to affect cardiomyocyte viability.

Results and Discussion: Our preliminary results show that CPB indeed changes the blood imprint of patients as measured by the induction of stress pathways in cardiomyocytes after CPB. This resulted in an increased activation of p38 and a decreased activation of Akt, which are both indicative for systemic inflammation and stress. We here demonstrate a novel technique that allows the application of blood as imprint of CPB-induced alterations in order to study the direct effects of systemic inflammation and stress on cardiomyocytes.

Conclusion(s): The level of cardiomyocyte stress enables us to investigate which pathways are affected by the use of CPB in the heart. This insight will eventually enable us to more specifically reduce cardiac stress after CPB, and hopefully reduce the incidence of postoperative complications.

Acknowledgements: This project is supported by an ESA pilot grant.

4AP8-3

Perfusion Index and Pleth Variability Index after administration of general anesthetic agents

J. Mizuno, Y. Morita, A. Kakinuma, S. Morita

Department of Anesthesiology, Teikyo University School of Medicine, Tokyo, Japan

Background and Goal of Study: Generally, anesthetic agents dilate peripheral vessels and increase peripheral perfusion by inhibiting the sympathetic nervous system. Respiratory variations in the pulse oximetry photoplethysmographic waveform amplitude have been shown to correlate with changes in ventricular preload and prediction of fluid responsiveness in anesthetized mechanically ventilated patients. Recently, a new non-invasive device (Radical 7 pulse oximeter monitor, Masimo Corp., USA) has been introduced that continuously detects changes in the photoplethysmographic waveform and computes a Perfusion Index (PI) reflecting peripheral perfusion and Photoplethysmogram Variability Index (PVI) reflecting fluid status and preload. In this study, we investigated the changes in PI and PVI before and after administration of general anesthetic agents.

Materials and Methods: Adult patients with unpremedicated ASA I and II underwent selective operation under general anesthesia. The method of general anesthesia was decided by each anesthesiologist. The pulse oximeter sensor was placed on the index finger of the upper limb without blood pressure cuff. We prospectively recorded study data before administration of general anesthetic agents and before tracheal intubation or insertion of laryngeal mask (LMA). Study data included hemodynamic measurements such as systolic blood pressure (sBP), heart rate (HR), and oxygen saturation by pulse oximetry (SpO_2) as well as PI and PVI. Fluid was administered continuously at 10ml/kg/hr during the anesthesia induction. The cases with administration of vasoactive agents and atropine were excluded from this study.

Results and Discussion: 21 patients (46 ± 15 years old, M/F = 11/10) underwent operations under general anesthesia. 19 patients were tracheally intubated and 2 patients were inserted LMA in. Time interval before administration of general anesthetic agents and before tracheal intubation or insertion of LMA was 7 ± 2 min. After administration of general anesthetic agents, sBP significantly decreased from 142 ± 29 to 104 ± 26 mm Hg ($p < 0.001$), HR did not significantly change from 75 ± 11 to 71 ± 13 beats/min, and SpO_2 significantly increased from 99.0 ± 1.2 to 99.6 ± 0.7% ($p < 0.05$). PI significantly increased from 2.1 ± 1.7 to 3.8 ± 2.3 ($p < 0.001$) and PVI significantly decreased from 22.9 ± 8.1 to 17.1 ± 7.2 ($p < 0.05$).

Conclusion(s): Our results indicate an increase in peripheral perfusion and improvement of fluid status and preload after administration of general anesthetic agents and intravenous fluid administration during anesthesia induction.

4AP8-4

The impact of patient's positions on the success of pulmonary artery catheterization and the incidence of arrhythmias

T. Pipanmekaporn, N. Bunchungmonkol, Y. Punjasawadwong, P. Pin-on

Anesthesiology, Faculty of Medicine, Maharaj Nakorn Chiang Mai Hospital., Chiang Mai, Thailand

Background and Goal of Study: The incidence of ventricular arrhythmias during pulmonary artery catheterization varied from 25 to 68 percent [(1)]. The purpose of this study was to determine the effects of patient's positions on the success of pulmonary artery catheterization and the incidence of arrhythmias.

Materials and Methods: Sixty-seven patients with ASA 3 undergoing elective coronary artery bypass graft surgery were enrolled and randomly allocated into two groups, i.e: the study group (being placed into 10° head down while passing catheter from right atrium to right ventricle and then positioning 10° head up and 10° right side tilt during passing catheter from right ventricle to pulmonary artery), and the control group (being placed in supine position while inserting the catheter). Pulmonary artery catheterization was performed before induction of anaesthesia. Time from right atrium to right ventricle and right ventricle to pulmonary artery was measured as T_1 and T_2 respectively. Arrhythmias were recorded and classified into benign (2–3 premature ventricular contraction) and severe (> 3 premature ventricular contraction or non sustained ventricular tachycardia) arrhythmias. Chi-square and unpaired t test

were used to compare categorical data and continuous data. A $p < 0.05$ was considered significantly.

Results and Discussion: Demographic data (including age, gender, weight, he-ight, heart rate, ejection fraction) were similar in both groups. Duration of $T_1$and T_2 between control and study group were not significant difference (6.9 ± 3.6vs.7.9 ± 3.7, P = 0.26,10.4 ± 4.5vs.10.9 ± 4.1sec, P = 0.66). Eighteen patients in study group (26.8%)and 14 patients in control group (20.9%)developed benign arrhythmias. Five patients (15.2%) in control group had experiencing severe ventricular arrhythmias during catheter passing from right ventricle to pulmonary artery, whereas none of patient in study group had this incident. All patients had stable hemodynamic and no treatment was required. The position of catheters was evaluated by transesophageal echocardiography and chest radiograph post-operatively. Tip of all catheters except one in control group were located in right pulmonary artery. No catheter-related complication was seen in this study.

Conclusion(s): Although the success of both groups was not different, the incidence of serious arrhythmias occurred more frequently in the conventional technique. Adjusting patient's position during passing the floating catheter could be used as an alternative method in minimizing serious arrhythmias.

Reference:

1 Iberti TJ, Benjamin E, Gruppi L, et al. Am J Med1985; 78:451–4.

4AP8-5

Haemodynamic effects of sub-anaesthetic doses of nitrous oxide as assessed by finometry

H. Sycamore, R. Evley, I. Moppett, R. Mahajan

Division of Anaesthesia & Intensive Care, University of Nottingham, Nottingham, Nottinghamshire, United Kingdom

Background and Goal of Study: Nitrous oxide, in sub-anaesthetic doses, is often used for short-term analgesia during orthopaedic manipulations, minor surgery or labour. Inhalation of 30% nitrous oxide has been recently shown to increase parasympathetic tone. [1] The gross haemodynamic effects of sub-anaesthetic doses of nitrous oxide are not well described. We used Finometry to investigate the effects of nitrous oxide inhalation, in the range of 10–50%, on systemic haemodynamic variables in healthy volunteers.

Materials and Methods: 17 volunteers were recruited. Continuous non-invasive measurements of heart rate (HR beats/min), blood pressure (mm Hg), cardiac output (CO litres/min) and total peripheral resistance (TPR mm Hg s/ml) were made using the Finometer. The volunteers inhaled nitrous oxide in 10% step changes between 0–50%, in randomly allocated ascending or descending order. After each change in nitrous oxide concentration was introduced, a 5 minute period was allowed to reach steady state. Data were recorded using purpose built software for off-line analysis. Measurements were subsequently averaged over a 1 minute window during steady state, and repeated measure ANOVA was applied for analysis.

Results and Discussion: None of the measured variables changed significantly at different concentrations of nitrous oxide.

Effects of Nitrous Oxide in subanaesthetic concentrations on haemodynamics. Data are mean (SD)

	baseline	10% N_2O	20% N_2O	30% N_2O	40% N_2O	50% N_2O
HR	62 (12)	62 (12)	61 (12)	61 (11)	61 (11)	65 (15)
MAP	92 (9)	91 (13)	92 (12)	93 (12)	92 (10)	92 (10)
CO	7.2 (1.9)	6.9 (2.1)	6.8 (1.5)	7.0 (1.5)	6.8 (1.3)	6.9 (1.8)
TPR	0.81 (0.15)	0.84 (0.14)	0.85 (0.13)	0.82 (0.14)	0.84 (0.13)	0.83 (0.15)

Conclusion(s): Our data suggests that gross haemodynamic variables remain unchanged during inhalation of sub-anaesthetic doses of nitrous oxide in healthy volunteers. This information should serve as a reference point when interpreting haemodynamic changes in the clinical setting in patients receiving sub-anaesthetic doses of nitrous oxide.

Acknowledgement: BOC Inspire Award.

Reference:

1 Okushima K, Kohjitani A, Asano Y et al. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008 Dec;106(6):e1–5.

4AP8-6

Lower body temperature during CPB is associated with postoperative thrombocytopenia and increased organ injury

H. Bouma, A. de Geus, R. Henning, A. Epema

Department of Anesthesiology, University Medical Center Groningen, Groningen, Netherlands

Background and Goal of Study: Cardiopulmonary bypass (CPB) is associated with postoperative organ damage, resulting in increased morbidity and mortality. To establish effects of different body temperature ranges during CPB, we assessed blood cell counts and markers for organ damage in patients undergoing hypothermic CPB.

Materials and Methods: Records from the OR and hospital databases of all adult patients undergoing hypothermic CPB in the University Medical Center Groningen were selected (n = 184). Preoperative values were compared to values measured during 48 h postoperative follow-up. Patients were divided into quartiles based on the temperature during CPB. Differences were calculated using non-parametric tests. Data are presented as mean ± SD. Statistical significance was accepted at $p < 0.05$.

Results and Discussion: The duration of surgery was increased in patients with lower body temperatures (table). A larger decrease in thrombocyte counts was found in patients with lower body temperatures. Serum creatinin levels increased in patients with lowest body temperature. While CK-MB increased in all groups after surgery, the increase was larger in patients with lower body temperatures. Thus, a correlation was found between thrombocyte counts and body-temperature during surgery ($p < 0.01$).

Conclusion(s): Serious lowering of body temperature during CPB seems to induce thrombocytopenia and organ injury during the postoperative period. Possibly, the organ injury is related to hypothermia-induced platelet activation in organs.

Demographic data and blood cell counts of patients undergoing hypothermic CPB (n = 184).

	1st quartile	2nd quartile	3rd quartile	4th quartile
Body temp (°C)	19.7 ± 12.0 ††	21.3 ± 2.0 **/††	25.5 ± 1.4 **/††	29.0 ± 2.7 **
Duration of surgery (min)	401 ± 149 ††	369 ± 116 ††	317 ± 121 */††	257 ± 117 **
Hb pre-CPB (mmol)	7.7 ± 1.3	11.3 ± 23.5	7.8 ± 1.2	15.1 ± 28.1
Hb post-CPB (mmol)	6.1 ± 0.9	6.0 ± 0.7	6.1 ± 0.6	6.1 ± 0.7
Platelets pre-CPB (10^9/L)	217 ± 98	206 ± 95	237 ± 100	225 ± 67
Platelets post-CPB (10^9/L)	109 ± 50 ††	121 ± 56 ††	140 ± 62 *	140 ± 46 **
Leukocytes pre-CPB (10^9/L)	10.9 ± 4.8	10.1 ± 5	8.4 ± 2.5	9.0 ± 4.1
Leukocytes post-CPB (10^9/L)	13.8 ± 3.6	12.4 ± 4	13.9 ± 4.4	14.1 ± 4.6
CK-MB pre-CPB (U/L)	4.4 ± 4.5	20.2 ± 55.2	10.1 ± 9.8	18.3 ± 23.1
CK-MB post-CPB (U/L)	20.0 ± 13.3	26.9 ± 37.1	33.8 ± 47.9	22.3 ± 34.6

*/** ($p < 0.05/0.01$) vs 1st quartile; †/†† ($p < 0.05/0.01$) vs 4th quartile.

4AP8-7

Digital thermal monitoring: Non-invasive assessment of perioperative microvascular function

R. Schier, R. Mehran, J. Singh, M. Hernandez, B. Riedel

Anesthesiology & Pain Medicine; Thoracic Surgery, The University of Texas M.D. Anderson Cancer Center, Houston, Texas, USA

Background and Goal of Study: Systemic inflammation may impair microvascular and more specifically endothelial cell (EC) function (1–3). Quantifying preop (1°, from co-morbidities) and perioperative (2°, from surgical inflammatory response) EC dysfunction may improve our understanding of the pathophysiology of postop morbidity. Digital Thermal Monitoring (DTM; Endothelix, Houston, TX, USA), a novel non-invasive method of assessing microvascular and EC function, measures temperature (T) change in the fingertip in response to forearm induced ischemia. Importantly, DTM lends itself to repetitive point-of-care testing-facilitating cardiovascular (4) and periop risk assessment. We set out to characterize the reactive hyperemic response to exercise and to the periop period.

Materials and Methods: Following IRB approval, 40 patients scheduled for major thoracic surgery were studied prospectively. Fingertip probes measured T [°C] prior to (T_i, initial temperature), during (T_{min}, lowest temperature during ischemia), and following (T_{max}, highest temperature during reactive hyperemia) 2-minutes of upper arm cuff occlusion. Three variables were derived: temperature rebound (TR = T_{max}–T_i); TR% (TR [%] = TR/Ti); and adjusted TR (aTR = T_{min} – peak TR). These variables were measured at: baseline (preoperative), 10 minutes after maximal voluntary exercise (preoperative, using a cycle ergometer), and postoperatively on Day 1, 2, and 5. The Kruskal-Wallis test (with Dunn's Correction for Multiple Comparisons) evaluated these variables over the measured time points.

Results and Discussion: Compared to preoperative values, the hyperemic response (TR °C,%TR was increased in response to surgery, with the greatest response seen after acute maximal exercise ($p < 0.05$). Maximal increase in postoperative temperature respnse was seen postop D2.

Conclusion(s): Since microvascular dysfunction is increasingly recognized as a component central to postoperative morbidity the clinical relevance of this physiologic signal requires further study. Our future investigations will explore whether impaired temperature response to surgical trauma correlates with adverse surgical outcome. Similarly, an impaired response to acute exercise may identify patients unable to mount an adequate physiologic surgical stress response, thereby allowing timely preoperative optimization.

References:

1 N Engl J Med 356: 911–20; 2007.
2 Heart 92: 441–4; 2006.
3 Lancet 349: 1391–2; 1997.
4 25th Annual Conference of the IEEE EMBS; 2003.

4AP8-8

Changes in calf blood flow during periods of prolonged seated immobility and modulation of these changes by the "Under Foot Oscillator" and graduated compression stockings

S. Mekala, R. Evley, I. Moppett

University Dept of Anaesthesia, University of Nottingham, Nottingham, Notts, United Kingdom

Background and Goal of Study: Immobility due to illness, surgery or travel predisposes to venous stasis in the legs; this is a risk factor for DVT. The Under Foot Oscillator (UFO) is a new device designed to mimic the effects of walking in seated subjects. It is an elliptical cylinder placed under the arch of the foot over which the subject actively rocks their foot. We have shown previously that intermittent use of the UFO prevents the reduction in calf blood flow induced by prolonged seated immobility. Guidelines suggest the use of early ambulation and graduated compression stockings (GCS) to reduce the risk of deep venous thrombosis (DVT) following surgery[1]. Ambulation is not being possible in all patients so a simple method of simulating the effects of walking may be beneficial. It is not currently known what the effect of GCS is on calf blood flow during seated immobility and whether intermittent exercise has any additive effects. We have examined the effects of intermittent exercise using the UFO on the reduction in calf blood flow caused by prolonged sitting when used in addition to GCS.

Materials and Methods: We have conducted a pilot study on five healthy volunteers. Calf blood flow was measured using strain gauge plethysmography after a 15 minutes rest period. The effects of prolonged immobility were then modelled using the venous sitting test in which subjects sat on a fixed chair with feet still for two hours. Subjects wore GCS on both legs during this time. In addition, with one leg, chosen at random, the subjects exercised using the UFO for 3 minutes every half an hour. Calf blood flow was then remeasured. Changes in calf blood flow were analysed using ANOVA.

Results and Discussion: There was a significant reduction ($p = 0.037$) in calf blood flow caused by the venous sitting test when GCS were worn. Additional use of UFO resulted in smaller reduction in blood flow from baseline ($p = 0.43$).

Effects of prolonged sitting and interventions on calf blood flow

	Calf blood flow (ml/100 g min) Mean (SEM)	Percentage reduction in blood flow from baseline. Mean (SEM)
Control (pre-test)	2.04 (0.2)	N/A
Venous sitting test + GCS	1.05 (0.3)	46.8 (15.3)
Venous sitting test + GCS + UFO	1.43 (0.3)	20.9 (24.3)

Conclusion(s): Graduated compression stockings do not prevent a reduction in calf blood flow during prolonged seated immobility. These early data suggest that the UFO device may confer additional benefit to the use of graduated compression stockings.

Reference:

1 http://www.nice.org.uk/nicemedia/pdf/CG046NICEguideline.pdf.

4AP8-9

Anesthesia for transapical and percutaneous aortic valve implantation

A. Calatayud, A. Gonzalez, M. de Nadal, S. Zapatero, M. Roca

Department of Anesthesiology, Vall d'Hebron University Hospital, Barcelona, Spain

Background and Goal of Study: Percutaneous aortic valve implantation is a recent and still experimental procedure described as advantageous in patients with contraindications to surgical valve replacement under cardiopulmonary bypass due to their excessive risk. We report our initial experience in seven patients, six undergoing percutaneous approach from the femoral artery and one via left ventricular apical puncture.

Materials and Methods: The procedures were performed in a catheterization laboratory with operating room-like sterile precautions. All patients underwent general anesthesia with tracheal intubation; the patient with transapical approach had also a paravertebral catheter placed for anterolateral thoracotomy analgesia. Monitoring included cerebral entropy, invasive arterial pressure through a femoral access, central venous pressure and transesophageal echocardiography. The procedure involved rapid ventricular pacing in order to cancell heart motion and reduce arterial pressure < 60 mm Hg, so the ballon could be inflated and deflated.

Results and Discussion: Most patients were ASA score III, with many comorbidities. Cessation of pacing was associated with rapid normalization of systemic arterial pressure. All patients were awaked and successfully extubated in the laboratory at the end of the procedure and transferred to the intensive care unit. One patient suffered from a transient ischemic attack and two cases were complicated by a complete atrio-ventricular block that needed a pacemaker.

Characteristic	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7
Age	70	77	77	73	62	89	87
Sex	male	male	Female	male	male	male	female
Limiting lung disease	yes	no	no	yes	no	yes	no
Coronary artery disease	yes	yes	yes	yes	yes	no	no
Cerebrovascular disease	no	no	no	no	no	yes	no
Mitral regurgitation	yes	no	yes	yes	yes	yes	no
Pulmonary hypertention	yes	no	yes	no	no	no	no
Prior thoracotomy	yes	no	yes	no	no	no	no
LV ejection fraction	60	30	70	44	65	50	64
Diabetes Mellitus	no	yes	no	yes	no	no	yes
Arterial hypertention	yes	yes	yes	yes	no	yes	yes
Chronic renal failure	no	yes	no	no	no	yes	no
Liver cirrhosis	no	no	no	no	yes	no	no

LV: left ventricular

Conclusion(s): Considering the overall high-risk profile of these patients, minimally invasive aortic valve replacement could be achieved without anesthetic complications. The initially favorable outcomes achieved with percutaneous techniques outside the operating room would probably represent an increasing challenge to the anesthesiologist.

4AP8-10

Effects of propofol versus desflurane on hepatic blood flow: A randomized cross-over designed clinical study

R. Meierhenrich, F. Wagner, B. Mühling, M. Tourbier, A. Gauss

Klinik für Anaesthesiologie, Universitätsklinikum Ulm, Ulm, Germany

Background and Goal of Study: The liver, in the presence of conditions that increase oxygen consumption or decrease oxygen supply, is known to be susceptible to hypoxic damage. Data about the effects of propofol on hepatic perfusion are scarce. Interestingly, several animal studies have shown that propofol may increase hepatic blood flow (1,2). The aim of the present study was to investigate, if in humans propofol is associated with a higher hepatic blood flow compared to desflurane.

Materials and Methods: With approval of the ethic committee we performed a randomized cross-over designed study with 20 patients, scheduled for elective surgery. 10 patients received first propofol and subsequently desflurane, the other 10 patients received first desflurane and subsequently propofol. Blood flow index (BFI) in the right and middle hepatic vein and cardiac index (CI) were assessed by use of multiplane transesophageal echocardiography during both types of anaesthesia.

Results and Discussion: Heart rate (HR), mean arterial blood pressure (MAP), stroke volume index (SVI), CI and BFI in the right and middle hepatic vein are given in the table. Propofol was associated with a significantly higher BFI in both hepatic veins.

Effects of propofol versus desflurane on global hemodynamics and hepatic blood flow

N = 20	Propofol	Desflurane	% difference	p-value
MAP [mm Hg]	79 [67–90]	73 [65–80]	6[(– 2)–26]	0.228
SVI [ml/m2]	47 [33–55]	48 [36–59]	– 2 [(–8)–4]	0.167
CI [l/min/m2]	2,5 [2,1–3,1]	2,6 [1,9–3,1]	8 [(– 2)–11]	0.174
BFI right HV [ml/min/m2]	199 [138–237]	149 [111–190]	22 [0–60]	0.005
BFI mid HV [ml/min/m2]	150 [124–188]	126 [93–146]	22 [8–43]	< 0.001

Data given as median [95% confidence interval of the median].% difference: percentage difference.

Conclusion(s): In humans propofol is associated with a significantly higher hepatic blood flow compared to desflurane. Animal studies have shown that the increased hepatic blood flow during propofol is induced by an increase in hepatic metabolic activity and oxygen consumption (1,2). Based on the current findings, presumably, also in humans propofol induces an increase in metabolic activity and oxygen consumption of the liver. This might have implications for patients in a hypoxic state or with circulatory failure. Studies about the effects of propofol on hepatic oxygen balance in particular in these patient groups are necessary.

References:

1 Carmichael FJ, et al. Anesthesiology 1993;79:1051–60.
2 Zhu T, et al. Can J Anesth 2008; 55: 364–70.

4AP9-1

Post-exercise reactive hyperemia: A novel preoperative risk assessment tool

R. Schier, R. Mehran, A. Smallwood, C. Hightower, B. Riedel

Departments of Anesthesiology and Thoracic Surgery, The University of Texas M. D. Anderson Cancer Center, Houston, Texas, USA

Background and Goal of Study: Established ultrasound-derived parameters, measured within the brachial artery (i.e., flow-mediated dilation and peak flow velocity) and in response to reactive hyperemia induced by cuff occlusion, allow for the noninvasive assessment of vascular function (specifically endothelium-dependent vasodilatation).[1] These parameters have been reported to be reproducible after exercise.[2] More recently, a vascular parameter that utilizes digital thermal monitoring (DTM) to measure temperature rebound (TR) during reactive hyperemia was developed. We hypothesized that the dynamic effect of acute exercise would increase TR. Secondary objectives were to correlate TR response to exercise ($DTR = TR_{post\text{-}exercise} - TR_{pre\text{-}exercise}$) with 1) established preoperative risk factors and 2) predefined postoperative complications.

Materials and Methods: Following IRB approval, patients scheduled for major noncardiac surgery were prospectively enrolled. Preoperatively, fingertip probes measured TR in response to upper arm cuff occlusion (2 minutes) and reperfusion both before and 10 minutes after peak exercise (ramp protocol with cycle ergometer). Data are presented as mean ± SD. Statistical analysis utilized ANOVA and Fisher exact test. P-values < 0.05 were regarded as significant.

Results and Discussion: Thirty patients (mean age, 58 ± 9 years) were studied. Baseline blood pressure and fingertip temperature did NOT differ before and after exercise. Following exercise, TR increased significantly (mean absolute: 0.53 ± 0.95°C vs. 0.04 ± 0.42°C, p=0.04 and% change: 1.78 ± 3.29% vs. 0.14 ± 1.27%, p=0.03). All patients with preoperative cardiac risk factors (modified Lee index > 2, hypertension, diabetes mellitus) had DTR values within the lower 2 tertiles of the study population (DTR < 1.1%). Postoperative cardiac, pulmonary, or surgical complications occurred at a threefold higher rate in those patients with DTR values that fell within the lower 2 tertiles.

Conclusion(s): Exercise increased TR in response to occlusion-induced reactive hyperemia. Patients with preoperative cardiac risk factors had an impaired TR response to exercise, which in turn was associated with increased postoperative morbidity. This inability to mount a dynamic microvascular response to exercise may improve preoperative risk stratification and our understanding of the pathophysiology associated with postoperative morbidity.

References:

1 Celermajer DS et al. Lancet 1992; 340: 1111–5.
2 Harris RA et al. Ultrasound Med Biol 2007; 33: 1579–85.

4AP9-2

Pulse transit time. The affect of blood pressure or blood volume?

D. Bystritski, E. Kalina, A. Eden, R. Pizov

Anesthesia, CCM and Pain Management, The Lady Davis Carmel Medical Center, Haifa, Israel

Background and Goal of Study: Pulse transit time (PuTT) is the interval between R-wave of ECG and the subsequent upstroke on peripheral arterial line curve[1]. Previous studies on awake volunteers found a correlation between PuTT and both systolic blood pressure (SBP)[2] and hypovolemia[1]. The current study evaluated the effect of hypovolemia and hypotension on PuTT in anesthetized ventilated patients.

Materials and Methods: 65 anesthetized and ventilated patients underwent gradual autologous blood donation. Blood was withdrawn by steps of 2% of estimated circulating blood volume (CBV) up to 20% of CBV or until SBP dropped to less than 80 mm Hg. ECG and arterial waveform were recorded at baseline and after blood withdrawal was completed. Systolic pressure variation (SPV) and PuTT was analyzed off line.

Results and Discussion: Patients were divided into two groups according to their tolerance to blood withdrawal: group 1) patients who became hypotensive following a 2–6% CBV reduction; group 2) patients who tolerated a 20% CBV reduction without hypotension. A significant correlation was found between changes in PuTT and SBP (Fig1) in the patients who tolerated a 20% reduction of CBV as well as in those who did not (R^2=0.45 and R^2=0.66, respectively). No correlation was found between SPV and PuTT in either of these groups (Fig 2).

Figure 1

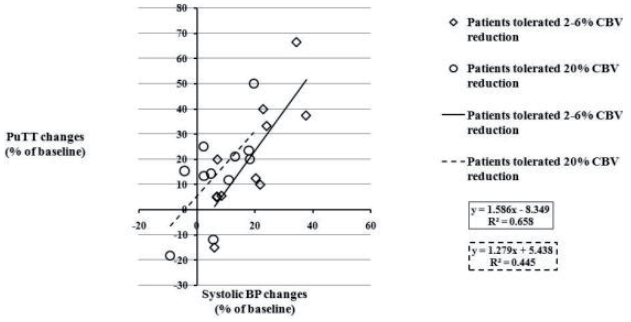
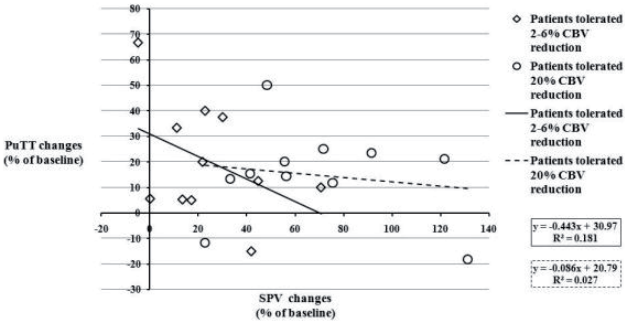


Figure 2



Conclusion(s): In anesthetized and ventilated patients PuTT changes correlated with changes in SBP but not with a reduction in CBV. There is a need for a prospectively designed study to evaluate the causative effect of blood pressure on PuTT.

References:

1 Gregory S.H. Chan et al. Journal of Clinical Monitoring and Computing 21: 283–293, 2007.
2 R.A. Payne et al. Journal of Applied Physiology 100: 136–141, 2006.

4AP9-3

Is arterial pressure an adequate parameter for assessing the hemodynamic effects of a volume expansion in the operating room?

M. Cannesson, O. Desebbe, V. Collange, O. Bastien, J. Lehot

Department of Anesthesiology, Hospices Civils de Lyon – Louis Pradel Hospital, Lyon, France

Background and Goal of Study: The aim of volume expansion (VE) is to increase cardiac output (CO). However, CO monitoring is not widely used in anaesthesiology and invasive arterial pressure still remains the standard for hemodynamic management. In this study investigated the ability of arterial pressure to be used as a surrogate for assessing the effects of VE on CO in patients under general anesthesia.

Materials and Methods: We studied 81 patients under general anaesthesia and mechanical ventilation. The following parameters were recorded before and after VE: systolic, diastolic, and mean arterial pressure (SAP, DAP, and MAP), pulse pressure defined as SAP–DAP (PP), central venous pressure (CVP), respiratory variations in PP (ΔPP), and CO (pulmonary catheter). Percent

change in CO following VE (δCO) was compared to percent change in SAP, DAP, MAP, PP, and ΔPP (δSAP, δDAP, δMAP, δPP, and δΔPP). Response to VE was defined as > 15% increase in CO following VE.

Results and Discussion: Changes in haemodynamic parameters induced by VE are summarized in Table 1. We observed weak but significant relationships between δSAP (r = 0.47), δDAP (r = 0.38), δMAP (r = 0.42), δPP (r = 0.41), and δCO (p < 0.05 for all) but no significant relationship between δΔPP and δCO (r = 0.098; p = 0.38). Importantly, δSAP, δDAP, δMAP, δPP, and δΔPP were weak markers of response to VE as compared to ΔPP value obtained before VE.

Effects of VE on haemodynamic parameters.

	Before VE (n = 82)	After VE (n = 82)	p value
SAP (mm Hg)	93 ± 16	109 ± 17	<0.01
DAP (mm Hg)	50 ± 10	57 ± 10	<0.01
MAP (mm Hg)	64 ± 11	72 ± 15	<0.01
PP (mm Hg)	42 ± 12	51 ± 13	<0.01
ΔPP (%)	12 ± 7	7 ± 4	<0.01
CVP (mm Hg)	10 ± 5	14 ± 4	<0.01
CO (L/min)	3.7 ± 1.2	4.5 ± 1.6	<0.01

Ability of changes in hemodynamic parameters to detect response to VE.

	Area Under the Curve	p compared to ΔPP	Threshold	Sensitivity	Specificity
δSAP	0.785	0.04	6%	87%	61%
δDAP	0.717	0.005	16%	56%	85%
δMAP	0.765	0.03	9%	83%	64%
δPP	0.777	0.04	26%	65%	82%
δΔPP	0.680	0.001	–22%	91%	41%
CVP	0.591	<0.001	12 mm Hg	42%	76%
ΔPP (pre VE)	0.888	–	12%	80%	91%

Conclusion(s): Changes in arterial pressure do not accurately reflect changes in CO. Assessing the effects of VE on arterial pressure alone (whatever the parameter) is milseading. Consequently, arterial pressure monitoring alone cannot be recommended for fluid optimization in the operating room.

4AP9-4

Timing of intraoperative fluid management by difference in pulse pressure (dPP)

K. Fukui, K. Markstaller, D. Leibundgut, G. Pestel

Department of Anaesthesiology, Johannes Gutenberg-University, Mainz, Germany

Background and Goal of Study: Fluid optimisation is considered to be a major contributor to improved oxygen delivery and improved outcome (1). Dynamic parameters like difference in pulse pressure (dPP) have gained interest (2) to predict patient's intraoperative fluid responsiveness. However, the amount of fluid given may be only one factor among others. It has been suggested that dynamic monitoring might improve outcome by immediate therapy once hypovolemia is detected (3). Therefore, we studied the amount and time factor of fluid application in a population undergoing major abdominal surgery.

Materials and Methods: 49 patients, ASA-PS 1-3, were randomised into a dPP-guided fluid regimen group (baseline fluid of 2 ml/kg/h of Lactated Ringer's Solution (LRS), substitution of lost blood by HAES6% 130/0.4, plus additional boluses of 250 ml of LRS in case of dPP > 13%), or a control group (fluid administration at the discretion of the attending anesthesiologist). The measurement of dPP in both groups was obtained continuously through automatic calculation by a bedside monitor. Data were recorded in 5 minute intervals. Fluid balances were compared between groups using Wilcoxon test. Episodes of dPP < 13% vs. episodes of dPP > 13% were counted and compared between groups by Fisher's Exact test. A p < 0.05 was considered to be statistically significant.

Results and Discussion: No difference between groups was found for blood loss, urine output, and administration of crystalloids. Patients in the control group received significantly more colloid (p=0.0006). Although a higher amount of fluid was given to the control group compared to the dPP-guided group, episodes of dPP < 13% were noticed in 653 of 879 (75%) data recording points in the dPP-group, and in 702 of 1063 (66%) data recording points in the control group (p < 0.0001).

Patients' fluid management

	dPP Group	Control Group	p
n	24	25	
Blood Loss (l)	0.8 ± 0.8	1.0 ± 1.1	ns
Urine (l)	0.7 ± 0.6	0.8 ± 0.5	ns
Crystalloid (l)	3.2 ± 2.4	2.8 ± 1.1	ns
Colloid (l)	0.7 ± 0.9	0.8 ± 0.5	0,006

Fluid data shown as mean ± SD.

Conclusion(s): Goal-directed therapy by dynamic parameters like difference in pulse pressure (dPP) does not lead necessarily to an increased amount of fluid given, but leads to less hypovolemic episodes compared to standard fluid management.

References:

1 Wilson J et al. Brit Med J 1999; 318:1099–1103.
2 Solus-Biguenet H et al. Brit J Anaesth 2006;97: 808–816.
3 Noblett SE et al. Brit J Surg 2006;93:1069–1076.

4AP9-6

Urine output does not predict intraoperative blood volumen variations during major surgery

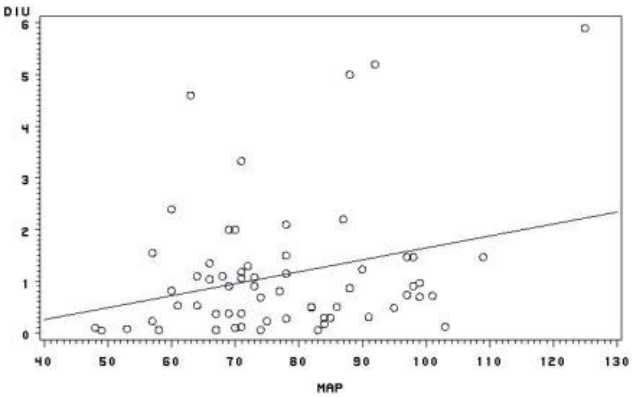
G. Solares, L. Perez, M. Rabanal, A. Taborga, I. Ruiz

Anesthesia, Hospital Universitario Valdecilla, Santander, Cantabria, Spain

Background and Goal of Study: Urine output (UO) is an integral part of algorithms that have showed significant benefits in septic shock (1). However, its role in predicting of intraoperative blood volume (BV) changes has been questioned (2). Our aim was to study the relation of UO with other parameters that meassure BV variations during major surgery.

Materials and Methods: After patient and institutional approval, 23 consecutive major surgery patients were prospective studied. Monitoring consisted in HR, invasive MAP, CI, stroke volume index (SVI), stroke volume variation (SVV) by means of FlotracTM sensor, and CVP and countinous ScvO2 by a central PresepTM catheter. The changes of HR, MAP, CVP, CI, SVI, SVV, and ScvO2 were recorded and taken at the begining (BO) and at the end of operation (EO), and at every hour along with the changes in UO. Normovolemia (NV) was accomplished, using our normovolemia algorithm, that is, by the maintenance of a CVP > 5 mm Hg, CI > 2.5 l/min/m2, SVV < 13% and ScvO2 > 70% with infusions of colloid and crystalloid solutions (3,4). Statistical analysis was done using ANOVA and correlation pearson test (p < 0.05).

Results and Discussion: NV was well maintained (CVPEO = 7 ± 4 mm Hg ;CIEO = 3.4 ± 0,7 L/min·m^2; ScvO2EO = 80 ± 4%; SVVEO = 7 ± 2%; NS vs control). As a result, hourly UO remained above 0.5–1 ml·Kg^{-1} h^{-1}, during the procedures (UO1h = 1,41 ± 1.6; UO2h = 0,7 ± 0,7; UO3h = 1,1 ± 1.2, UO4h = 1,1 ± 0.8 ml·Kg^{-1} h^{-}1). There were no relation between the changes of UO with the changes of CVP (r = 0.08, p = 0.5), CI (r = 0.07, p = 0.5) SVI (r = 0.22, p = 0.08), SVV (r = 0.05, p = 0.7) or ScvO2 (r = 0.07, p = 0.8). Interestingly, the changes in UO were only predicted by those in MAP ((r = 0.28, p = 0.03), variable that has a limited value as a determinant of volumen status (2).



Conclusion(s): This work demonstrate that UO should not be used as an intraoperative guide of blood volumen loss/restitution during major surgery. Further Studies are needed to confirm our findings.

References:

1 Rivers E. N Engl J Med 345;1368–77. 2001.
2 Yeager M and Spence B. Seminars in Dialysis 19;6:472–79. 2006.
3 Eu J Anesthesiology 2005. 4. Anesthesiology 2008.

4AP9-7

Pulse pressure variation measurements in healthy volunteers using a continuous blood pressure measurement device

C. Boer, L. Sipkens, K. Treskes, K. Ariese-Beldman, D. Veerman

Anesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: Pulse pressure variation (PPV) is an extensively studied dynamic index for the prediction of volume responsiveness in ventilated patients. In non-ventilated patients, PPV fails to be indicative for the response to volume expansion, since spontaneous respiratory movements

affect PPV through several pathways. As alternative, the arterial response during provoked fluid shifts like the Valsalva maneuver showed promising results in detecting preload dependency in a spontaneously breathing population. In the present study we therefore aimed to investigate whether a non-invasive continuous blood pressure (BP) measurement device reliably assesses changes in PPV during autonomic function testing in healthy male subjects.

Materials and Methods: Twenty sober males (21.6 ± 3.2 years; BMI 23.2 ± 2.5 m^2/kg) were recruited and the PPV was determined by non-invasive continuous finger BP measurements (Nexfin HD; BMeye, Amsterdam). Exclusion criteria were a BMI < 15 or > 35, pre-existing co-morbidities and use of medication or drugs. After baseline measurements during supine steady state, volunteers executed controlled breathing (0.125 Hz), a passive leg raising test and a controlled Valsalva maneuver in triple and one quick standing test. Data was analyzed using a Student's t-test for paired observations and Intra Class Correlations (ICC).

Results and Discussion: Nexfin reliably reproduced the BP measurements (ICC 0.91 (0.82–0.96)) and the PPV provoked by controlled breathing (0.96 (0.93–0.98). The BP drop as derived from the autonomic function tests averaged 36.5 ± 13.5 mm Hg, 23.5 ± 7.8 mm Hg and 73.3 ± 20.3 mm Hg for the Valsalva, passive leg raising and stand test, respectively. Controlled breathing generated a reproducible respiration-induced BP change which allowed calculation of the PPV. The PPV during the Valsalva maneuver and quick stand test (52.2 ± 13.5% and 41.2 ± 26.9%, respectively) were significantly higher as compared to the controlled breathing-derived PPV (12.9 ± 5.1%, P < 0.001). Further clinical studies are needed to validate the clinical value of these PPV measurements in the non-ventilated patient.

Conclusion(s): PPV as measured by a non-invasive continuous BP measurement device during controlled breathing and autonomic function testing may be further developed as a clinical indicator for fluid shifts. Furthermore, our study shows that this type of measurement may be useful in hemodynamic monitoring of the non-ventilated patient population.

4AP9-8

Saline infusion produces hyperchloremic acidosis in patients undergoing cardiac surgery

M. Ellachtar, S. Hamrouni, K. Zaîdi, A. Ammous, A. Cherif

Anesthesia and Intensive Care, Rabta University Hospital, Tunis, Tunisia

Background and Goal of Study: Despite the common practice of crystalloid infusion during cardiac surgery, few data have been published that describe acid-base changes associated with infusion of 0.9% saline (1). The recognition that 0.9% saline contains chloride in a nonphysiologic concentration led to the introduction of lactated Ringer's solution.

Materials and Methods: Two groups of 15 patients each who were undergoing on pump cardiac surgery were assigned randomly to receive 0.9% saline (SS group) or lactated Ringer's solution (RL group) in a dosage of 250 ml when a volume replacement were needed during anesthesia and the first 24 h post operative. The infusion was completed within 15 mins. The pH, and serum concentrations of sodium, potassium, chloride and lactate were measured before induction of anesthesia (T1), 1(T2), 4(T3), 12 (T4) and 24 (T5) hours post operative. Hemodynamic parameters were registered at the same time. The total amount of vasopressors required was also documented.

Results and Discussion: The total amount of fluid infused was similar in both group (2750 ± 250 in SS group versus 3000 ± 250 ml in RL group). Infusion of 0.9% saline, but not lactated Ringer's solution, caused a metabolic acidosis with hyperchloremia and a concomitant decrease in bicarbonate concentration. The post operative need for infused vasopressors in the patients in isotonic saline group was increased compared with the Ringer's Lactate solution group.

Conclusion(s): Infusion of isotonic saline solution during cardiac anesthesia and surgery inevitably leads to metabolic acidosis, which is not observed after administration of lactated Ringer's solution. The acidosis is associated with hyperchloremia and increased doses of vasopressors.

Reference:

1 Scheingraber S et al. Anesthesiology 1999;90(5):1265–1270.

4AP9-9

Hemodynamics during long term pneumoperitoneum using robotic telescopic device for gynecological surgery

H. Christidou, E. Dalampini, A. Mponarou, N. Tsiantzi, P. Petropoulou

Anesthesiology Department, Papageorgiou General Hospital, Thessaloniki, Greece

Background and Goal of Study: In the context of an educational-training mini programme of robotic telescopic surgery, the influence and safety in hemodynamics of long lasting pneumoperitoneum (PNO) at trendelenburg position was evaluated.

Materials and Methods: Seven consecutive women, ASA I-II, who consented and underwent advanced robotic pelvic surgery, were studied. Anesthesia was standardized and mean arterial pressure (MAP), heart rate (HR) and central venous pressure (CVP) were recorded before pneumoperitoneum (PROPNO), after induction of PNO (PNO), after head down titl (TREND), intraoperatively after 1 h, 2 h, 3 h of pneumoperitoneum, after deflation of PNO (NO PNO), and finally, with the patient in the supine position. Using Flo Trac sensors of Vigileo system CO, CI and central venous saturation ($ScvO_2$) were recorded at the same time intervals. Rises of MAP were regulated using remifentanyl. Statistical analysis was performed by one way ANOVA and paired-Samples t-test.

Results and Discussion: Values are indexed as mean ± standard deviation: MAP was raised stastistically significant by gas insufflation*, but retuned to previous values using remifentanyl. CVP augmented stastistically significant* by PNO and trendeleburg position and reduced to normal values after 2 hours of PNO. All other measured values had no significant statistically changes.

Conclusion(s): At our patients robotic telescopic surgery in gynecology was hemodynamically safe and rises of MAP could be easily reduced by the use of remifentanyl.

Reference:

1 Dirk Meininger at al. Effects of Posture and Prolonged Pneumoperitoneum on Hemodynamic Parameters during Laparoscopy. World J Surg (2008) 32:1400–1405.

4AP9-10

Norepinephrine does not impair gastric mucosal blood flow when used for treatment of hypotension during cardiopulmonary bypass

F. De la Briere, B. Laviolle, C. Blery, P. Seguin, C. Ecoffey

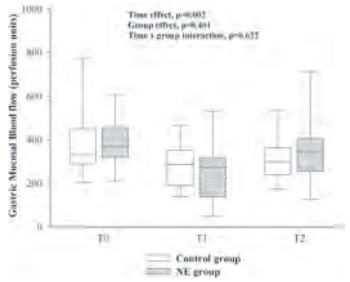
Anesthesiology, CHU Pontchaillou, Rennes, Bretagne, France

Background and Goal of Study: Norepinephrine is a vasoconstrictor routinely used for the treatment of hypotension in patients undergoing cardiac cardiopulmonary bypass (CPB) surgery. Disturbances in the splanchnic microcirculation are often described during CPB and could be worsened by norepinephrine. The aim of this study was to measure the impact of norepinephrine on gastric mucosal perfusion during CPB.

Materials and Methods: This prospective, non randomized, observational study included patients aged ≥ 60 years with left ventricular ejection fraction (LVEF) ≥ 40%, and scheduled for elective CPB surgery. Norepinephrine was introduced at the end of cardioplegia if the mean arterial pressure (MAP) was ≤ 70 mm Hg. Gastric mucosal blood flow (GMBF) was measured by laser Doppler flowmetry before CPB (baseline, T0), after cardioplegia (T1), and when MAP reached 70 mm Hg with or without norepinephrine (T2). The patients who needed norepinephrine (NE group), were compared to those who did not (control group) using a 2-way analysis of variance (time, group).

Abstract 4AP9-9 – Table 1

	MAP	HR	CVP	CO	CI	SV	SVcvO2
PROPNO	85,3 ± 19,1	65,0 ± 15,8	11,5 ± 3,5	4,4 ± 1	1,9 ± 0,1	69,7 ± 9,5	79,7 ± 2,3
PNO	99,8 ± 19	66,7 ± 4,7	25,5 ± 0,7*	4,7 ± 0,5	2,5 ± 0,2	67,8 ± 12,1	83,0 ± 8,2
TREND	89,9 ± 18	57,9 ± 7,7	25,4 ± 2,3	4,3 ± 1,1	2,3 ± 0,7	74,1 ± 12,2	79,0 ± 7,1
1 h	75,3 ± 8	57,7 ± 8,5	27,3 ± 7,8	3,4 ± 0,5	1,8 ± 0,1	59,3 ± 5,7	76,3 ± 4,0
2 h	75,9 ± 6,4	62,3 ± 10,7	25,0 ± 6,8	3,7 ± 0,6	2,0 ± 0,3	60,3 ± 11,3	79 ± 4,2
3 h	83,6 ± 10,5	72,4 ± 18	15,0 ± 10,6	4,3 ± 0,9	2,6 ± 0,7	69,4 ± 10,8	70 ± 6,1
NO PNO	71,5 ± 11	67,8 ± 18,1	18 ± 6,9	4,1 ± 0,6	2,3 ± 0,4	66,1 ± 14,7	79 ± 5,9
SUPINE	75,7 ± 11,5	72,3 ± 22,9	19 ± 5,7	4,1 ± 0,4	2,5 ± 0,2	65,7 ± 22,9	75 ± 7,1
P	0,02	0,43	0,05	0,11	0,43	0,43	0,66



Results and Discussion: A total of 52 patients were included, 30 in the NE group, and 22 in the control group. Age, medical history, treatments and type of surgery were similar in the two groups. Only LVEF was lower in the NE group compared to the control group (59% vs 64%; p=0.05). The GMBF decreased after cardioplegia and returned to baseline values at T2 without significant difference between the two groups.

Conclusion(s): Norepinephrine did not impair GMBF when used for the treatment of hypotension during CPB.

Acknowledgements: Pr Leguerrier, cardiac surgeon, CHU Pontchaillou, Rennes, France.

4AP9-11

Evaluator variability in the noninvasive determination of anaerobic threshold at cardiopulmonary exercise testing

C. Farrow, S. Howell, S. Turvill, S. Howard

Academic Unit of Anaesthesia, The General Infirmary at Leeds, Leeds, United Kingdom

Background and Goal of Study: Several authors have questioned the inter-observer reliability of the determination of anaerobic threshold (AT) from cardiopulmonary exercise testing (CPX), especially in subjects with exercise limitation.(1,2) As decisions regarding fitness for surgery may be based on the value of AT, reliable estimation of this variable in patients with functional limitation is important. We undertook a study to compare inter-rater reliability for AT in aortic surgery patients with good or poor functional capacity.

Materials and Methods: Four experienced observers independently re-analysed results obtained from 18 CPX tests performed in our unit by patients being considered for open aortic aneurysm repair. The patients were divided into two groups on the basis of their functional capacity estimated from the AT reported at the original test; Group A (good capacity) AT > 11 ml kg^{-1} min^{-1} and Group B (poor capacity) AT < 8.5 ml kg^{-1} min^{-1}. The raters were asked to determine AT by the the V-slope method and the dual criteria method and to give an overall best estimate of the AT. The intraclass correlation coefficient (ICC) was calculated to examine concordance between raters, where 1 is perfect agreement and 0 is none at all.

Results and Discussion: Group A included 10 patients (8 male), median (range) age 76 (70–92) years. Group B included 8 patients (7 male), age 83.5 (75–89) years. One observer felt unable to accurately determine the AT of three patients in group B.

Anaerobic thresholds and intraclass correlation coefficients for groups A and B

		Intraclass correlation coefficient		
	Best estimate of AT Median (range) ml/kg/min	Best estimate of AT	V-slope	Dual criteria
Group A	12.1 (10.1–17.1)	0.89	0.90	0.76
Group B	7.2 (6.5–8.0)	0.69	0.71	0.29

Conclusion(s): Our results demonstrate worse inter-rater reliability in the determination of AT in patients with limited functional capacity than in those with good exercise tolerance. Agreement was better between estimates made with the V-slope method than using dual criteria. However, these data suggest that AT may not be the most reliable method of characterising exercise capacity in high risk patients and other measurements such as VO_2 peak should be considered.

References:

1 Sources of error and variability in the determination of anaerobic threshold in healthy humans. Garrard CS, Das R. Respiration. 1987; 51:137–45.

2 Noninvasive determinations of the anaerobic threshold. Reliability and validity in patients with COPD. Belman et al. Chest. 1992; 102:1028–1034.

Respiration

5AP1-1

The effects of propofol on airway contractility in a rat model with airway hyperresponsiveness to muscarinic receptor stimulation

J. Barrio, J. Cortijo, P. Santamaría, E. Morcillo

Department of Pharmacology, Faculty of Medicine, University of Valencia, Valencia, Spain

Background and Goal of Study: Previously we observed an in vitro airway hyperresponsiveness to muscarinic receptor stimulation in a rat model of bleomycin-induced pulmonary fibrosis, that was accompanied by an increased intracellular calcium signal in tracheal smooth muscle cells stimulated with carbachol (1). The aim of the study was to investigate the in vitro effect of propofol on tracheal contraction and intracellular calcium signal in response to muscarinic receptor stimulation with carbachol in a rat bleomycin model in comparison with non treated rats. It was hypothesized that the antispasmodic effect of propofol would be less effective in the model of airway hyperresponsiveness.

Materials and Methods: Concentration-response curves to carbachol (10^{-8} to 10^{-4}) were obtained in tracheal rings isolated from Sprague-Dawley rats 14-days after endotracheal bleomycin or saline. After washing the rings with Krebs-Henseleit solution, propofol (concentrations tested half-log $5*10^{-4}$ to 10^{-5}M) was added 20 minutes before a new concentration-response curve to carbachol was obteined. The intracellular calcium signal in response to carbachol (10 μM) was measured by epifluorescence microscopy using fura-2 in primary cultures of tracheal smooth muscles cells from bleomycin- and saline-exposed rats.

Results and Discussion: Tracheal rings from bleomycin-exposed rats showed significantly greater carbachol potency (– log EC50:6,15 ± 0,02 vs 5,74 ± 0,05; p < 0,05) and greater maximal contraction compared to controls (3,5 ± 0,4 vs 2,5 ± 0,3 mN/mg dry weight; p < 0,05), and tracheal smooth muscle cells from bleomycin-exposed rats showed greater increase of intracellular calcium elicited by carbachol (370 ± 40 vs 175 ± 20μM; p < 0,01). The lowest effective concentration of propofol that reduced the EC50 of carbachol was $5*10^{-4}$M for the bleomycin-exposed rats and 10^{-4}M for the control group. The lowest effective concentration of propofol that reduced maximal response to carbachol was $5*10^{-4}$M for the control group, while any propofol concentration tested reduced maximal response to carbachol in the bleomycin group. The lowest effective concentration of propofol that reduced significantly the increase of intracellular calcium elicited by carbachol was 10^{-5}M in the bleomycin-exposed group and 10^{-7}M in the control group.

Conclusion(s): In vitro propofol antispasmodic effect and propofol inhibition on intracellular calcium signal in response to carbachol is reduced in a model of airway hyperresponsiveness to muscarinic receptor stimulation.

Reference:

1 Barrio J et al.Auton Autacoid Pharmacol 2006;26:327–33.

5AP1-2

End-points for pre-oxygenation

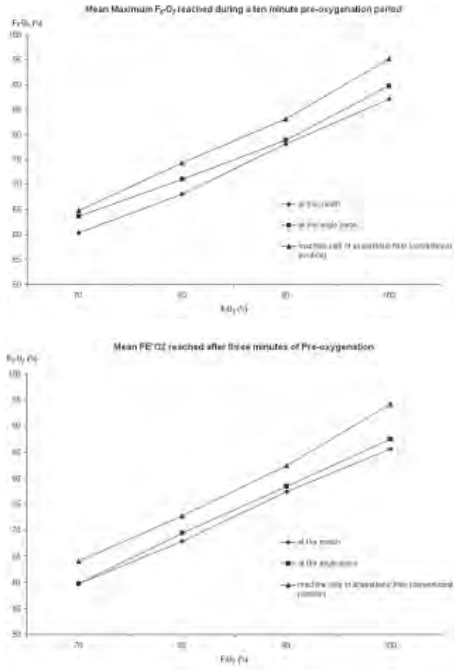
P. Sneddon, R. Sirian, I. Moppett, J. Hardman

University Department of Anaesthesia, University of Nottingham, Nottingham, United Kingdom

Background and Goal of Study: A widely used end-point for determining the adequacy of pre-oxygenation is end-tidal O_2 fraction ($F_{E'}O_2$), with a value of 90% typically being taken to indicate adequate pre-oxygenation. It is unclear how (i) FIO_2 and (ii) the sampling site in the breathing system affect this value. We intended to determine:–The change in $F_{E'}O2$ concentrations at various sites in the breathing system during pre-oxygenation–The effect of varying FIO_2 on the maximum $F_{E'}O_2$ achieved–The achievable $F_{E'}O_2$ after 3 minutes of pre-oxygenation with an optimal sampling site.

Materials and Methods: Ten healthy volunteers lay supine and breathed in a relaxed fashion via a tight-fitting facemask attached to a Bain circuit for a 10 minute period. A flow rate of 10 l/min was used with an FIO_2 of 100%, 90%, 80% or 70%, with a 10 minute period of breathing room air between each. $F_{E'}O_2$ was monitored at the mouth, angle piece and on the machine-side of the breathing system filter every 30 seconds using a calibrated, side-stream capnograph.

Results and Discussion: The average difference between $F_{E'}O_2$ measured at the mouth and the conventional position on the anaesthetic filter is 6%. There was a linear increase in maximum $F_{E'}O_2$ as FIO_2 increased. After the traditional 3 minute pre-oxygenation with 100% O_2 the maximum $F_{E'}O_2$ achieved is 86% measured at the mouth or 94% measured after the anaesthetic filter.



Conclusion(s): Measurement of $F_{E'}O_2$ at the breathing system filter misleadingly exaggerates the adequacy of pre-oxygenation. Pre-oxygenation using smaller FIO_2 may avoid atelectasis, but results in substantially reduced pulmonary oxygen stores.

5AP1-3

The effect of PEEP on respiratory system compliance and SpO_2 during laparoscopic procedures in morbidly obese patients

M. Perdiou, A. Louizos, T. Kupreou, P. Zavrides

Anesthesiology, Ippokrateion General Hospital, Athens, Greece

Background and Goal of Study: BMI is considered an important determinant of reduction of lung volumes and of worsening of respiratory mechanics and oxygenation during general anesthesia. Several modes of ventilation have been examined so far, without crear evidence of advantage. The aim of our study was to evaluate the effect of PEEP on respiratory system compliance and oxygenation during laparoscopic sleeve gastroplasty procedures.

Materials and Methods: We examined 40 morbidly obese patients, ASA I and II, randomly allocated into group I and II. After induction of anesthesia we used volume controlled mode of ventilation, respiratory rate 10/min, minute volumes large enough to keep an $ETCO_2$ 30–35 mm Hg and FIO_2 50%. Patients of group I were ventilated with addition of PEEP 5 cm H_2O and patients of group II without PEEP. All patients received the same induction and maintenance of anesthesia regiments. The pneumoperitoneum applied was 14 mm Hg. The parameters recorded were: respiratory system compliance (C), PPeak, minute volume (MV), SpO_2 and Mean arterial pressure (MAP) at four distinctive phases or positions: A) Supine, B) Head-up, C) Head-up with pneumoperitoneum and D) Supine at the conclusion of the operation. Statistical analysis was made using the t-test.

Results and Discussion: The anthropometric data and the results are shown in table1,2. No statistically significant differences were shown in the recorded parameters. MAP also did not show statistically significant changes in both groups and in all phases.

Table 1. Anthropometric data

VARIABLE	GROUP I	GROUP II
Age (yr)	37,1 ± 9,6 (22–53)	37,36 ± 12,30 (22–55)
Sex (M/F)	8/12	7/13
Height (cm)	170,5 ± 12,44	166,18 ± 10,82
Weight (kg)	135 ± 20,71	132,63 ± 25,81
BMI (kg/m2)	46,23 ± 3,5	47,58 ± 4,99

Table 2.

	A	B	C	D
COMPLIANCE	I:41,51 ± 13,59 II:35,72 ± 3,57	I:48,96 ± 15,13 II:39,24 ± 5,59	I:36,08 ± 6,77 II:31,06 ± 4,38	I:41,78 ± 10,88 II:38,86 ± 5,22
PPEAK	I:24 ± 2,70 II:22 ± 2,28	I:22,33 ± 2,1 II:21 = / – 3,03	I:27,11 ± 2,13 II:26 ± 0,89	I:25 ± 2,49 II:26 ± 3,74
MV	I:7,65 ± 1,37 II:7,68 ± 1,45	I:7,98 ± 1,71 II:7,84 ± 1,5	I:7,91 ± 1,27 II:8,4 ± 1,29	I:8,58 ± 1,42 II:9,82 ± 1,30
SPO2	I:98,1 ± 141 II:99,1 ± 1,54	I:98,28 ± 1,5 II:98 ± 1,67	98,28 ± 1,66 II:97,8 ± 1,6	98,83 ± 1,34 II:98,8 ± 0,97

Conclusion(s): The appliance of PEEP improves compliance and oxygenation without increasing inspiratory pressure, while minute volume of ventilation does not need to be increased compared to the control group.

5AP1-4

The efficacy of preoxygenation with noninvasive positive pressure ventilation in obese patients

M. Georgescu, P. Drolet, I. Tanoubi, F. Donati, L. Fortier

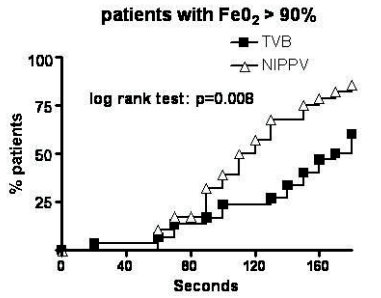
Anesthesiology, Université de Montréal, Montreal, Quebec, Canada

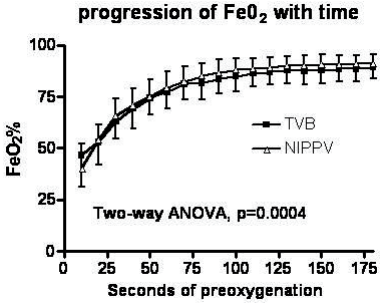
Background and Goal of Study: Preoxygenation efficacy is reduced in obese patients. This study compared end-tidal O_2 (FeO_2) during noninvasive positive pressure ventilation (NIPPV) vs tidal volume breathing (TVB) preoxygenation in obese patients.

Materials and Methods: Thirty patients with BMI > 30 entered this double blind study and were preoxygenated for 3 minutes with both 100% O_2 TVB and NIPPV (4cm H_2O IPAP/4cm H_2O PEEP) in random order. End-points were number of patients reaching FeO_2 > 90%, time to do so and FeO_2 at the end. Data were recorded every 10 seconds. Patient comfort and mask seal were also evaluated. Based on a previous experiment, this study was designed to find a 26 sec. difference in time to reach FeO_2 > 90%, (errors $\alpha = 0.05$, $\beta = 0.2$).

Results and Discussion: The table shows demographic data. Sixty% of patients reached FeO_2 > 90% during TVB vs 79% with NIPPV. It took 124 ± 42 sec. to reach FeO_2 > 90% with NIPPV vs 145 ± 46 sec. with TVB ($p = 0.02$). FeO_2 at the end of the trial was higher with NIPPV vs TVB (90 ± 3 vs 88 ± 5%, $p = 0.04$). The second figure shows the evolution of FeO_2 with time. No difference was noted regarding patient comfort or mask seal. This study suggests that adding 4cm H_2O IPAP/4cm H_2O PEEP during preoxygenation provides only a modest increase in FeO_2. Still, since no supplemental discomfort was noted with NIPPV, this technique may be worth using. Although higher pressures could bring better results, we selected this level of IPAP and PEEP following previous work with non-obese volunteers for whom higher pressures increased discomfort without enhancing FeO_2[1].

	n = 30
Sex (M/F)	16/14
Age (y)	50 ± 14
Weight (kg)	103 ± 18
Height (cm)	167 ± 9
BMI (kg/m²)	36 ± 5





Conclusion(s): NIPPV (4cm H_2O IPAP/4cm H_2O PEEP) provides a modest increase in preoxygenation efficacy for obese patients.

References:

1 Tanoubi I et al., Inspiratory support improves preoxygenation in healthy subjects [meeting abstract], Can J Anesth 2008; 55:465170.

5AP1-5

Retroperitoneal urological laparoscopic interventions: The impact on respiratory mechanics

G. Eren, B. Akdemir, B. Kozanhan, Z. Cukurova, O. Hergunsel

Anesthesiology and Intensive Care, Bakirkoy Dr Sadi Konuk Training and Research Hospital, Istanbul, Turkey

Background and Goal of Study: Laparoscopic surgery has the advantages such as better cosmetic results and less postoperative complications decreasing the hospital stay. However, during laparoscopy, hypercarbia and respiratory asidosis may occur due to systemic absorption of insufflated CO_2. Especially as the retroperitoneum is rich of vascular and areolar tissue, CO_2 absorption may well be a problem in retroperitoneoscopy. In this study, we investigated the influence of CO_2 insufflation, during elective retroperitoneal urological laparoscopic surgery, on hemodynamics, arterial blood gases and respiratory mechanics.

Materials and Methods: With the approval of local ethics committee, 40 patients of ASA I–II between the ages of 20–65 years scheduled for elective urological retroperitoneoscopic procedures were enrolled. Before the operations, patients were evaluted for FEV_1, FEV_6 and FEV_1/FEV_6 with manual spirometry. Under a standardized anesthethic protocol, hemodynamic and respiratory parameters together with arterial blood gases were recorded before induction, 10 minutes after intubation, 15minutes after insufflation, 10minutes after desufflation and 30minutes and 1hour after the end of the operation. Evaluations of FEV_1, FEV_6 and FEV_1/FEV_6 were repeated on postoperative 12th and 24th hours and they were compared with preoperative values.

Results and Discussion: Mean arterial pressures didn't change much compared to the preinduction values ($p > 0.05$), however heart rates, $EtCO_2$, plateau and peak pressures as well as tidal volumes increased significantly compared to the values before insufflation ($p < 0.05$). $PaCO_2$ and PaO_2 levels after insufflation significantly increased compared to the levels before induction ($p < 0.05$) whereas pH levels significantly decreased ($p < 0.01$). FEV_1 and FEV_6 measurements at 12th and 24th hours postoperatively were lower significantly compared to the preoperative levels ($p < 0.01$) whereas FEV_1/FEV_6 measurements showed no significance ($p > 0.05$).

Conclusion(s): During urological retroperitoneoscopic interventions, compared to the preoperative values, there is significant decrease in pH and increase in $PaCO_2$ and $EtCO_2$. Although retroperitoneoscopy seems to decrease respiratory function tests, respiratory function comes closer to the preoperative levels at 24th hour. So, we suggest to be alert especially in elderly patients with pulmonary and cardiac disease about CO_2 absorption and its systemic consequences after retroperitoneoscopy.

5AP1-6

Protective effect of a Nuclear Factor Kappa B (NF-KKB) inhibitor, pyrrolidium dithiocarbamate in the lung injury of rats due to streptozocin induced diabetes

G. Eren, Z. Cukurova, O. Hergunsel, G. Demir, A. Gedikbasi

Anesthesiology and Intensive Care, Bakirkoy Dr Sadi Konuk Training and Research Hospital, Istanbul, Turkey

Background and Goal of Study: The range of severity of presentation of diabetes is very wide and diabetics often require intensive care admission because of its debilitating complications. Although the lungs are thought to be not affected primarily by DM, an increasing number of studies indicate physiological and structural abnormalities in the lung of diabetics. Intracellular oxidative stress and subsequent activation of the redox-sensitive transcription factor NF-κB is supposed to play an important role in the development of late diabetic complications. Pyrrolidine dithiocarbamate (PDTC) is a metal chelator and antioxidant, with potent anti-inflammatory properties, due to its ability to suppress NF-κB. Because NF-κB activation may be crucial in the end-organ injury due to DM, in the present study, we studied the effects of inhibiting NF-κB activation using PDTC on DM-induced possible lung injury.

Materials and Methods: With approval of animal care committee, 28 Sprague-Dawley rats were allocated into 3 groups. Rats in DM group (n:10) were given intraperitoneal 65 mg kg^{-1} streptozocin to induce diabetes and the rats in PDTC group (n:10), together with streptozocin, received 60 mg kg^{-1} PDTC for a total of 10 weeks. Third group of rats (n:8) were taken as control group without given any medication. At the end of 10 weeks, rats were sacrificed and their lungs were taken for evaluation histopathologically and immunohistochemically for NF- κB (p65) activity and endothelial nitric oxide (eNOS) expressions. Biochemical detreminations of protein carbonyl content (PCC), as a marker of oxidative stress, were done in the lung tissue; and superoxide dismutase (SOD) and reduced glutathione (GSH) activities were measured.

Results and Discussion: Histopathologically alveolar basal membranes were thickened and there was intense inflammatory reaction in the diabetic lung; and these changes were lessened in PDTC group. There were more intensive positive expressions of eNOS and p65 staining in diabetic lung compared to the control group. Whereas there were poor positive expressions of them in PDTC given group which was closer to the ones in control group. PCC levels were higher and SOD and GSH activites lower in diabetic lungs, whereas these parameters were found closer to control group.

Conclusion(s): The lungs seem to be exposed to changes induced by oxidative stress in DM through NF- κκB activation. Our results encourage us to say that PDTC might be useful when used clinically. However, there is need for further studies on this issue before clinical application becomes possible.

5AP1-7

Does head-up position (HUP) improve preoxygenation with non-invasive positive pressure ventilation (NPPV) in morbidly obese patients?

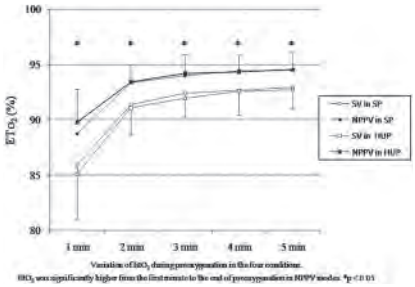
M. El Kamel, J. Delay, A. Saour, L. Gignon, S. Jaber

Anesthesia and Critical Care B (SAR B), Saint-Eloi University Hospital, Montpellier, France

Background and Goal of Study: Preoxygenation of morbidly obese patients before induction of general anesthesia can be improved by NPPV with pressure support (PS) ventilation and positive end-expiratory pressure (PEEP). It may also be enhanced by placing the patient in the HUP. However, the efficacy of the association of NPPV and HUP on end-tidal O2 fraction (EtO2) during preoxygenation has not been reported. The aim of this physiological study was to evaluate EtO2 during preoxygenation in spontaneous ventilation (SV) with balloon (standard method) in comparison with NPPV both in supine position (SP) and HUP.

Materials and Methods: We enrolled 25 consecutive morbidly obese patients ($BMI = 47 \pm 5\ Kg \cdot m^{-2}$) in this randomized cross-over study. Preoxygenation was performed in the same conditions as before induction of general anesthesia. Four conditions were evaluated in random order in each patient: 1) SV in SP; 2) NPPV in SP; 3) SV in HUP and 4) NPPV in HUP. In the NPPV mode, PS was set at 5 cm H_2O and PEEP at 10 cm H_2O. Values of EtO2 at baseline, 1, 2, 3, 4 and 5 minutes in each condition were compared. Time to reach 90% EtO2 and number of patients achieving 95% EtO2 were also recorded.

Results and Discussion: Preoxygenation with NPPV allowed achieving higher EtO2 values from 1 to 5 min than with SV regardless to patient's position. Highest values of EtO2 at 1, 2, 3, 4 and 5 min were recorded in the "NPPV in HUP" series (89,7 ± 3,0% at 1 min; 94,6 ± 1,6% at the end of preoxygenation). Mean time to reach 90% EtO2 was significantly shorter in NPPV conditions with comparison to SV ones, regardless to patient's position. There was a trend to a shorter time to reach 90% EtO2 in "NPPV in HUP" compared to "NPPV in SP" that did not reach significance (60,4 ± 23,2 s vs. 67,7 ± 37,7 s, p = 0,22). Both in SP and in HUP, the proportion of patients achieving 95% EtO2 in NPPV conditions was significantly higher than in SV conditions (60 vs. 32%, $p < 0.001$).



Variation of EtO_2 during preoxygenation in the four conditions.
EtO_2 was significantly higher from the first minute to the end of preoxygenation in NPPV modes. *p < 0.05

Conclusion(s): Preoxygenation with NPPV allows achieving higher EtO2 values and provides a more rapid oxygenation than standard method using spontaneous ventilation with balloon. Adding head-up position to NPPV did not modify EtO2 values achieving in comparison with NPPV in supine position.

5AP1-8

Respiratory dependent PO_2 oscillations proceed to the arterial but not to the venous circulation in a porcine lavage acute respiratory distress syndrome

A. Vogt, S. Böhme, B. Dünges, B. Röhrig, K. Markstaller

University Department of Anaesthesiology and Pain Therapy, University Hospital Bern, Bern, Switzerland

Background and Goal of Study: Changes in shunt fraction due to tidal recruitment of atelectasis with large PaO_2 oscillations at the brachiocephalic artery has been shown in a rabbit surfactant-depletion model of lung injury (1). It is not known, however, whether PO_2 oscillations are detectable downstream of the arterial circulation or in the venous system. In a porcine lavage ARDS we evaluated the amplitude of respiratory dependent PO_2 oscillations in the aortic and central venous circulation.
Materials and Methods: After local IRB approval fast intravascular PO_2 was measured in 8 anaesthetized pigs (24.1 ± 1.1kg) by fiberoptic, fluorescence-quenching oxygen probes (FOXY-AL300, Ocean Optics, Dunedin, FL) connected to multi frequency phase fluorimeters (MFPF-100, TauTheta, USA). Respiratory parameters were set as follows: RR 8/min, tidal volume 30ml/kg, PEEP 5mbar, FIO_2 1.0. After induction of a lavage ARDS, measurements were taken at the ascending aorta (AA), at the aortic bifurcation (AB) and at the inferior central vein (ICV). All data were recorded online with a sampling rate of 10Hz and stored on a PC by serial capture. Measurements at AA and AB were performed at the same time period and arterial and mixed venous samples were taken for blood gas analysis.
Results and Discussion: Amplitude of respiratory dependent PO_2 oscillation mean ± SD (95%CI) was 55 ± 26mm Hg (31,79) at AA, 72 ± 35mm Hg (40, 104) at AB and 4 ± 3 (1, 6) at ICV. No difference was found for AA vs. AB (p-value = 0.176, Wilcoxon Signed Ranks Test), but for ICV vs. AA and ICV vs. AB (p-value = 0.018, Wilcoxon Signed Ranks Test). Conventional blood gas analysis revealed an arterial PO_2 of 218 ± 133mm Hg (106,329) and a mixed venous PO_2 of 42 ± 6mm Hg (37, 46).
Conclusion(s): In conclusion, in this porcine lavage ARDS model respiratory dependent PaO_2 oscillations, detected near the left ventricular outflow tract, proceeded to the aortic bifurcation, but not to the central venous system. Further studies are needed to evaluate the impact of PaO_2 oscillations in ARDS.
Acknowledgements: All experiments were performed at the Department of Anaesthesiology, Johannes Gutenberg-University, Mainz, Germany. This work was supported by German Research Foundation DFG Ma 2398/3, Swiss National Foundation SNF POIB—117065/1 and an institutional grant of the University Department of Anaesthesiology and Pain Therapy, Inselspital, Bern.
Reference:
1 Pfeiffer B, Syring RS, Markstaller K, Otto CM, Baumgardner JE. The implications of arterial PO_2 oscillations for conventional arterial blood gas analysis. Anesth Analg. 2006 Jun;102(6):1758–64.

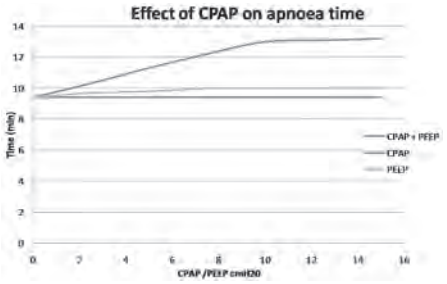
5AP1-9

Does continuous positive airway pressure enhance pre-oxygenation?

R. Sirian, J. Hardwick, J. Hardman

University Department of Anaesthesia, University of Nottingham, Nottingham, United Kingdom

Background and Goal of Study: Continuous positive airway pressure (CPAP) prevents atelectasis and increases functional residual capacity (FRC), consequently improving oxygenation. The benefit of CPAP during pre-oxygenation has been poorly quantified. It may be uncomfortable and risks gastric inflation, so it is necessary to quantify its potential benefit during pre-oxygenation. We aimed to quantify the benefit of CPAP during pre-oxygenation and its effect on apnoea time.
Materials and Methods: The Nottingham Physiology Simulator (NPS), which has been validated for the investigation of pre-oxygenation[1,2], was used to carry out our investigation. A single healthy in-silico subject was configured and pre-oxygenated using tidal volume breathing for 3 minutes and then rendered apnoeic with an airway open to 21% oxygen in nitrogen. Three protocols were studied: 1) CPAP (0, 5, 10, 15 cm H_20) during pre-oxygenation. 2) CPAP (0, 5, 10, 15 cm H_20) during pre-oxygenation and maintained as positive end-expiratory pressure (PEEP) during apnoea. 3) No CPAP during pre-oxygenation, but PEEP applied during apnoea.
Results and Discussion: Application of up to 10 cm H_20 of CPAP increase apnoea time by up to 38% if it is maintained as PEEP during open airway apnoea (see figure 1). CPAP + PEEP above 10cm H_20 produces little extra benefit. CPAP during the pre-oxygenation period without PEEP does not prolong apnoea time. Application of PEEP during apnoea without preceding CPAP provides only a very small improvement in apnoea time (up to 6%).
Conclusion(s): A combination of CPAP and PEEP has a significant benefit on the pre-oxygenation process, prolonging apnoea time.
References:
1 Hardman JG, Wills JS, Aitkenhead AR. Investigating hypoxemia during apnea: validation of a set of physiological models. Anesth Analg. 2000; 90: 614–8.
2 Hardman JG, Bedforth NM, Ahmed AB, Mahajan RP, Aitkenhead AR. A physiology simulator: validation of its respiratory components and its ability to predict the patient's response to changes in mechanical ventilation. Br J Anaesth. 1998; 81: 327–32.



5AP1-10

Ischemic preconditioning decreases oxidative stress in a lung auto-transplant pig model

M. Del Barrio, J. Casanova, E. Vara, C. Simón, I. Garutti

Anesthesiology, H.G.U. Gregorio Marañón, Madrid, Spain

Background and Goal of Study: Ischemic preconditioning (IPC) has been proved to protect several organs from ischemia reperfusion (I/R) injury [1,2]; however this has been poorly studied in lung transplants. Molecularly, at the beginning of this syndrome free radicals interact with the membrane lipids damaging its structure and producing new toxic metabolites. The main propose of this study was to evaluate if ischemic preconditioning prevents from oxidative stress and consequently I/R injury.
Materials and Methods: Two groups (ischemic preconditioning and control) of 7 large-white pigs were submitted to a lung auto-transplant. Both groups receive the same anesthetic induction (fentanyl 3 ug/Kg, propofol 3 mg/Kg, atracurium 0,5 mg/Kg) and maintenance (propofol 10 mg/Kg/h). Ischemic preconditioning was done by five minutes of left pulmonary artery clamping separate of five minutes of normal irrigation in two occasions before pneumonectomy was perform in the study group. Measures of oxidative stress were made using malondialdehyde (MDA), lipid hydroperoxides (LPO) and myeloperoxidase (MPO) on lung's tissue during surgery, 1) pre-neumonectomy (5min before pulmonary artery clamp), 2) pre-reperfusion (5 min. before reperfusion), 3) post-reperfusion (10 min. post-reperfusion). Non-parametric test was used to find statistical meaning.
Results and Discussion: See table 1 (mean ± SD) for details
Conclusion(s): Oxidative stress derived molecules are diminished in lungs where ischemic preconditioning maneuver was performed which indicates a protective effect over ischemia-reperfusion syndrome.
References:
1 Yin D, Ding JW, Shen J, et al. Am J Transplant. 2006 Jan;6(1):60–8.
2 Zoulay D, Del Gaudio M, Andreani et al. Ann Surg. 2005 Jul;242(1):133–9.

Table 1

	GROUPS	Pre-neumonectomy	Pre-reperfusion	Post-reperfusion
Edema	CONTROL	4.986 ± 0.54	4.965 ± 0.56	5.166 ± 0.29
	IPC	4.996 ± 0.26	4.195 ± 0.22	4.422 ± 0.33
LPO	CONTROL	2.8 ± 0.09	3.54 ± 0.09 (*)	3.50 ± 0.2 (*)
(mmol/mg protein)	IPC	2.63 ± 0.1	2.801 ± 0.1	2.856 ± 0.08
MDA	CONTROL	3.25 ± 0.2	3.86 ± 0.1	4.93 ± 0.1 (*)
(pmol/mg protein)	IPC	3.46 ± 0.2	4.33 ± 0.11	4.35 ± 0.12
MPO	CONTROL	0.06 ± 0.006	0.09 ± 0.002	0.17 ± 0.008 (*)
(Ul/mg protein)	IPC	0.06 ± 0.012	0.10 ± 0.014	0.08 ± 0.014

(*) $p < 0.05$ comparison between groups

5AP1-11

Sevoflurane's administration effect on NO synthesis in a lung auto-transplant model

G. Cusati, B. Martín, E. Vara, C. Simón, L. Olmedilla

Anesthesiology, H.G.U. Gregorio Marañón, Madrid, Spain

Background and Goal of Study: Nitric oxide (NO) is considered one of the most important mediators in ischemia-reperfusion (IR) injury. NO synthase, has three isoforms: two constitutive (eNOS, nNOS) and one inducible (iNOS). iNOS rises has been related to graft rejection, septic shock and other inflammatory processes [1]. On the other hand, sevoflurane has proved to be protective over IR injury in myocardial tissue [2], but data available are not enough to demonstrate this fact on lung tissue. The aim of this study was to determine whether or not sevoflurane has a protector effect on lung tissue decreasing IR injury measured through NO and NOS levels.
Materials and Methods: 14 large-white pigs (average weight 40 ± 12kg) were submitted to a left lung auto-transplant model. They were divided into

two groups (sevoflurane and control with propofol), anesthetic induction was the same for both of them (fentanyl 3 mcg/Kg, propofol 3 mg/Kg, atracurium 0,5 mg/Kg), however hypnotic maintenance was perform with sevoflurane 4% (sevo group) and propofol 10 mg/Kg/h (control group) until pneumonectomy was done, then propofol 10 mg/Kg/h was used for the two groups. Blood and lung's tissue samples were taken in three different moments, 1) pre-neumonectomy (5 min before pulmonary artery clamp), 2) pre-reperfusion (5 min before reperfusion) and 3) post-reperfusion (10 min after reperfusion), in order to measure levels of NO and NOS isoforms. We use non-parametric test to find statistical meaning.

Results and Discussion: Data (Mean ± SD) are shown in the table 1.

Table 1.

	GROUP	Pre-neumonectomy	Pre-reperfusion	Post-reperfusion
eNOS	CONTROL	1.66 ± 0.03	1.35 ± 0.02 (*)	1.47 ± 0.02
	SEVO	1.78 ± 0.013	1.72 ± 0.013	1.61 ± 0.0001
nNOS	CONTROL	1.462 ± 0.02 (*)	1.041 ± 0.04 (*)	1.34 ± 0.05
	SEVO	1.619 ± 0.04	1.51 ± 0.05	1.47 ± 0.06
iNOS	CONTROL	1.768 ± 0.03	1.851 ± 0.11	1.945 ± 0.09 (*)
	SEVO	1.867 ± 0.05	1.773 ± 0.04	1.553 ± 0.12
NO	CONTROL	41.96 ± 2.3	24.13 ± 2.4	29.62 ± 2.9
(nmol/ml)	SEVO	30.71 ± 3.2	34.08 ± 5.3	34.54 ± 4.77

(*) $p < 0.05$ comparison between groups.

Conclusion(s): sevoflurane preconditioning has revealed its utility to decreased iNOS' expression probably reducing ischemia-reperfusion syndrome in the graft.

References:

1 BK Podesser1 and S Hallstro. Br J Pharmacol (2007) 151, 930–940 Hare.
2 Kaneda K, Miyamae M. et al. Anesth Analg. 2008 Jan; 106(1):9–16.

5AP2-1

Dependence of arterial to end-tidal PCO_2 differences on FIO_2 in anesthetized humans

S. Ito, H. Yamauchi, H. Sasano, F. Joseph, K. Sobue

Department of Anesthesiology and Medical Crisis Management, Nagoya City University Graduate School of Medical Sciences, Nagoya, Aichi, Japan

Background and Goal of Study: Arterial PCO_2 ($PaCO_2$) to end-tidal PCO_2 ($PETCO_2$) differences (Pa-$ETCO_2$) are affected by alveolar dead space and tidal volume (VT). The effect of fraction of inspired O_2 (FIO_2) on Pa-$ETCO_2$ is as yet undetermined[1,2]. We predicted on theoretical grounds that high FIO_2 will increase Pa-$ETCO_2$ and investigate their relationship in anesthetized humans.

Materials and Methods: Subjects were ASA I–II supine patients undergoing elective lower abdominal surgery. Anesthesia was maintained with sevoflurane, of which concentration was kept during this study, in air/O_2. Standard anesthetic monitors were applied, including analysis of tidal gas for PCO_2 and Fo_2. All patients underwent cannulation of a radial artery for continuous pressure reading and intermittent arterial blood sampling. VT and frequency (*f*) were adjusted to maintain $PETCO_2$ at 30–35 mm Hg. After establishing a hemodynamic and ventilatory steady state we introduced FIO_2 levels of 0.21, 0.33, 0.5, 0.75, 0.97 in random order without changing VT or *f*. Arterial blood samples were analyzed for $PaCO_2$ at each FIO_2. We obtained Pa-$ETCO_2$ from temperature-corrected $PaCO_2$ and $PETCO_2$.

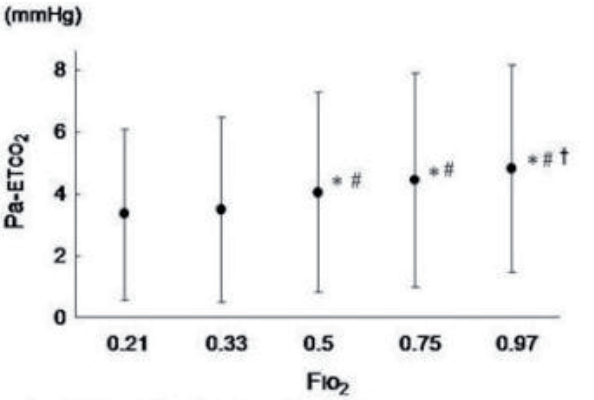


Figure 1. The relationship between FIO_2 and Pa-$ETCO_2$
Data are expressed as mean ± S.D.
*** P<0.05 versus 0.21, # P<0.05 versus 0.33, † P<0.05 versus 0.5**

Results and Discussion: We studied 30 subjects (13 male and 17 female). Their characteristics were [average (range)]: age, 61.9 (34–82) years; height, 161.5 (145–180) cm; weight, 54.4 (35–95) kg. The values of Pa-$ETCO_2$ in 0.21, 0.33, 0.50, 0.75 and 0.97 of FIO_2 were 3.3 ± 2.8, 3.5 ± 3.0, 4.1 ± 3.2, 4.4 ± 3.5 and 4.8 ± 3.4 mm Hg respectively. Pa-$ETCO_2$ in 0.5 and 0.75 of FIO_2 were significantly larger than those in 0.21 and 0.3. Pa-$ETCO_2$ in 1.0 of FIO_2 was significantly larger than those in 0.21, 0.33 and 0.5. Pa-$ETCO_2$ increased consistently as FIO_2 was increased above 0.33. This is the first study to demonstrate the FIO_2 dependence of Pa-$ETCO_2$ in anesthetized humans This relationship can be explained by an FIO_2-related increase in alveolar dead space reducing the $PETCO_2$. Clinically FIO_2 should be taken into account when using $PETCO_2$ as a surrogate for $PaCO_2$.

Conclusion(s): Pa-$ETCO_2$ was increased FIO_2-dependently.

References:

1 Larson CP, Severinghaus JW. J.Appl.Physiol. 1962;17:417–420.
2 Whitesell R, Asiddao C, Gollman D, et al. Anesth Analg. 1981;60:508–512.

5AP2-2

Analysis of regional lung aeration and ventilation during two modes of assisted mechanical ventilation in experimental acute lung injury

P. Spieth, M. Cuevas, P. Pelosi, T. Koch, M. Gama de Abreu

Department of Anesthesiology and Intensive Care Therapy, University Clinic Carl Gustav Carus, Dresden, Germany

Background and Goal of Study: Biphasic positive airway pressure/airway pressure release ventilation with spontaneous breathing (BIPAP/APRV + SB) can lead to less tidal hyperinflation and reaeration than pressure support ventilation (PSV) during assisted mechanical ventilation. However, previous studies have not assessed controlled and spontaneous breath cycles separately during BIPAP/APRV + SB.

Materials and Methods: BIPAP/APRV + SB and PSV were performed in random sequence (1 h each) in 10 pigs with acute lung injury (ALI) induced by surfactant depletion at comparable mean airway pressures and minute volumes. Mean tidal volumes were 6–8 ml/kg and end-expiratory pressure was 5 cm H_2O. We measured gas exchange, hemodynamics, inspiratory effort and work of breathing. Dynamic computed tomography scans were obtained at a rate of 8.33 Hz at apex, hilus and base of lungs for 60 s. Aeration compartments and ventilation were calculated in four zones along the ventral-dorsal gradient. Statistical analysis was performed with paired t-tests and mixed linear models. Significance was accepted at $p < 0.05$.

Results and Discussion: We found that BIPAP/APRV + SB, compared to PSV: 1) increased $PaCO_2$, inspiratory effort and work of breathing, with similar oxygenation and hemodynamics; 2) decreased poorly and non aerated areas; 3) decreased mean tidal hyperinflation and re-aeration. Nevertheless, controlled breaths during BIPAP/APRV + SB led to more tidal hyperinflation and re-aeration than PSV; 4) resulted in similar distributions of ventilation. Although the mean values were reduced, more tidal hyperaeration and reaeration were observed in controlled breath cycles of BIPAP/APRV + SB, compared to PSV (see Fig.1).

Conclusion(s): Our findings suggest that BIPAP/APRV + SB may be not more protective than PSV in this ALI model.

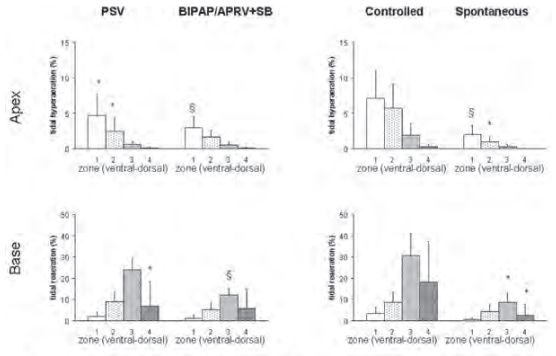


Fig. 1 – Percentages of tidal hyperaeration at lung apex and of tidal reaeration at the base from ventral to dorsal. * = P < 0.05 vs. Controlled BIPAP cycles; § = P < 0.05 vs. PSV.

5AP2-3

Influence of high perioperative oxygen fraction on pulmonary function after abdominal surgery

A. Stæhr, C. Meyhoff, S. Henneberg, P. Christensen, L. Rasmussen

Department of Anaesthesia, Centre of Head and Orthopaedics, Copenhagen University Hospital, Rigshospitalet, Copenhagen, Denmark

Background and Goal of Study: A high perioperative inspiratory oxygen fraction (FIO_2) may reduce the frequency of surgical site infections[1]. Ventilation with 100% oxygen for only a few minutes is associated with significant formation of atelectasis [2], which may impair oxygenation and decrease functional residual capacity (FRC). Our aim was to compare the changes in oxygenation index (PaO_2/FIO_2) and FRC in patients given an inspired oxygen concentration of either 80% or 30% oxygen during and for 2 hours after surgery.
Materials and Methods: After giving informed consent, 35 patients scheduled for laparotomy for ovarian cancer were randomised to receive 30% oxygen (15 patients) or 80% oxygen (20 patients). Exclusion criteria were: inability to give informed consent, inability to keep arterial oxygen saturation above 90% without supplemental oxygen, chemotherapy within 3 months, and surgery within 30 days. PaO_2/FIO_2 was measured every 30 min. during anaesthesia and at 90 min. after extubation. FRC was measured the day before surgery and 2 hours after extubation by a rebreathing method using the inert gas SF_6[3]. The study was designed to detect a 4kPa difference in PaO_2/FIO_2 with a power of 80% and a significance level of 0.05, assuming a SD of 4 kPa.
Results and Discussion: At the end of anaesthesia the median change in PaO_2/FIO_2 was – 7 [intequartil range: – 18; 3] kPa in the 30%-group vs. 0.3 [–5; 6] kPa in the 80%-group (P = 0.10). Ninety min. after extubation, the change in the PaO_2/FIO_2 was – 12 [–19; 0] kPa in the 30%-group vs. – 8 [–18: 1] kPa in the 80%-group (P = 0.66). The change in FRC was – 83 [–348; 223] mL in the 30%-group vs. – 133 [–463; 80] mL in the 80%-group (P = 0.70). The level of positive end expiratory pressure (PEEP) was kept at 5 cm H_2O during surgery. This application could have reduced the amount of intraoperative atelectasis and improved the oxygenation.
Conclusion(s): A high perioperative oxygen fraction was not significantly associated with changes in PaO_2/FIO_2. The reduction in FRC tended to be larger in patients receiving 80% oxygen, but this did not seem to have a great impact on oxygenation.
References:

1 Greif R et al. Supplemental perioperative oxygen to reduce the incidence of surgical-wound infection. Outcomes Research Group.N.Engl.J.Med.2000; 342:161–167.
2 Edmark L et al. Optimal oxygen concentration during induction of general anesthesia. Anesthesiology 2003; 98:28–33.
3 Clemensen P et al. A modified photo- and magnetoacoustic multigas analyzer applied in gas exchange measurements. J.Appl.Physiol 1994; 76: 2832–9.

5AP2-4

Diaphragmatic angiogenic growth factors mRNA levels in response to mode of ventilation during general anaesthesia

D. Dermitzaki, E. Neofytou, I. Matalliotakis, E. Tzortzaki, H. Askitopoulou

Dept of Anaesthesia, University Hospital of Heraklion, Heraklion, Crete, Greece

Background and Goal of Study: New capillaries (angiogenesis) develop in skeletal muscles in response to increased exercise. This study investigates diaphragmatic angiogenic activity a)during active contraction on spontaneous respiration and b) passive diaphragmatic contraction under controlled mechanical ventilation, in patients receiving general anaesthesia for lower abdominal surgery.
Materials and Methods: The study included women ASA I–II undergoing elective hysterectomy under combined general and epidural anaesthesia. Regarding the mode of ventilation during surgery, patients were randomized in three groups. Group A received controlled ventilation under muscle relaxant of intermediate duration. Group B received controlled ventilation without muscle relaxant and Group C was placed on Pressure Support of spontaneous breathing. Diaphragmatic specimens for each patient were taken in two different time ponts: at 15 min after the induction of anesthesia (control) and at 90 min later. The mRNA levels of three angiogenic factors, namely Vascular Endothelial Growth Factor (VEGF), b-Fibrogen Growth Factor (b-FGF) and b1-Tumor Growth Factor (b1-TGF) were measured in the diaphragmatic specimens by Real-ime PCR. Statistical analysis was performed using the SPSS version 10.0 (SPSS Inc, Chicago IL, USA). A *p* value of 0.05 or less was considered statistical significant.

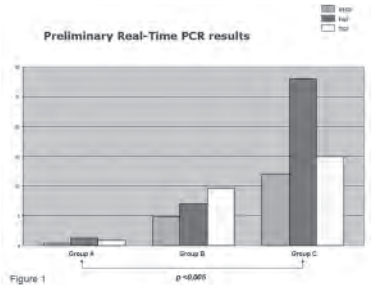


Figure 1

Results and Discussion: Group A included 8 women with mean age of 48 ± 4 years and BMI 30.8 ± 3.4. Group B included 5 women with mean age of 48 ± 3.8 years and BMI 27.6 ± 3.5. Group C included 7 women with mean age of 52 ± 6.2 years and BMI 28.1 ± 3.2. VEGF, b-FGF and b1-TGF mRNA levels were statistically significantly increased above control in Group C in comparison to Group A ($p < 0.005$) and Group B.
Conclusion(s): In healthy anaesthetized women, diaphragmatic angiogenesis is increased during active muscle contraction on spontaneous breathing in comparison to passive contraction on controlled mechanical ventilation by upregulating three important angiogenic growth factors.
Reference:

1 N.M. Siafakas, M. Jordan, H. Wagner et al. Diaphragmatic angiogenic growth factor mRNA responses to increased ventilation caused by hypoxia and hypercapnia. Eur Respir J 2001; 17: 681–7.

5AP2-5

Influence of high versus low tidalvolumes on airway pressure in patients with healthy lungs

W. Kaisers, V. Wania, C. Eisenberger, A. Schmitz, T. Treschan

Department of Anaesthesiology, Duesseldorf University Hospital, Duesseldorf, Germany

Background and Goal of Study: Whether patients with healthy lungs benefit from low tidalvolumes intraoperatively remains a matter of debate. Here we compare the influence of low versus high tidalvolumes on maximum airway pressure during upper abdominal surgery in patients with healthy lungs.
Materials and Methods: With IRB approval, 23 patients randomly received intraoperative tidalvolumes of 6 or 12 ml/kg PBW (predicted body weight). Inclusion criteria: written informed consent, ASA ≥ II, age ≥ 50 years, duration of surgery > 3hours. Initial ventilator settings: 14 (for 6ml) or 7 (for 12ml) breaths/minute, PEEP 5 mbar, FIO_2 0.5. Intraoperative parameters were recorded every 15 minutes.
Results and Discussion: In both groups tidalvolumes were well maintained during surgery. Two patients in the 12ml group received lower tidalvolumes by the discretion of the attending anesthesioloigst. Of note, maximum airway pressures did not differ between groups. Although not statistically significant, low tidalvolumes required a higher minute ventilation. If ventilation frequency is adjusted properly, in patients with healthy lungs CO_2 elimination is efficient with low tidalvolumes. High tidalvolumes in some cases required very few breaths/minute.

Patient characteristics and comparison of ventilator settings during surgery

	6 ml/kg PBW	12 ml/kg PBW
Number of Patients	10	13
Male/Female	7/3	11/2
Height (cm)	171 ± 11	177 ± 8
Wheight (kg)	84 ± 16	75 ± 13
Body mass index (kg/m²)	29 ± 6	24 ± 4
Adjusted ventilation frequency	17 ± 2	8 ± 3*
Minute ventilation	6,4 ± 1,6	5,3 ± 1,3
Positive endexpiratory pressure	6 ± 1	5 ± 1
Maximum inspiratory pressure	16 ± 4	17 ± 1
Endtidal Carbondioxid	34 ± 3	34 ± 3

Data are presented as full numbers or means ± standard deviation, * indicates statistically significant differences between groups (p 0.05).

Conclusion(s): Maximum airway pressure does not differ between patients ventilated with high or low tidalvolumes during elective upper abdominal surgery in patients with healthy lungs. Additionally, CO_2 elimination is uncritical with low tidalvolumes, if ventilation frequency is properly adjusted.
Acknowledgements: Special thanks to Martin Beiderlinden, Thorsten Eisenach, Bea Bastin, Maximilian Schäfer, Ursula Schmalz, Renate Babian, Annett Urban, Stella Büttgen, Claudia Dohle and Peter Kienbaum.
References:

1 Lee PC, Helsmoortel CM, Cohn SM, Fink MP: Are low tidal volumes safe? Chest 1990; 97: 430–4.
2 Schultz MJ, Haitsma JJ, Slutsky AS, Gajic O: What tidal volumes should be used in patients without acute lung injury? Anesthesiology 2007; 106: 1226–31

5AP2-6

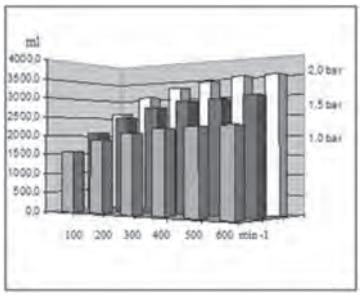
JET gas volume increases with higher JET frequencies

O. Vujanovic, G. Ihra

Anaesthesiology & Intensive Care Medicine, Medical University Vienna, Vienna, Austria

Background and Goal of Study: High-frequency jet ventilation (HFJV) is a valuable alternative ventilation technique considered in airway emergencies and special situations of airway surgery. However, application of pressurized gas is

associated with the risk for barotrauma or volutrauma. In this study, we investigated the effect of different jet frequencies on the applied gas volume.
Materials and Methods: HFJV was administered in a test lung model (Dual Adult TTL Test Lung, Model 5600i, Michigan Instruments Inc., MI, U.S.A) via a metal injector cannula (I.D. 1.5 mm) with a TwinStream ventilator (C.Reiner Corp., Austria) with 1.0, 1.5, and 2.0 bar driving pressure at increasing jet frequencies HF (100, 200, 300, 400, 500, 600/min), respectively. To facilitate determination of jet gas only, entrainment of ambient air was prevented by performing HFJV in a closed ventilation system. HFJV was administered for 5 seconds at each setting and gas volume was measured with a FlowAnalyserTM PF-300 (Imtmedical Corp, Buchs, CH). Repeated measurements of volumes at each respirator setting were analysed (mean, SD, $p < 0.05$).
Results and Discussion: Higher driving pressures were asssociated with higher gas volumes, i.e. 1580 ml (1.0 bar) vs 2615 ml (2.0 bar) at a HF 100/min. Increase of jet frequency further increased applied gas volume from 1580 to 2205 ml (140%), from 2082 to 2926 ml (141%), and from 2615 to 3499 ml (134%) at 1.0, 1.5, and 2.0 bar, respectively (Fig.1).



Conclusion(s): Application of HFJV with different jet frequency delivers different minute volumes. Increase of jet frequency markedly increases gas volume and may depend on technical respirator characteristics.

5AP2-7

Glycaemic control in patients undergoing major thoracic surgical procedures – The role of anaesthesia and postoperative analgesia

M. Werner, H. Misiolek, K. Strojek, M. Werszner

Department of Anaesthesia and Intensive Care, Medical University of Silesia, Zabrze, Poland

Background and Goal of Study: The stress of surgery and perioperative period promotes multiple metabolic disturbances. The presence of hyperglycaemia during that period is associated with poor clinical outcomes, particularly in diabetic patients. While the perioperative stress response may be managed by intensive insulin therapy, the choice of anaesthetic technique and pain control also can alleviate the metabolic response via its impact on the sympathetic system. The aim of the study was to asses an impact of the type of anaesthesia and perioperative analgesia on glycemic control in type 2 diabetic and nondiabetic patients underoing major thoracic surgical operations.
Materials and Methods: 80 patients (57 men and 23 women), aged 57 ± 9 undergoing elective thoracic surgical procedures were enrolled in the study. Patients were divided in 4 groups: I – general and thoracic epidural anaesthesia (TEA), non diabetic patients; II – TIVA, non diabetic patients; III – general and thoracic epidural anaesthesia, patients with type 2 diabetes mellitus; IV – TIVA, patients with type 2 diabetes mellitus. Postoperative analgesia was provided by patient controlled TEA with ropivacaine (I and III group) or patient controlled analgesia (PCA) with morphine (II and IV group). Intensive insulin therapy protocol was implemented in all patients, aiming for a target glucose range 80 – 110mg/dl. Initial glycaemic values, intraoperative haemodynamic and ventilatory parameters, glycaemia in several time points (every 30 min.), insulin requirements during anaesthesia and mean values of glycaemia and insulin requirements for 3 days post-surgery were evaluated.
Results and Discussion: There were no differences in haemodynamic and ventilatory parameters during anaesthesia. No significant differences between the groups were found with respect to mean ± SD blood glucose levels (I–97,3 ± 15,8mg/dl II–93,9 ± 18,8mg/dl III–111,4 ± 24,7mg/dl IV–119,3 ± 19,8mg/dl) or insulin requirements (I–0,6 ± 0,8 IU/h II–0,3 ± 0,9 IU/h III–1,2 ± 1,4 IU/h IV–1,3 ± 0,9 IU/h) and anaesthesia type in the intraoperative period. Postoperative glucose levels and insulin requirements were also not different in patients with or without type 2 diabetes mellitus.
Conclusion(s): Type of anaesthesia (TIVA or general and epidural anaesthesia) and perioperative analgesia (PCA or patient controlled TEA) has no influence on glycaemia and insulin requirements in type 2 diabetic and nondiabetic patients undergoing major thoracic surgery.

5AP2-8

Feasibility and reliability of a variable ventilation mode run by a remotely controlled ventilator

S. Trachsel, P. Schumacher, D. Leibundgut, B. Eberle

Department of Anesthesiology, University Hospital, Bern, Switzerland

Background and Goal of Study: Biologically variable ventilation results in better oxygenation in compromised lungs of animals and humans 1,2. Many biological variables show a fractal pattern, and life support systems may benefit from noise 3,4. Varying tidal volumes could have a positive effect on lung tissue, where lower tidal volumes reduce mean airway pressure and higher volumes recruit less ventilated lung regions and ameliorate gas exchange. The aim of this work was to evaluate a ventilator mode that applies randomly assigned tidal volumes within defined limits. We opted for a volume controlled ventilation to keep minute ventilation constant, in presence of changing pulmonary compliance over time.
Materials and Methods: Ten pigs with a weight of 29 ± 1.6 kg were ventilated with a DIVAN ventilator (Dräger Medical, Lübeck, Germany), modified for research purposes. The ventilator was controlled by a target-host system (xPC, MATLAB/Simulink, The Mathworks Inc., Natick, MA, USA), to provide randomly varying tidal volumes with a defined distribution in defined limits. Tidal volumes were applied within 5 to 11 ml/kg. The limits were set in order not to harm the lung and to provide adequate ventilation with a respiratory rate below 50/min. Spirometry, hemodynamics and end-tidal CO_2 were recorded with a Datex Ohmeda S5 Monitor (GE Healthcare). Blood gas analyses were performed to assess gas exchange.
Results and Discussion: All animals were successfully ventilated for 6 hours with this variable ventilation mode. Hemodynamics were not affected by the varying tidal volumes delivered and oxygenation and $PaCO_2$ was constant during the entire period. Median tidal volume delivered was 8.2 ml/kg. Linear correlation of tidal volumes and end-tidal CO_2 resulted in a slope of 0.006. This confirms adequate tidal volumes for CO_2 excretion.

Gasexchange and hemodynamic parameters

Parameter	Baseline	3 hours	6 hours
PaO_2 [mm Hg]	241 ± 14	234 ± 11	226 ± 27
$PaCO_2$ [mm Hg]	44 ± 2	45 ± 5	44 ± 3
MAP [mm Hg]	77 ± 16	76 ± 19	76 ± 8.4
MPAP [mm Hg]	14 ± 2.8	15 ± 2.6	16 ± 3.6
CO [l/min]	5.2 ± 1.2	4.8 ± 1.3	5.6 ± 1.7

Values are given as mean ± SD

Conclusion(s): Normal hemodynamic values and adequate gas exchange were found during 6 hours of variable ventilation in each of the 10 pigs. This ventilation mode may be used in further investigations of controlled ventilation with variable tidal volumes.
References:
1 Mutch et al Br J Anaesth 2000; 84: 197–203.
2 Boker et al. Am J Respir Crit Care Med 2002;165; 456–62.
3 Navalesi et al. Curr Opin Crit Care 2003; 9: 51–8.
4 Suki et al. Nature 1998; 393; 127–8.

5AP2-9

Ventilation for laparoscopic surgery of obese patients: Volume or pressure controlled?

A. Hesbois, M. Leclercq, E. Engelmann, C. Velghe-Lenelle

Anaesthesiology – Intensive Care, Hôpital Erasme, Brussels, Belgium

Background and Goal of Study: The prevalence of obesity continuously increases. Few studies have investigated the impact of ventilatory mode in the obese patient during laparoscopic surgery. Recently, Cadi and al showed a better oxygenation when using pressure controlled ventilation. The aim of this study was to compare the two main modes of controlled ventilation in the obese patients.
Materials and Methods: Patients with a BMI > 35 kg m^{-2} admitted for laparoscopic bariatric surgery were randomized into 2 groups : PCV (pressure controlled ventilation, 20 mbar, 11 cycles per minute, PEEP 5 cm H_2O) and VCV (volume controlled ventilation 8 ml kg^{-1} of ideal tidal volume, 11 cycles per minute, PEEP 5 cm H_2O). Anesthesia was standardized with propofol for induction and maintenance with desflurane. TCI remifentanil was used for analgesia and continuous neuromuscular block was obtained with cisatracurium). The gases are conducted, the parameters (ventilation and hemodynamic) are collected at different time of surgery: in ambient air (T0), 15 min after intubation (T1), 30 and 60 minutes after the start of the laparoscopy (T2 and T3), at the extubation (T4) and 15 minutes after arrival in the recovery room (T5). The target was to maintain a $paCO_2$ within 15% of its initial value.
Results and Discussion: 28 patients were randomized, 13 in the PCV group and 15 in the VCV group, There were no significant demographic differences.

Plate pressure differed significantly at different time of surgery (T1 : 25 mbar ± 1 vs 20 mbar ± 3; p < 0,01) (T2 : 29 mbar ± 3 vs 23 mbar ± 2; p < 0,01) (T3 : 30 mbar ± 2 vs 23 mbar ± 3; p < 0,01). For blood pressure analysis of variance between groups gives a p = 0,046 for the overall difference between groups. No differences were observed in pH, $paCO_2$, paO2 or other ventilation parameters (peak pressure and PEEP) or hemodynamic parameters (heart rate, diastolic blood pressure). Volume controlled ventilation may provide a better control of the pressure plate, while involving no change in terms of oxygenation. Similar blood gas values show that patients were ventilated in the same way in both groups. In the immediate postoperative period paO2 show no significant differences between the groups.

Conclusion(s): Our study shows no difference in terms of oxygenation between the two groups, whether intra or postoperatively. However volume controlled ventilation provides a better control of the pressure plate during the preoperative period.

5AP3-1

Frequency of pulmonary complications after surgery for lung cancer

A. Cami, A. Hoxha, A. Hatibi, E. Fype, E. Shima

Dept. Anaesth&Critical Care, Clinic of Pneumology, University Hospital Centre "Mother Theresa", Tirana, Albania

Background and Goal of Study: Many of patients suffering from lung cancer presents prior to surgery a lot of pulmonary complications leading to respiratory failure. Complications appeared after surgery are a common finding and contributes to increased post-operative morbidity and mortality. In our study we aimed to show the frequency and types of these complications in patients after surgery for lung cancer.

Materials and Methods: In our retrospective study were enrolled 176 patients operated for lung cancer in our department during the period 2004–2007 (62.37 ± 8.16 years old, ASA I–II, nonsmoking for more than 8 weeks, FEV1 > 75%, FEV1/FVC > 75%, without significant heart disorders or respiratory failure). Routine chest X-ray, gasometry and spirometry were performed in daily intervals up to the day 8. In certain cases the follow-up was prolonged and chest CT scan and supplementary chest X-rays were needed. Post-operative pulmonary complications (POPC) were considered all the new radiology or Ct-scan findings compared to pre-operative status. p ≤ 0.05 is considered as statistically significant.

Results and Discussion: Total of patients with POPC was 86 (48.86%). Atelectasis were the predominant finding compared to others (95.34%, p < 0.01). Mortality was 5.11% (9 patients or 10.47% among patients with POPC, p < 0.001). Mortality in patients with 2 or more POPC was 24.14% (7 from 29) and in other patients with POPC was 2.99% (2 from 67) p < 0.01. The cause of mortality were ARDS (88.88%, p < 0.05) and purulent pleuritis/sepsis (11.11%).

POPC after surgery for lung cancer

	Atelectasis	Air leak	Bronchople fistula	Empyema	PNX	ARDS	≥ 2 complicat.
patients	82	14	2	4	7	12	29
% to total	46.6*	7.95	1.14	2.29	3.98	6.81	16.48
% of POPC	95.34*	16.28	2.36	4.73	8.14	13.95	33.72

* p ≤ 0.01

Conclusion(s): Our results shows that POPC after the surgery for lung cancer are frequent event. The most common findings were presented as atelectasis. POPC are a major cause of mortality in these patients. Presence of 2 or more POPC is threatening condition with increased rate of mortality. The most common cause of mortality was ARDS.

5AP3-2

The role of pre-operative sleep studies in patients scheduled for bariatric surgery

H. Murray, A. Kendall, J. Dakin, S. Somers, M. Margarson

Bariatric Surgical Service, St Richard's Hospital, Chichester, West Sussex, United Kingdom

Background and Goal of Study: Morbidly obese patients have a high incidence of co-morbidities including occult sleep apnoea and are at high risk of post-op respiratory complications. Identification of patients with significant Obstructive Sleep Apnoea (OSA) and other forms of sleep disordered breathing is important to ensure appropriate targeting of high-level monitoring and other critical care resources to these patients. Epworth Scoring is widely practised as an initial screening tool for patients likely to suffer from OSA.

Materials and Methods: Between May 06 and Nov 08, 572 Morbidly obese patients (212 with BMI > 60 kg/m2) underwent Roux-en-Y Gastric Bypass at our Bariatric Surgical Unit. All patients were seen pre-operatively in a multi-disciplinary outpatient clinic staffed by three surgeons and one of four consultant anaesthetists. Those patients felt at high risk for sleep disordered breathing were scored using the Epworth Sleepiness Scale and admitted for overnight sleep study. Multi-channel respiratory studies were performed, monitoring thoraco-abdominal movements, nasal airflow, oximetry and ECG. Each study was assessed by a sleep medicine physician, and scored according to the criteria of the American Academy of Sleep Medicine. If present, OSA was graded as mild, moderate or severe. The presence of hypoventilation was construed by occurrence of prolonged desaturation not attributable to obstruction.

Results and Discussion: 52 patients (24 female, 28 male) with an average age of 44 years underwent formal sleep study. The median BMI was 67 kg/m2 (range 46–102) and the median weight was 191 kg (range 125–274 kg). The Epworth Scores ranged from 1 to 22, in only eleven patients were the scores greater than 12. 21 patients had studies demonstrating severe Obstructive Sleep Apnoea, with a further 12 demonstrating moderate OSA. Seven patients demonstrated moderate or severe hypoventilation, in three patients associated with severe OSA, in four patients associated with only moderate or mild OSA. 17 (33%) of the patients had no significant sleep disorder and proceeded to operation without delay. 26 patients were commenced on CPAP and 6 commenced on BIPAP.

Conclusion(s): A high proportion of pre-operative bariatric surgical patients identified clinically as high risk, have degrees of sleep disorder warranting treatment. There is a very poor correlation between high scores on the Epworth Scale and the severity of Obstructive Sleep Apnoea. The use of the Epworth Scale in the Morbidly Obese population to screen for OSA is of questionable value.

5AP3-3

Comparison of desfluran and propofol anaesthesia for one lung ventilation

K. Rutkowska, M. Werszner, H. Misiolek

Department of Anaesthesiology and Intensive Therapy, Medical University of Silesia, Katowice, Poland

Background and Goal of Study: General anaesthesia with one lung ventilation (OLV) is always associated with cardiac and respiratory dysfunction. The haemodynamic and respiratory effects of desflurane have been extensively studied but its effect during OLV is not well documented yet. The aim of our study was to investigate the usefulness of the desflurane anaesthesia during OLV.

Materials and Methods: 40 ASA I–III patients qualified for elective lobectomy were randomized to receive general anaesthesia with either propofol (n = 20) or desfluran (n = 20) combined with epidural thoracic anaesthesia. Doppler ultrasound oesophageal probe was inserted for non-invasive, continuous monitoring of: heart rate (HR), stroke volume (SV) and cardiac index (CI). Baseline parameters were assessed before starting anaesthesia with study agent (T0). Data were recorded at: 15 min after induction of anaesthesia with two lung ventilation (TLV) (T1), 15 min after conversion to lateral position with TLV (T2), 15 min after starting OLV (T3), 30 min after starting OLV (T4), 15 min after restarting TLV (T5) and 30 min after restarting TLV (T6). Arterial blood samples were taken in all time points to obtain partial pressure of the oxygen ($Pa O_2$) and carbon dioxide ($Pa CO_2$). Peak inspiratory pressure (PIP) was recorded as well.

Results and Discussion: Haemodynamic parameters were comparable between study groups. $PaCO_2$ and PIP were increased in propofol group (p < 0.001 for majority of measurements) comparing to desflurane group, in all mesurament points.

Table 1. Partial pressure of the carbon dioxide ($Pa CO_2$).

Time points	Desflurane group (n = 20)	Propofol group (n = 20)	p
T0	39.6 ± 5.6	41.6 ± 5.6	NS
T1	38.6 ± 4.4	46.7 ± 8.3	<0.001
T2	37.7 ± 4.2	47.5 ± 9.3	<0.001
T3	40.0 ± 5.3	47.4 ± 7.9	<0.001
T4	39.5 ± 4.0	46.2 ± 8.4	<0.001
T5	38.4 ± 6.5	46.3 ± 6.5	<0.001
T6	38.1 ± 5.9	44.4 ± 10.4	<0.05

Table 2. Partial pressure of the carbon dioxide ($Pa CO_2$).

Time points	Desflurane group (n = 20)	Propofol group (n = 20)	P
T0	16.9 ± 5.5	22.6 ± 6.5	NS
T1	16.5 ± 5.4	27.6 ± 6.0	<0.001
T2	17.6 ± 5.5	27.5 ± 5.1	<0.001
T3	20.9 ± 5.7	31.0 ± 4.7	<0.001
T4	21.8 ± 5.1	31.5 ± 5.0	<0.001
T5	15.6 ± 3.4	27.4 ± 5.7	<0.001
T6	15.0 ± 3.1	26.9 ± 5.6	<0.001

Conclusion(s): Based on the results of respiratory parameters desflurane appeared to be useful anaesthestic agent for OLV.

5AP3-4

Postoperative sleep-disordered breathing (obstructive sleep apnea) in patients with and without nasal packing – Preliminary results

T. Crozier, J. Crozier, A. Groh, R. Rödel, H. Criee

Anesthesiology and Intensive Care Medicine, University of Göttingen Medical School, Göttingen, Germany

Background and Goal of Study: Patients with sleep-disordered breathing have periods of central and obstructive apnea and hypopnea (OSA) with arterial oxygen desaturation, that are associated with serious side-effects such as myocardial infarction and stroke. The effects of anesthesia and surgery on its severity have not been clearly demonstrated. Patients with pre-existing OSA or surgery with airway obstruction are thought to be at risk of significantly worsening apnea and oxygen desaturation and thus require increased monitoring, but this has not been conclusively shown.
Materials and Methods: We performed a prospective polysomnographic study (Sagura 2000) registering i.a. total sleep time, SpO2, apnea-hypopnea index (AHI) and sleep phases before and after surgery in 12 patients with moderately invasive surgery; six of whom required nasal packing. Anesthesia was with remifentanil-propofol. Postoperative analgesia was with diclofenac and oxycodon. No hypnotics were given in the evening.
Results and Discussion: AHI increased slightly in most patients, with greater increases with nasal packing or pre-existing OSA, but the changes were not statistically significant. The duration of the apnea phases and oxygen saturation values were not affected.

	All		with packing		with OSA (n = 7)	
	pre	post	pre	post	pre	post
AHI	11	22	29	64	52	78
max Time (sec)	52	45	52	45	52	42
mean SpO2%	93.4	92.5	92.5	92.5	93	92
min SpO2%	87	85	86	85	88	81

Median values given; no changes were significant

Conclusion(s): The AHI increased slightly after surgery particularly with nasal packing and in patients with OSA. Neither nasal packing nor pre-existing OSA had an influence on severity of oxygen desaturation. The results do not support the necessity of increased monitoring in the first postoperative night, but the sample size is probably too small to allow general conclusions and larger series are required.

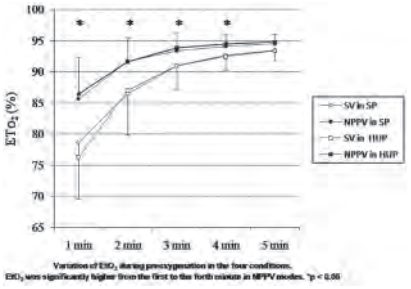
5AP3-5

Efficacy of non-invasive positive pressure ventilation (NPPV) and head-up position (HUP) to enhance preoxygenation in non-obese patients

M. El Kamel, J. Delay, L. Gignon, A. Saour, S. Jaber

Anesthesia and Critical Care B (SAR B), Saint-Eloi University Hospital, Montpellier, France

Background and Goal of Study: Continuous positive airway pressure during preoxygenation has been showed to prevent atelectasis formation and delay oxygen desaturation after induction of general anesthesia in non-obese patients. NPPV in supine position (SP) has been proved to enhance preoxygenation in morbidly obese patients. However, the efficacy of NPPV in HUP to improve preoxygenation has not been tested. In this study, we evaluated evolution of end-tidal O2 fraction (EtO2) during preoxygenation with NPPV in comparison with spontaneous ventilation (SV) in both SP and HUP.
Materials and Methods: Twenty five non-obese patients (BMI = 22 ± 3 $Kg \cdot m^{-2}$) were enrolled in this randomized cross-over study. Preoxygenation was performed in the same conditions as before induction of general anesthesia. Four conditions were evaluated in random order in each patient: 1) SV in SP; 2)NPPV in SP; 3) SV in HUP and 4) NPPV in HUP. In the NPPV mode, PS was set at 5 cm H_2O and PEEP at 10 cm H_2O. Values of EtO2 at baseline, 1, 2, 3, 4 and 5 minutes of ventilation in each condition were compared. Time to reach 90% EtO2 and number of patients achieving 95% EtO2 were also recorded. Tolerance of the patient to every combination was evaluated by a visual numeric scale at the end of the preoxygenation.
Results and Discussion: Higher EtO2 values were achieved with NPPV than with SV, regardless to patient's position during 4 minutes but with a gradual difference reduction from the first to the forth minute. A At the end of preoxygenation, EtO2 values with SV were nearly similar to those with NPPV. Both in SP and in HUP, the proportion of patients achieving 95% EtO2 in NPPV conditions was significantly higher than in SV conditions (64 to 68% vs. 28 to 32%, p < 0,001). Tolerance of preoxygenation was comparable in the four conditions.



Variation of ETO_2 during preoxygenation in the four conditions. ETO_2 was significantly higher from the first to the forth minute in NPPV modes. *p < 0.05

Conclusion(s): NPPV via a facemask achieved higher EtO2 values more rapidly but EtO2 values at the end of 5-min preoxygenation were comparable to those obtained with standard method. Head up alone or associated to NPPV did not significantly modify the EtO2 values during preoxygenation in non-obese patients.

5AP3-6

Are PEEP and recruitment necessary in volume control ventilation during open bariatric surgery? A preliminary study

A. Parera, M. Garcia, J. Casas, V. Moral

Servei D' Anestesiologia, Reanimació i Terapé Utica del Dolor, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

Background and Goal of Study: The aim of the study was to demonstrate whether the systematic application of PEEP and recruitment manoeuvres is of clinical relevance during this surgery.[1]
Materials and Methods: A prospective, randomized, controlled clinical trial in 14 patients with BMI > 40 kg/m2 undergoing open bariatric surgery. General anaesthesia was induced after randomization of the initial period PEEP/ZEEP. Ventilatory parameters of 12 bpm, FIO_2 0.5 and tidal volume were set to achieve normoventilation. Patients were divided into 2 groups each with 7 patients. After the abdominal wall was opened Group P received 20 min PEEP (8cm H_2O) followed by 20 min ZEEP, and Group Z received 20 min the same treatment but in reverse order (ZEEP before PEEP). Recruitment manoeuvres were performed at the beginning and end of each period. We analyzed arterial blood gas after each period. Main variable PO2 and secondary variables PCO_2, $ETCO_2$, compliance, resistance, airway pressures and haemodynamics were assessed. The results of both techniques in each patient were compared by bilateral student t test. Anlpha error of 5% and statistical power of 80% were considered significant.
Results and Discussion: We did not observe statistical differences in PO2 between PEEP and ZEEP periods (p = 0.07). Group P: PO2 (198 ± 55.1) vs group Z: PO2 (176 ± 64.1). Compliance increased significantly at the beginning of the surgery with PEEP (27.4 ± 6.69 to 31.7 ± 7.22 p < 0.01) and with ZEEP (from 27.4 ± 6.69 to 30.6 ± 6.81 p = 0.01), possibly due to FRC recovery with the recruitment manoeuver that reduced plateau pressure significantly at the beginning (22.2 ± 4.49 to 21.7 ± 4.81 p < 0,05) and at the end of the PEEP period (21.9 ± 3.20 to 20.5 ± 3.78 p < 0.01). Compliance improved during the PEEP period but it was not significantly reflected in the oxygenation respect to the ZEEP period. Plateau pressure and mean pressure were higher during PEEP and could have haemodynamic repercussion. The recruitment manoeuver improved lung compliance, but did not produce changes at the end of the surgery due to loss of mobility in the abdominal wall.
Conclusion(s): These results suggest that PEEP can improve lung compliance and oxygenation but it is not significantly reflected in the oxygenation respect to ZEEP and it does not imply any clinical relevance to the patient. Strategies that could induce a lasting effect of PEEP after surgery could perhaps be designed.
Reference:
1 Whalen FX, Gajic O, Thompson GB, Anesth Analg. 2006 Jan;102(1):298–305.

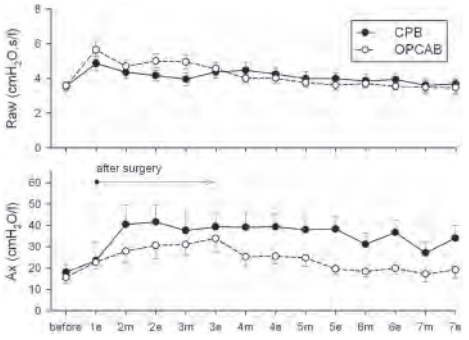
5AP3-7

Changes in airway and respiratory tissue mechanics following cardiac surgery

G. Albu, B. Babik, K. Kesmarky, Z. Hantos, F. Petak

Department of Medical Informatics and Engineering, University of Szeged, Szeged, Hungary

Background and Goal of Study: Since the forced oscillation technique requires minimum patient cooperation and no special breathing manoeuvres, it offers an appropriate measurement tool to follow up changes in respiratory mechanics in patients unable to perform forced expiratory manoeuvres. We therefore applied this technique to characterize the effects of cardiac surgery on the input impedance of the respiratory system (Zrs).
Materials and Methods: Zrs was obtained by averaging 15-s recordings during spontaneous breathing between 4–26 Hz in patients with (n = 16; Group CPB) or without (n = 19; Group OPCAB) extracorporeal circulation. In all patients, the baseline was established the day before the surgery, while the changes in Zrs were followed for 7 days after the surgery by collecting data twice a day (morning: m, evening: e). Airway resistance (Raw) was estimated by averaging the total resistive component of Zrs between 16 and 26 Hz, whereas the changes in the respiratory elastance were assessed by calculating the reactance curve area under the resonant frequency (AX).
Results and Discussion: Raw increased significantly in both groups (p = 0.04) immediately after extubation (day 1, evening,) with maximal changes of 29.5 ± 13.9% and 58.5 ± 13.1% (p = 0.17) in Groups CPB and OPCAB, respectively. Raw exhibited a gradual decrease and recovered completely before discharge. Smaller increases in AX were observed in the OPCAB Group (138 ± 38% in the evening of day 3) than in the CPB Group (217 ± 80% in the morning of day 4), with a faster recovery in the former.



Conclusion(s): These findings suggest that the uniform increases in Raw in both groups of patients are a consequence of the mechanical irritation in the upper airway exerted by the ET tube. The increases in AX indicate the development of atelectasis, as a result of mechanical ventilation and the limitations in the postoperative respiratory movements. The greater increases in AX in the CPB patients may indicate an additional deleterious effect due to the compromised production of surfactant by the pneumocyte-II cells during temporary pulmonary ischemia.
Acknowledgements: This work is supported by grant OTKA K 62403.

5AP3-8

Effect of sevoflurane administration on lipid peroxidation and leucocitary activation in a lung autotransplant model

I. Erquicia, A. Giráldez, M. García, C. Simón, I. Garutti

Anesthesiology, H.G.U. Gregorio Marañón, Madrid, Spain

Background and Goal of Study: Free radicals production contributes to tissue damage by leucocyte activation and lipid peroxidation, finally breaking the cell membrane. These products are widen released in ischemia-reperfusion (IR) injury [1]. We hypothesised that sevoflurane, as it has been proved in other tissues, can attenuate IR injury in lungs and, therefore, oxidative stress products would be lower that control after graft's implant. The purpose of this study was to determine the presumably effects of sevoflurane as lung protector.
Materials and Methods: We divided 14 large-white pigs into two groups (sevoflurane preconditioning and control). Both groups were submitted to a lung auto-transplant. All of them receive the same anesthetic induction (fentanyl 3 ug/Kg, propofol 3 mg/Kg, atracurium 0,5 mg/Kg), however, maintenance was perform with sevoflurane 4% (sevo group) or propofol 10 mg/Kg/h (control group), until pulmonary artery clamp was done, then propofol 10 mg/Kg/h was used for the two groups. Lung's samples were taken in three different moments, in order to detect biochemical changes during the procedure, 1) pre-neumonectomy (5min before pulmonary artery clamp), 2) pre-reperfusion (5 minutes before reperfusion), 3) post-reperfusion (10 minutes after reperfusion). Malondialdehyde (MDA), lipid hydroperoxides (LPO) and myeloperoxidase (MPO) were the biomarkers determined in order to measure the oxidative stress. We used U Mann-Whitney and Wilcoxon as non-parametric test to find statistical meaning.

Table 1.

	GROUP	Preneumonectomy	Pre-reperfusion	Post-reperfusion
EDEMA	CONTROL	4.986 ± 0.54	4.965 ± 0.56	5.166 ± 0.29
	SEVO	4.566 ± 0.37	4.744 ± 0.47	5.344 ± 0.34
LPO (mmol/mg protein)	CONTROL	2.8 ± 0.09	3.54 ± 0.09(*)	3.50 ± 0.2(*)
	SEVO	2.64 ± 0.1	2.8 ± 0.1	2.87 ± 0.09
MDA (pmol/mg protein)	CONTROL	3.25 ± 0.2	3.86 ± 0.1	4.93 ± 0.1(*)
	SEVO	3.05 ± 0.3	2.88 ± 0.4	3.5 ± 0.3
MPO (UI/mg protein)	CONTROL	0.05 ± 0.006	0.09 ± 0.002	0.17 ± 0.008(*)
	SEVO	0.04 ± 0.008	0.07 ± 0.01	0.09 ± 0.01

(*)p < 0.05 comparison between groups

Results and Discussion: Data (Mean ± SD) are shown in the table.
Conclusion(s): Sevoflurane use has demonstrated to decrease oxydative stress' mediators and possibly ischemia-reperfusion injury in our lung autotransplant model.
Reference:
1 Rezzani R. Histol Histopathol. 2006 Mar;21(3):301–16. Review.

5AP4-2

Restoration of pulmonary compliance after laparoscopic surgery using a simple alveolar recruitment maneuver

O. Cakmakkaya, G. Kaya, F. Altintas, M. Hayirlioglu, B. Ekici

Anesthesia and Reanimation, University of Istanbul, Cerrahpasa School of Medicine, Istanbul, Turkey

Background and Goal of Study: Diaphragmatic shift due to increased intra-abdominal pressure during laparoscopic surgery can increase atelectasis and, therefore compliance subsequently may not fully return to its baseline after desufflation. We tested the hypothesis that a pulmonary maneuver designed to recruit additional alveoli (and thereby decrease atelectasis) applied before extubation could restore pulmonary compliance to baseline values.
Materials and Methods: Twenty ASA I–II patients scheduled to receive laparoscopic radical nephrectomy were consented to participate in the study. Intervention: A pulmonary recruitment maneuver was performed as a single manual inflation of the lungs to 40 cm H_2O, maintained for 10 seconds after release of pneumoperitoneum. Participants received a balanced general anesthesia using intermittent positive pressure ventilation. Respiratory mechanics including dynamic compliance were measured continuously using the VenTrak respiratory mechanics monitor (VenTrak®, Novametrix, Wallingford, CT). Respiratory measures were recorded together with arterial blood gases after induction (T1), in lateral "jack-knife" position (T2), 10 and 120 min after CO_2 insufflation (T3 and T4), immediately after desufflation in the lateral and supine position (T5 and T6), and 10 min after a pulmonary recruitment maneuver at the conclusion of surgery (T7). Outcome data were analyzed using ANOVA for repeated measures with $P < 0.05$ defined as statistically significant.
Results and Discussion: On average, compliance decreased from an initial value of 63.5 to 52.6 mL/cm H_2O when patients were turned from the supine position to lateral position (T1 vs. T2, $P < 0.001$), and decreased further to 31.07 mL/cm H_2O after CO_2 insufflation (T2 vs. T3, $P < 0.001$). Compliance increased to 50.8 mL/cm H_2O after desufflation and 54.4 mL/cm H_2O after turning to supine position, but did not return to baseline levels until after performance of the pulmonary recruitment maneuver, 64.3 mL/cm H_2O (T6 vs. T7, $P < 0.001$ and T1 vs. T7, $P = 0.73$).
Conclusion(s): We thus conclude that respiratory mechanics do not fully return to baseline levels after desufflation following laparoscopy; however, lung compliance can be fully restored using a simple alveolar recruitment maneuver, likely through opening of residual atelectasis.
Acknowledgements: Thanks to Dr. Christian C. Apfel for his thoughtful mentorship and extensive editorial guidance.

5AP4-3

Alveolar recruitment manoeuvre is more effective in improving oxygenation compared to PEEP in morbidly obese patients receiving laparoscopic gastroplasty

E. De Groef, M. Lauwers, J. Poelaert

Department of Anesthesiology, VUB, Brussels, Belgium

Background and Goal of Study: Morbidly obese patients experience more pronounced alterations in their respiratory mechanics and gas exchange than normal weight subjects. This prospective randomized controlled trial tested the hypothesis that a repeated alveolar recruitment manoeuvre (ARM) is more effective in improving arterial oxygenation compared to the application of PEEP alone in morbidly obese patients.

Materials and Methods: Eighty patients scheduled for laparoscopic gastric banding were randomly assigned to an ARM or control group. The control group was ventilated pressure controlled mode, FIO_2 0.50, with a positive end-expiratory pressure of 8 cm H_2O. Ventilation parameters in the ARM group were identical to the control group but every twenty minutes an alveolar recruitment manoeuvre was performed. This manoeuvre consists of a pressure controlled ventilation with peak inspiratory pressure of 40 cm H_2O during one minute with FIO_2 1.0. Haemodynamics, ventilation parameters and arterial blood gas analysis were measured pre-induction (T0), 10 minutes post-induction (T1), 20 minutes after insufflation (T2), at the end of surgery (T3) and 20 minutes after arrival in the recovery room (T4). Statistical analysis: All data are expressed as mean ± SD. Unpaired T-test was performed and $p < 0.05$ was considered statistically significant.
Results and Discussion: No statistical differences were observed with respect to demographic data and haemodynamics. Oxygenation increased after both application of ARM with PEEP (ARM group PaO_2 T0: 82.1 ± 11.4 mm Hg, PaO_2 T1: 243.2 ± 73.9 mm Hg) as well as after application of PEEP alone (Control group PO T0: 81.6 ± 11.3 mm Hg, PaO_2 T1: 189.6 ± 83.6 mm Hg]. Increased oxygenation was kept during anaesthesia. PaO_2 levels were significantly higher in the ARM group at T1 ($p = 0.003$)and postoperatively ($p = 0.03$) ((ARM group PaO_2 T4: 85.2 ± 19.7; control group PaO_2 T4: 76.2 ± 15.5). (graphic 1) These results suggest a decrease in atelectasis and a better gas exchange in both techniques. However the ARM technique seems to have a prolonged effect in the postoperative period.
Conclusion(s): We can confirm our hypothesis that repeated ARM is more effective in preventing atelectasis and improving oxygenation compared to the application of PEEP alone in morbidly obese patients.

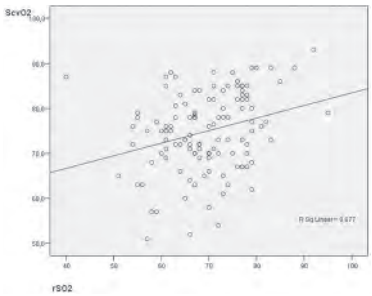
5AP4-4

Noninvasive cerebral oximeter as a surrogate for central venous saturation in thoracic surgery

A. Ruiz Ortega, F. Ramasco Rueda, A. Gómez Rice, J. de Vicente Sánchez, A. Planas Roca

Anesthesiology, H. U. La Princesa, Madrid, Spain

Background and Goal of Study: We evaluated the relationship between regional cerebral oxygen saturation (rSO_2) and regional tissue saturation (StO_2) measured by near-spectroscopy (NIRS) oximeter with superior vena cava saturation ($ScvO_2$) in patients undergoing single lung ventilation (SLV) during thoracic surgery.
Materials and Methods: Data were obtained from 20 consecutive patients undergoing thoracic surgery and requiring SLV of more than 1 hour. The INVOS®4100 (Somanetics Inc., Troy, MI) absolute oximeter was used to measure absolute rSO_2 and StO_2 every 5 min from the awake state to 24h after extubation. $ScvO_2$ was recorded also every 5 min with CeVOX® (Pulsion Medical System, Munich, Germany). Data median were analysed using repeated-measured ANOVA and Pearson's correlation test, $P < 0,05$.
Results and Discussion: We found a statistically significant correlation between rSO_2 and the $ScvO_2$ [$r = 0,27$; $p = 0,002$; (95% CI 0,101–0,458)]. The bias and precision of rSO_2 compared to $ScvO_2$ were 0,23 and 6,9%. The correlation between StO_2 and $ScvO_2$ was not statiscally significant ($r = 0,11$, $p = 0,228$). The decrease in rSO_2 was not correlated with any standard clinical parameters, for example, cardiac index, arterial pressure, blood loss or peripheral oxygen saturation.



Conclusion(s): The concordance correlations between rSO_2 and $SvCO_2$ were statistically significant although weak. In adult patients undergoing thoracic surgery without previous neurological injury, rSO_2 readings do correlate with central venous oxygen saturation.
References:
Hemmerling TM, Bluteau MC, Kazan R et al. Significant decrease of cerebral oxygen saturation during single-lung ventilation measured using absolute oximetry. Br J Anaesth 2008; 101: 870–875.
Murkin JM, Adams SJ, Novick RJ *et al*. Monitoring Brain Oxygen Saturation During Coronary Bypass Surgery: A Randomized, prospective study. Anesth Analg 2007;104:51–8.
Pearse R and Hinds CJ. Should we use central venous saturation to guide management in high-risk surgical patients? Crit Care Med 2006, 10:181.

5AP4-5

Effects of recruitment maneuver and PEEP on arterial oxygenation, mechanical respiratory system and hemodynamic parameters during retroperitoneal laparoscopic urological surgery

C. Ferrando, R. Ferrandis, E. Pastor, J. Belda

Anaesthesia and Critical Care, Hospital Clínico Universitario, Valencia, Spain

Background and Goal of Study: During urological laparoscopy surgery, as consequence of pneumoperitoneum and patients position, increases in arterial CO_2, airway pressures and hypoxemia have been observed, being the atelectasis the principal cause. It has been described that recruitment maneuvers plus PEEP improves the oxygenation. We therefore determined whether recruitment plus PEEP could avoid the changes observed during these surgeries.
Materials and Methods: We designed a prospective study. After ethics committee approval, we included patients of 18 to 85 aged, ASA I–III, with informed consent, scheduled for urological laparoscopy surgery. We excluded severe EPOC and cardiac insufficiency. After anesthetic induction, a recruitment maneuver was made increasing PEEP 5–10–15–20 cm H_2O for 5 respiratory cycles. All were ventilated in volume controlled (Tidal volume of 8 ml/kg, 12 respiratory rate, PEEP 7 cm H_2O, FIO_2 0.4%). Respiratory parameters were monitorized with CO_2SMO (Respironics Inc) and hemodynamic parameters with Vigileo (Edwards). Data were taken in 5 times: 1) 20´ after induction, 2) 20´ after position, 3) 20´ pneumo, 4) 120´ pneumo, 5) 20´ after pneumo. We used SPSS 15.0 (SPSS Inc, Chicago MC) for statistical tests (ANOVA), and Bonferroni for multiple comparisons, significance when $p < 0.05$.
Results and Discussion: We included 17 men scheduled for laparoscopic prostatectomy, of 64 ± 10 years. Pneumo time was 180 ± 40 min. The table 1 shows mean ± standard deviation of main data in the 5 times describes: recruitment maneuvers plus PEEP preserved arterial oxygenation, avoided increase in Vdalv and maintained cardiac index and other hemodynamic parameters. Then, it promoted an open lung and prevented atelectasis, being the absorption of the insufflated CO_2 the unique cause for the increase in $PaCO_2$.

Table 1. Evolution in 5 times

	1	2	3	4	5
PaO_2/FIO_2	406 ± 258	361 ± 101	366 ± 108	360 ± 90	348 ± 208
Csr	79 ± 13	67 ± 14	34 ± 8 *	32 ± 5 *	56 ± 8
Vd alv	99 ± 28	102 ± 20	84 ± 26	98 ± 26	109 ± 44
$PaCO_2$	39 ± 4	39 ± 3	43 ± 3	46 ± 2	46 ± 5
IC	2,3 ± 0,7	2,5 ± 1,0	2,6 ± 0,8	2,4 ± 0,8	3,0 ± 0,9

Vd alv, alveolar dead space (ml); Csr, compliance (ml/cm H_2O); Ppl, plateau pressure (cm H_2O);IC, cardiac index; Difference with time 1, $p < 0.05$ **

Conclusion(s): Recruitment maneuvers plus PEEP preserves arterial oxygenation and does not produce hemodynamic changes in retroperitoneal laparoscopy urological surgery.
Reference:
Ferrando C, Ferrandis R, Pastor E, Belda FJ. Eur J Anaesth 2008 ;25 (Suppl 44):79.

5AP4-6

Comparison of volume control ventilation and pressure control ventilation during laparoscopic procedures in morbidly obese patients

S. Poulou, M. Pavlidis, M. Mavri, P. Doka, K. Tsinari

Department of Anaesthesiology, Laiko General Hospital, Athens, Greece

Background and Goal of Study: The purpose of this study is to investigate whether pressure control ventilation (PCV) in laparoscopic procedures in cases of morbid obesity improves arterial oxygenation compared to volume control ventilation (VCV).
Materials and Methods: 24 patients, men and women, of mean age 32 ± 9 and with BMI > 35 were included in our study. They all underwent laparoscopic gastric binding. Patients with previous lung pathology and/or cardiovascular disease were excluded. The induction and maintenance of anaesthesia was standardized in all cases. Using as starting measuring point 15 min after the initiation of pneumoperitoneum, we implemented at first VCV for 1 hour (period T1) with the following parameters: Tidal Volume (Vt) of 8ml/kg of ideal body weight, Respiratory Rate (f) adjusted to achieve an End Tidal Carbon Dioxide ($EtCO_2$) of 33–38, Inspiration to Expiration ratio (I/E) 1/2.5 and Positive End Expiratory Pressure (PEEP) 5. At the end of the T1 period we switched to PCV for 1 hour (T2 period) with the following parameters: the Airway Pressure was set to allow a Vt same as before, f was adjusted to keep $EtCO_2$ levels between 33–38, I/E ratio was 1/2.5 and PEEP 5. At the end of each period blood gases were obtained and the following parameters were recorded and compared: pH, PaO_2, $PaCO_2$, Heart Rate, Mean Arterial Pressure, Peak and Plateau Airway Pressure.

Results and Discussion: There were no statistically important differences between PCV and VCV in arterial oxygenation and in cardiovascular responses. Significant differences were observed in Peak and Plateau Pressure. More specifically: Peak and Plateau in VCV were 33,12 ± 5,23 and 28,52 ± 3,34 compared to 27 ± 4,54 and 24,43 ± 3,2 in PCV respectively.
Conclusion(s): PCV does not improve arterial oxygenation compared to VCV in laparoscopic procedures in morbidly obese patients. The advantage of PCV is that it achieves ventilation with lower pressures and reduces the risk of barotrauma.
References:

1 P. Cadi, T. Guenoun, D. Journois, J.-M. Chevallier, J.-L. Diehl, D. Safran. BJA 100(5): 709–16 (2008).
2 M. Carmen Unzueta, J. Ignacio Casas, M. Viktoria Moral. Anesth Analg 2007; 104:1029–33.

5AP4-7

Alveolar recruitment maneuver and positive end-expiratory pressure improve ventilatory efficiency on the laparoscopic nephrectomie surgery

C. Almaraz, E. Terradillos, L. Penide, A. Alonso, F. De la Gala

Anestesiologia y Reanimación, HGU Gregorio Marañon, Madrid, Spain

Background and Goal of Study: After the induction of anesthesia most patients developed atelectasis, increased alveolar to arterial oxygen gradients and the functional residual capacity is reduced. These effects are exaggerated in patients undergoing laparoscopic nephrectomie surgery as consequence of the surgery postition (lateral decubitus and Trendelenburg) and the increase of intraabdominal pressure after pneumoperitoneum. These alterations explain the abnormalities in gas exchange. The goal of this study was analyze the effects of alveolar recruitment maneuvers followed by positive end-expiratory pressure on oxygenation arterial and compliance.
Materials and Methods: 30 patiens undergoing laparoscopic nephrectomie were studied. Variables related to gas exchage, respiratory mechanics and hemodynamics were evaluated in four steps: before pneumoperitoneum, 15 minutes after pneumoperitoneum, 10 minutes after the alveolar recruitment maneuver and 30 minutes after the recruitment.
Results and Discussion: After recruitment the patients had a significantly higher intraoperative PaO_2/FIO_2 ($p < 0,01$) and higer compliance ($p < 0,05$).
Conclusion(s): Lung recrutment improved the efficiency of ventilation in laparoscopic nephrectomie surgery.

5AP4-8

Respiratory mechanics during long term pneumoperitoneum using robotic telescopic device for gynecological surgery

E. Christidou, A. Mponarou, E. Dalampini, N. Tsiantzi, P. Petropoulou

Anesthesiology Department, Papageorgiou General Hospital, Thessaloniki, Greece

Background and Goal of Study: In the context of an educational-training mini programme of robotic telescopic surgery, the influence of long term pneumoperitoneum (PNO) in respiratory mechanics was evaluated.
Materials and Methods: Seven ASA I–II women, who consented and underwent advanced robotic pelvic surgery, were studied. Anesthesia was standardized and patients were ventilated by pressure control mode with a Julian-Drager anesthesia machine, using P_1 = 2–3 mm Hg and adjusting Pmax that as to achieve a satisfactory blood oxygenation and $ETCO_2$. Respiratory frequency was kept between 10–12 per minute. Pmax, tidal volume (VT), $ETCO_2$, system compliance were recorded before peritoneum (PROPNO), after induction of pneumoperitoneum (PNO), after head down titl (TREND), intraoperatively after 1 h, 2 h, 3 h of pneumoperitoneum, after deflation of PNO (NO PNO), and finally, with the patient in the supine position. Statistical analysis was performed with one way ANOVA and paired-Samples t-test.
Results and Discussion: Values are indexed as mean ± standard deviation. Pmax had no stastistically significant differences, but was maintained at levels up to 32 mm Hg in order to ventilate patients under PNO and deep head down tilt. VT was reduced statistical significantly* and returned to initial prizes at supine position after deflation. $ETCO_2$ was augmented statistical significantly* after PNO and trendelenburg position and returned to previous values after gas deflation. In the same way, compliance was reduced stastistically significant by PNO and returned to normal values after PNO release.
Conclusion(s): At our patients long term PNO at trendelenburg position affects significantly respiratory mechanics and proper adjustments of ventilatory machine had to be done. All mesured values returned to normal after release of PNO and supine position.
Reference:

Dirk Meininger at al, Impact of Overweight and Pneumoperitoneum on Hemodynamics and Oxygenation during Prolonged Laparoscopic Surgery. World J Surg (2006) 30: 520–526.

Table 1.

	PMAX	VT	$ETCO_2$	COMPLIANCE
PROPNO	17,7 ± 4,6	835 ± 168	24,5 ± 3,4	45,7 ± 8,3
PNO	18,2 ± 4,9	537 ± 134*	30,5 ± 6	26,5 ± 12,9*
TREND	19 ± 8,1	420 ± 134	34,7 ± 4,6*	23,7 ± 8,1
1 h	24,9 ± 8,1	546 ± 127	37,0 ± 6,3	26,5 ± 9,5
2 h	26,0 ± 8,1	581 ± 113	40 ± 6,2	23,8 ± 4,4
3 h	26,0 ± 7,3	577 ± 110	38,7 ± 1,5	34,0 ± 9,6
NO PNO	25,3 ± 8	1068 ± 136	37,7 ± 10,	51,1 ± 12,2
SUPINE	23,3 ± 10,4	837 ± 281	23,5 ± 3,5	54,1 ± 0,3
P	0,18	0,00	0,00	0,00

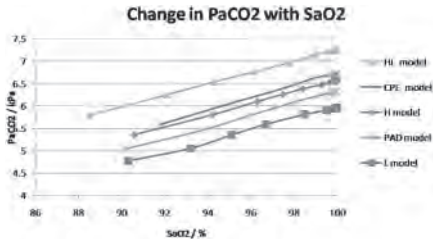
5AP4-9

Prediction of oxygen-induced hypercapnia in chronic obstructive pulmonary disease using a computational model

J. Hardwick, R. Sirian, J. Hardman

Anaesthesia, University of Nottingham, Nottingham, United Kingdom

Background and Goal of Study: Oxygen therapy during acute exacerbations of chronic obstructive pulmonary disease (COPD) may lead to hypercapnia. Oxygen-induced hypercapnia is thought to occur via relaxation of hypoxic pulmonary vasoconstriction and/or by suppression of central respiratory drive. We aim to study different types of COPD, and observe how $PaCO_2$ varies with increasing arterial oxygen saturation (SaO_2).
Materials and Methods: Using the Nottingham Physiological Simulator (NPS) we constructed and validated five models of COPD using previously described ventilation/perfusion (V/Q) distribution data[1,2]. The V/Q distributions modelled were: 1) High (H) V/Q (more deadspace). 2) Low (L) V/Q (more shunt). 3) High–Low (HL) V/Q. 4) Chronic Pulmonary Emphysematous (CPE). 5) Peripheral Airways Disease (PAD). These models were then exposed to an increasing FIO_2 (from 0.20 to 1.00). $PaCO_2$ was measured and average percentage change of $PaCO_2$ per percentage change of SaO_2 was calculated.
Results and Discussion: The average percentage increase in $PaCO_2$ per percentage increase in SaO_2 appears to be similar despite the type of COPD V/Q distribution studied. The observed increase in $PaCO_2$ is approximately 12.4–13.5% per percentage increase in SaO_2. This was a linear relationship. Ventilatory drive was held constant[3], independent of varying $PaCO_2$. The observed increase in $PaCO_2$ is thus entirely due to relaxation of hypoxic pulmonary vasoconstriction and a consequent increase in pulmonary deadspace. Our findings indicate that CO_2 accumulation may be predictable on the basis of SpO2 monitoring.



Conclusion(s): Computational modelling of COPD may lead to the ability to predict oxygen induced hypercapnia from bedside SaO_2 monitoring.
References:

1 Wagner, P., Dantzker, DR. Dueck, R. Clausen, JL. West, JB., *Ventilation-perfusion inequality in chronic obstructive pulmonary disease.* Journal of Clinical Investigation., 1977. 59(2): p. 203–16.
2 Yamaguchi, K., et al., *Inhomogeneities of ventilation and the diffusing capacity to perfusion in various chronic lung diseases.* Am J Respir Crit Care Med, 1997. 156(1): p. 86–93.
3 Dick, C.R., et al., *O2-induced change in ventilation and ventilatory drive in COPD.* Am J Respir Crit Care Med, 1997. 155(2): p. 609–14.

5AP4-10

The effect of bicarbonated and lactated Ringer's solution on acid-base balance in spontaneously breathing patients during lower limb surgery using a tourniquet

H. Yogo, Y. Kasuya, M. Ozaki, S. Isono, T. Nishino

Anaesthesiology, Graduate School of Medecine, Chiba University, Chiba, Japan

Background and Goal of Study: Bicarbonated Ringer's solution (BRS) is considered an ideal infusion fluid for major surgery because of its rapid effect on acid-base balance (1). We therefore undertook a prospective study to compare the metabolic responses of patients receiving BRS or lactated Ringer″s solution (LRS).
Materials and Methods: With approval of IRB, 7 ASA I-II female patients, aged 60–80 years and scheduled for surgeries, twice with an interval of several weeks, of both of lower limbs with a tourniquet, were recruited. During each

operation under combined spiral and general anaesthesia with spontaneous breathing, either BRS or LRS was administered at a rate of 7–9 ml/kg/hr in a randomized, crossover design. Arterial blood gas and lactate levels were determined after induction of anaesthesia (before tourniquet inflation), just before tourniquet deflation, and 3 min and 15 min after deflation. Respiration rate, minute volume (MV) and end-tidal carbon dioxide ($EtCO_2$) were recorded. Results are presented as mean ± SD. Repeated measures ANOVA and paired/unpaired t-test were used. $P < 0.05$ was considered significant.

Results and Discussion: One woman was excluded because of unstable breathing. Tourniquet time (130 ± 26 vs. 131 ± 20 min, $p = 0.93$) were similar in BRS arm and LRS arm of the study. Lactate levels were significantly greater in LRS arm than in BRS arm all the time. After deflation, lactate levels and MV significantly increased in both arms (lactate levels: BRS = 0.50 ± 0.16 to 1.42 ± 0.23 mmol/L, $p < 0.01$; LRS = 0.76 ± 0.21 to 2.00 ± 0.23 mmol/L, $p < 0.01$. MV: BRS = 3.3 ± 0.7 to 4.7 ± 1.2 L/min, $p < 0.01$; LRS = 3.1 ± 0.9 to 4.4 ± 1.6 L/min, $p < 0.01$). Although pH was significantly decreased only in LRS arm, pH value was similar between 2 arms (BRS = 7.36 ± 0.03 to 7.34 ± 0.03, $p = 0.06$; LRS = 7.36 ± 0.04 to 7.33 ± 0.04, $p < 0.01$). Maximum MV peaked 2–3 minutes after deflation and MV returned to baseline within 10 minutes in both arms. These data indicated that a respiratory mechanism compensated for the tourniquet-induced metabolic acidosis. Since lactate is metabolized to bicarbonate in the liver, LRS has almost same potential to equilibrate acid-base balance as BRS in patients with normal liver function. Further studies are required in patients with hepatic or respiratory insufficiency.

Conclusion(s): The effect of bicarbonated Ringer's solution and lactated Ringer's solution on acid-base balance is similar in spontaneously breathing patients during lower limb surgery using a tourniquet.

Reference:

1 Satoh K. et al. Eur J Anaesthesiol. 2005;22(9):703–11.

5AP4-11

Receptors and ion channels involved in carotid body oxygen sensing and signalling

J. Kåhlin, L. Eriksson, A. Ebberyd, M. Jonsson Fagerlund

Department of Anesthesiology and Intensive Care Medicine, Karolinska University Hospital and Karolinska Institutet, Stockholm, Sweden

Background and Goal of Study: Anesthetic compounds such as non-depolarizing neuromuscular blocking agents and propofol attenuate the acute hypoxic ventilatory response in humans. This inhibition orginates from an interaction with chemosensing or -transduction processes within the carotid body (CB)[1,2]. The CB, being the major global oxygen sensor in the body, governs the acute ventilatory response to hypoxia[3]. In this context, the CB chemosensory type I cell in close proximity to the afferent carotid sinus nerve, expresses important proteins that have key functions in the oxygen signalling process. The most central receptor systems in oxygen signalling are the excitatory nicotinic and purinergic and the inhibitory dopaminergic systems[3], whereas the TASK-1 potassium channel is important for the oxygen sensing process. While mRNA and/or proteins expressing different receptors have been found to some extent in various animal species, no studies have in a more comprehensive approach mapped a wider range of receptors. This is relevant since CB oxygen sensing and signalling are dependent on an interplay between different receptors and ion channels[3]. As a first step, we therefore characterize the mouse CB with special attention to relevant nicotinic, purinergic and dopaminergic receptors as well as the TASK-1 potassium channel.

Materials and Methods: The carotid bifurcation with the CB was extracted from anesthetized mice, fixated in 4% PFA and frozen. After sectioning, the tissue was stained with Hematoxylin-Eosin and immunohistochemical techniques for visualisation of relevant proteins using light-, fluorescent- and confocal microscopy.

Results and Discussion: Tyrosine hydroxylase and GFAP were used to identify the chemosensory type 1 and the glial-like type 2 cells, respectively. The type 1 cells of the mice CB revealed presence of the α3 nicotinic acetylcholine receptor (nAChR) subunit, the dopamine D_2 receptor, the ATP-receptors $P2X_2$ and $P2X_3$ and the TASK-1 potassium channel.

Conclusion(s): We can for the first time demonstrate the presence of the α3 nAChR subunit, the D_2 receptor and the TASK-1 potassium channel in the CB. Also, we have confirmed the presence of the $P2X_2$ and $P2X_3$ receptors in mice CB. Our data are in line with the theory that the CB hosts an orchestra of receptor systems that ultimately modulate the response to hypoxia in mammals via a push-pull mechanism.

References:

1 Jonsson, M., et al (2005) *Anesthesiology* 102, 110–6.
2 Jonsson, M., et al (2004) *Eur J Pharmacol* 497, 173–80.
3 Prabhakar, N. R. (2006) *Exp Physiol* 91, 17–23.

Transfusion and Haemostasis

6AP1-1

Perioperative intravenous iron supplementation in reducing transfusion requirements in colorectal cancer surgery

L. Mirea, A. Manoleli, R. Ungureanu, I. Grintescu, C. Olteanu

Anesthesia and Intensive Care, Clinical Emergency Hospital, Bucharest, Romania

Background and Goal of Study: Gastrointestinal bleeding is the most common cause of **iron** deficiency in adult patients. Iron-deficiency **anemia** is not a disease itself, but a manifestation of an underlying disease, therefore treating the cause is of greatest importance. Several data suggest that up to 78% from patients with colorectal cancer are anemic preoperatively. To investigate whether giving an intravenous iron preparation (Venoferâ) to anemic patients before colorectal cancer surgery improves their anemia and reduces the need for intraoperative blood transfusion.

Materials and Methods: Among 169 patients who underwent colorectal cancer surgery between 2006 and 2007, we studied 22 anemic patients who received iron supplementation for at least 7 days preoperatively in 2 or 3 doses (group A) and 39 anemic patients who did not (group B). Blood tests included FBC and blood film, serum Fe, coagulation screen, renal and liver function tests and C-reactive protein. Anemia was defined as a hemoglobin (Hb) level at first presentation of ≤ 10.0 g/dl. Hemoglobin, hematocrit (Ht) and serum Fe levels were measured at first presentation, then immediately before and after surgery. We also calculated intraoperative blood loss and compared intraoperative transfusion rates.

Results and Discussion: There were no significant differences between groups A and B in age, sex, surgical technique, tumor stage, and operating time. Their Hb and Ht values were similar at first presentation, but significantly different immediately before surgery (both $P < 0.05$). Hemoglobin increased significantly after intravenous iron treatment ($P < 0.001$). Overall, the mean maximum increase was 1.0 ± 0.6 g/dl (range, 0.2–2.2 g/dl) and serum iron (13.3 ± 4.6 to 13.1 ± 4.5 µm) did not change significantly after intravenous iron treatment. There were no significant differences in intraoperative blood loss between the groups, but significantly fewer patients in group A needed an intraoperative blood transfusion (8.9% vs 26.8%, $P < 0.05$).

Conclusion(s): Iron supplementation for at least 7 days before colorectal cancer surgery increases Hb and Ht values in anemic patients, and reduces the need for intraoperative transfusion. However, which patients are more likely to benefit from either perioperative iron administration or selective addition of postoperative blood salvage to pharmacologic treatment, needs to be further evaluated.

6AP1-2

Preoperative treatment with intravenous iron and low dose erythropoietin reduce allogenic blood transfusion in total knee arthroplasty

R. Asbert, M. Pérez-Poquet, M. Morales, A. Matamala, J. Bernal

Anesthesiology, Hospital Mútua de Terrassa, Terrassa, Barcelona, Spain

Background and Goal of Study: Total knee arthroplasty (TKA) is associated with important blood loss. The best strategy for reducing allogenic blood transfusion (ABT) has been not well established. Preoperative Hemoglobin (Hb) value is the most important predictive factor for ABT. Our objective was to test a ABT-saving strategy in patients undergoing TKA.

Materials and Methods: In 2008, we have conducted a non-randomized prospective controlled study to determine the effect of iv iron with or without low-dose erythropoietin (EPO) on the postoperative ABT rate. 129 consecutive patients were treated with regard to their preoperative Hb values. Group A (Hb ≥ 15g/dl: no treatment, n = 23); Group B (Hb ≥ 13–15g/dl: 200mg iv iron 1 week before surgery, n = 69); Group C (Hb ≥ 11–13g/dl: 200mg iv iron plus EPO 40000U sc 2 weeks before surgery and 200 mg iv iron 1week before surgery, n = 36); and Group D (Hb > 9–11g/dl: 200mg iv iron plus EPO 40000U

sc 3 weeks and 2 weeks before surgery, and 200mg iv iron 1 week before surgery, n = 1). All cases received 200mg iv iron after surgery associated with a postoperative blood reinfusion system. We included 127 controls operated the same year in our institution. They only received the postoperative reinfusion system. ABT was performed if Hb was ≤ 8.5g/dl (Hospital guidelines). The main outcome was blood transfusion rate after surgery. We also recorded the units of red blood cells transfunded.

Results and Discussion: There were not basal differences among cases and controls in age, gender, ASA, mean preoperative Hb value, prosthetic implant and length of surgery. Prevalence of preoperative anemia (Hb < 13g/dl) was 17.6% (45/256). 12 cases (9.3%) received allogenic blood transfusion (Group A = 0; B = 4, C = 7 and D = 1) compared to 23 controls (18.1%) (p = 0.0022). Mean units of red blood cells transfunded were: Group A = 0; B = 0.12 ± 0.47, C = 0.39 ± 0.99, D = 2; and control group = 0.35 ± 0.84. We only observed significant differences when comparing Group B vs control group (p = 0.03). No adverse effects were recorded. Hemoglobin values did not increase significantly after treatment. Nonetheless treated patients presented a lower rate of postoperative blood transfusion compared with controls. This was because treated patients experienced minor reduction in their preoperative Hb after surgery.

Conclusion(s): We have observed that our Hb value-based preoperative protocol with iv iron with or without low dose EPO, despite not increasing preoperative Hb, allowed a 50% reduction in ABT, which raise pharmacoeconomic issues that might be studied in the future.

6AP1-3

Effect of creatinine clearance, ejection fraction and anticipated number of bypasses on the diagnostic capacity of a transfusional risk model in elective off-pump coronary artery bypass graft surgery

A. Fernández de Gamarra, A. Martínez, M. Giné, A. Font, H. Litvan

Anaesthesiology Cardiac Anaesthesia Unit, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

Background and Goal of Study: Allogenic blood is a scarce resource and its transfusion has risks. Preoperative identification of transfusion risk should help to assign blood saving strategies. In 2006 we developed a predictive model to evaluate this risk in patients undergoing elective off-pump coronary artery bypass graft surgery. The goal was to study the modifications in the diagnostic capacity of our previous model, retrospectively including the recorded values of these three variables: preoperative ejection fraction (EF), anticipated number of bypasses (NBP) and creatinine clearance (Cl_creat).

Materials and Methods: Blood transfusions were given under a restrictive protocol. Variables included in our first model were: preoperative haemoglobin, body mass index, sex and age (ROC = 0.80, sensitivity = 0.57, specificity = 0.87). A new model was developed with binary logistic regression. Discriminate analysis was performed by ROC curve.

Results and Discussion: 68 patients of 176 (transfusional risk: 38.6%, 95%CI: 31.8–45.9) were transfused. Of all the above mentioned variables, only those with statistically significant information were included in the new model: preoperative haemoglobin (OR 0.63, p = 0.001), age (OR 1.07, p = 0.03), female (OR 4.0 p = 0.007), NBP (OR 1.92, p = 0.018) and Cl_creat (OR 0.98, p = 0.05). By including the new three variables the statistical analysis of our predictive model was: ROC = 0.82, p = 0.0001, sensitivity = 0.64, specificity = 0.88. Body mass index (OR 0.97, p = 0.59) and ejection fraction (OR 0.99, p = 0.81) were excluded.

Conclusion(s): The variables creatinine clearance and anticipated number of bypasses slightly improved the diagnostic capacity of our previous predictive model of transfusion. Ejection fraction gave no statistically significant information about the transfusional risk in these specific cohort of patients.

Reference:

1 Ferraris VA FS, Saha SP, Hessel EA, et al. Ann Thorac Surg. 2007;83(5 Suppl):S27–86.

6AP1-4

The safety limits of time required for emergency delivery of blood products from blood banks

K. Irita, E. Inada, S. Inaba

Anesthesiology, Kyushu University Hospital, Fukuoka, Japan

Background and Goal of Study: According to a survey conducted in 2003, delayed blood delivery was reported in 20% of life-threatening hemorrhages occurring in the operating theater. Meanwhile, the Japanese Red Cross Society has promoted centralization of regional blood banks, which has the potential to promote further delay in emergency blood delivery. This study evaluated the safety limits of time required for emergency delivery of blood products from blood banks.

Materials and Methods: Questionnaires regarding intraoperative massive hemorrhage and the conditions of emergency blood delivery to the operating theater were sent to 384 Japanese Society of Anesthesiologists-certified teaching hospitals. The recovery rate was 72%, and 692,241 anesthetic procedures were registered.

Results and Discussion: Overall incidence of massive hemorrhage exceeding one circulating blood volume and critical hemorrhage (associated with cardiac arrest or severe hypotension which might develop into cardiac arrest) was 38 and 6/10,000 anesthetics, respectively, implying that 15% of massive hemorrhage developed into critical events. Odds ratios of the proportion of critical hemorrhage to massive hemorrhage according to the average time required for emergency blood delivery are shown in Table 1. The odds ratio was less than one (0.71, p < 0.01), when the average time required for emergency blood delivery was divided into two groups at a cutoff of 30 min. However, the ratio was greater than one (1.31, p < 10.05), when the average required time for emergency blood delivery was divided into two groups at a cutoff of 45 min. Seventy-eight percent of hospitals reported that the average emergency delivery time was less than 45 min. However, only 41% reported that the maximum emergency delivery time was less than 45 min. Limitations of the study include the voluntary nature of the survey and disregard for the distribution of patients' physical status, difficulties in surgical procedures, and time required for emergency blood supply from the hospital blood service to the operating theater.

Table 1.

	Odds ratio	p
Longer than 31 min/shorter than 30 min	0.71 (0.54–0.88)	< 0.01
Longer than 46 min/shorter than 45 min	1.31 (1.03–1.66)	< 0.05
Longer than 61 min/shorter than 60 min	1.60 (0.99–2.57)	= 0.070

Conclusion(s): The safety limit of the time required for emergency delivery of blood products from blood banks seems to be between 31 and 45 min.

6AP1-5

Effectiveness of erythropoietin in preoperative autologous donation in spine surgery

L. Mora, M. Colomina, J. Bago, E. Ciercoles, E. Guerrero

Anaesthesiology, Hospital Vall d'Hebron, Barcelona, Spain

Background and Goal of Study: To evaluate the effectiveness of erythropoietin (rHuEPO), administered in a preoperative autologous donation (PAD) program, for reducing allogenic blood requirements and the number of wasted autologous blood units in patients scheduled for elective spine surgery.

Materials and Methods: Between 2005 and 2007, 135 patients undergoing multilevel spine fusion, 79 women and 56 men with a mean age of 42 years, were analysed. All patients participated in a PAD program: Group A received rHuEPO + PAD; Group B only PAD. Perioperative hemoglobin (Hb) levels, rHuEPO dose, number of PAD units used and wasted, and allogeneic blood requirements were recorded. In addition, two subgroups of patients according to Hb baseline levels (higher[2] or lower[1] than 13 g/dL) were also checked in each A and B groups. Descriptive, non-parametric tests for comparison were used for statistics.

Results and Discussion: Seventy-two patients were included in group A and sixty-three in group B, all of them comparable in demographic characteristics and also in type and duration of surgery. The average number of PAD units collected was 2,94 (range 2–4), equivalent among A(3) and B(2,87). The mean administered dose (40.000 UI) of rHuEPO were 1,72 (0–5), SD 1.743. No major differences in mean Hb levels were observed between groups at baseline (A:14,1 g/dL vs B:13,9 g/dL) but there were statistically significant differences in mean Hb values just before surgery (A:12,1 g/dL vs B:11,4 g/dL $p < 0,05$). No differences were established between subgroups in reference to equivalent transfused allogeneic units $p = 0,12$ but a statistically significant difference has been found related to the number of wasted autologous units (WAU) $p = 0.004$.

Table 1.

GROUPS	n	WAU/mean (range)
B[1]	15	5/0.33 (0–2)
A[1]	16	0
B[2]	48	27/0.56 (0–3)
A[2]	56	45/0.80 (0–4)

Conclusion(s): The strategies of combining PAD with rHuEPO, or attempting PAD alone can be considered as appropiate options for reducing the use of allogenic blood in major bleeding surgery. Administration of rHuEPO under an autologous donation program does not offer benefits that can be quantified in terms of collected, used or wasted autologous blood units from non-anaemic patients. There is a need for higher-quality randomised blinded studies to

enable assessment of the effects of rHuEPO plus PAD in non-anaemic patients undergoing spine surgery.

References:

1 Lemaire R. J Bone Joint Surg [Br] 2008;90-B:1128–36.
2 Goodnough LT. Arch Pathol Lab Med 2007;131:695–701.

6AP1-6

Predictors of allogenic blood transfusion in revision hip arthroplasty surgery

E. Terrer, L. Molto, A. Ruiz, A. Alier, E. Bisbe

Anesthesia, Hospital Mar-Esperança, Barcelona, Spain

Background and Goal of Study: Revision hip arthroplasty is commonly associated with subtantial blood loss and the subsequent need for blood transfusion. The aim of the study was to determine clinical predictors of allogenic transfusion in patients undergoing revision hip arthroplasty.

Materials and Methods: The medical records of all patients undergoing revision hip arthroplasty surgery between January 2003 and October 31st 2008, were reviewed using Awge online database (www.awge.org). Univariate and logistic regression analyses were used to identify predictors of allogeneic transfusion during the perioperative period.

Results and Discussion: We studied 140 consecutive patients with hip revision arthroplasty surgery with a median age of 71 ± 10 years and 52% were females. Prevalence of anemia on admission (hemoglobin (Hb) < 13g/dl) was 52.7% but 60% of these patients reach the hemoglobin objective (Hb > 13g/dl) with preoperative EPO treatment or/and intravenous iron. Risk factors found to be associated with need for allogenic transfusion were in the table. Characteristics independently associated with an increased risk of receiving any allogeneic transfusion included preoperative anemia with an OR 0.2 (CI 95%0.1–5), ASA 3 patients with an OR 1.5 and age with an OR 0.1 (CI 95%0.1–0.5).

PREDICTIVE FACTORS OF TRANSFUSION

	Transfusion	No transfusion	p
Number of patients (%)	44 (31.4%)	96 (68.6%)	
Age (years)	75.7 ± 7	68.9 ± 11	0.000
ASA III (%)	17 (38.6%)	20 (20.8%)	0.01
Admission hemoglobin (g/dl)	12.1 ± 1.6	13.4 ± 1.3	0.000
Septic surgery (%)	20 (45.5)	17 (18.1)	0.001
Autologous predonation (%)	4 (9.1)	28 (29.2)	0.03
Duration of surgery (minutes)	114.06 ± 27	97.86 ± 28	0.006

Conclusion(s): In spite the use of a Blood saving program, anemia in admission is still one of the independent predictive factors of allogenic transfusion, with worse physical state (ASA 3) and older patients. Preoperative Autotransfusion protect for allogenic transfusion.

6AP1-7

Impact of preoperative anemia on digestive oncological surgery outcome

I. Cindea, A. Balcan, G. Nicolae, V. Gherghina

Anesthesiology and Intensive Care, Emergency County Hospital, Constanta, Romania

Background and Goal of Study: Preoperative anemia, a common finding in subjects scheduled for digestive oncological surgery, could negatively affect their postoperative prognosis. On the other hand, this is one of the few factors we could optimise prior surgery. The objective of this study is to identify the influence of preoperative anemia on postoperative outcome in digestive oncological surgery patients.

Materials and Methods: We have retrospectively collected from hospital database, the records belonging to 84 subjects admitted to our institution between June–December 2007, for digestive oncological surgery. The investigated patients have been allocated, according to admittance Hb level, to group A (n = 44 subjects) with preoperative anemia and group B (n = 40 subjects) with non-anemic status. We have analyzed the rate of postoperative surgical complications, incidence of postoperative infections, length of hospital stay and in-hospital mortality for both groups. Data have been statistically evaluated by "t" student test.

Results and Discussion: Considering demographics, ASA physical status, time from admittance to surgery, surgical complexity, type and duration of anesthesia, perioperative blood loss and transfusional strategy, the groups have been homogenous. Anemic subjects have had a significantly higher incidence of postoperative surgical complications (63.6% vs 32.5%, $p < 0.05$), specially postoperative infections (36.3% vs 17.5%, $p < 0.05$). In addition, the difference in the mean length of hospital stay has been significant between anemic and non-anemic patients (11.2 ± 3.1 vs 6.3 ± 1.2, $p < 0.05$). In-hospital mortality has followed the trend of previously examined parameters, too (11.3% vs 2.5%, $p < 0.001$).

Conclusion(s): Preoperative anemia in candidates to digestive oncological surgery is associated with increased risk for postoperative outcome deterioration. An optimum preoperative assessment and a patient-specific plan allowing the use of hospital and subject resources, could correct preoperative Hb, and respectively improve patient postoperative recovery.

6AP1-8

Increase of endogenous erythropoietin levels in postoperative cardiac surgery patients through the normobaric oxygen paradox

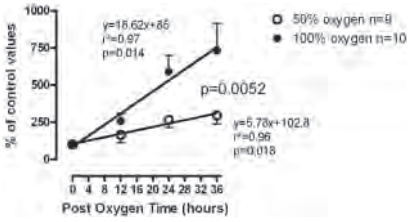
Y. Ciccarella, C. Balestra, J. Valsamis, P. Van der Linden

Anesthesiology, Brugmann University Hospital, Brussels, Belgium

Background and Goal of Study: Hypoxia is the main and only recognized trigger of endogenous erythropoietin (EPO) production. The normobaric oxygen paradox is a new mechanism of triggering EPO production : a sudden and sustained decrease in tissue oxygenation level, aside from an absolute low level of tissue oxygen tension, could lead to an increase of serum EPO levels in healthy humans (1). The goal of this study was to assess the relevance of this paradox in postoperative cardiac surgery patients.

Materials and Methods: After institutional Ethics Committee approval, 19 cardiac surgery patients who gave informed consent were studied. Exclusion criteria were preoperative renal disease, severe respiratory disease and massive peroperative bleeding. Upon arrival at the intensive care unit (ICU), patients were randomized to undergo postoperative mechanical ventilation with 2 different inspired fractions of oxygen (FIO_2). In the fisrt group (100%: N = 10) patients received a FIO_2 of 100% for 2 hours, which was thereafter reduced to 50%. In the second group (50%; N = 9), patients received a FIO_2 of 50% which remained unchanged for the next 2 hours. After this period, FIO_2 and extubation procedure were let at the discretion of the clinician in charge. Blood gases and EPO concentrations were measured before the beginning of the protocol, and every 12 hours for up to 36 hours. The slope of the regression line relating EPO concentration changes as a function of postoperative time were compared between both groups using the ANCOVA approach.

Results and Discussion: EPO levels increased significantly more in the 100% group than in the 50% group. This phenomenon cannot be explained by pre and postoperative haemoglobin levels, that were comparable in both groups.



Conclusion(s): These results show that relative hypoxia represents a potent stimulus for EPO production in humans even in acute conditions. The normobaric oxygen paradox may therefore represent an elegant adjuvant/alternative to exogenous EPO (2). Future studies are required to evaluate the usefulness of this mechanism in a global blood conservation strategy.

References:

1 Balestra C, Germonpre P, Poortmans JR, et al. J Appl Physiol 2006;100:512–8.
2 Burk R. Med Hypotheses 2007;69:1200–4.

6AP1-9

Intravenous iron as anemia treatment in major orthopaedic surgery. Uses and effectiveness

M. Colomina, M. Basora, F. Salazar, L. Mora

Anaesthesia, Hospital Universitari Vall d'hebron, Barcelona, Spain

Background and Goal of Study: Preoperative anemia is the major predictor of transfusion needs in surgery. Anemia is often caused by iron deficiency, and intravenous iron-sucrose administration is a fast, safe corrective treatment.

Materials and Methods: Clinical data of patients scheduled to undergo major orthopaedic surgery were prospectively recorded after initiation of preoperative intravenous treatment with iron alone or iron plus erythropoietin to achieve optimized hemoglobin (Hb). All treated patients were analyzed. Inclusion criteria were preoperative Hb < 13 g/dL; iron deficiency was evaluated by one or more

Table 1. Patient data and effectiveness of iron treatment

	Patients evaluated (n)	Men/Women (%)	Age (y)	Hb increase (g/dL)	Hb increase (g/dL/100 mg)	Patients Hb > 13 (%)	EPO doses
Iron	165	10/90	65.8 ± 17.2	0.95 ± 1.31	0.10 ± 0.15	26	0
Iron + epo	92	8/92	71.1 ± 9.7	1.67 ± 1.35	0.24 ± 0.27	58	2.5 ± 0.89

EPO (erythropoietin). Values expressed as a mean ± standard deviation

criteria: ferritin < 45 ng/mL, sTRf > 1.76 mg/L, MCH < 26.7 pg, MCV < 80.0 fL,% hypochromic erythrocytes > 2.8%. Effectiveness was defined as a total Hb increase and the percentage of patients with preoperative Hb higher than 13 g/dL. Patients who did not reach this value were considered to have inadequate treatment.

Results and Discussion: 301 patients received intravenous iron, 199 as single treatment and 102 combined with EPO; 34 and 10 patients, respectively, were excluded because of inadequate treatment due to not defined criteria (14.62%). Mean interval from treatment initiation to preoperative Hb evaluation was 30 days.

Conclusion(s): Intravenous iron achieved a moderate Hb increase as single treatment and a higher increase when given in combination with erythropoietin, although we waited several weeks to evaluate the treatment effect. The low effectiveness and the inadequacy rate is a clear area of improvement.

Reference:

Bisbe E et al. Preoperative use of intravenous iron: a new transfusional therapy. Rev Esp Anestesiol Reanim 2005; 52:536–40.

6AP2-1

The quality and safety of reinfused drainage blood after total knee arthroplasty

D. Sintes, M. Pijoan, R. Mansilla, E. Esteva, L. Martinez

Anesthesiology, Badalona Serveis Asistencials, Badalona, Barcelona, Spain

Background and Goal of Study: To study the use of the Redax Drentech Surgical® post-operative blood recovery system in the treatment of patients undergoing total knee arthroplasty with regional anaesthesia.

Materials and Methods: We carried out a randomized, prospective study of the draining and reinfusion of blood using a post-operative blood recovery system (Redax Drentech Surgical®) in 50 male and female patients undergoing total knee arthroplasty with regional anaesthesia between February and December 2008. Analytical tests were carried out immediately preoperatively, immediately postoperatively and at 6 and 24 hours postoperatively. Blood from the recovery system was also tested before transfusion. We measured the aspiration pressure, the amount of blood (in ml) transfused using the recovery system, whether heterologous blood was required, and complications.

Results and Discussion: The preliminary results from 48 of the 50 anticipated patients show:– The mean haemoglobin (Hb) concentration of the recovered blood was 11.59–Only 5 (11%) patients required additional transfusion of heterologous blood.– Mean Hb concentrations were: Preoperative 13.38, 24 h postoperatively 9.69.– There were no significant differences in haptoglobin (free Hb) measurements preoperatively, at 6 hours and at 24 hours postoperatively compared with the measurements at the end of surgery or in the recovered blood. We found no significant differences in post-transfusion coagulation (prothrombin and cephalin). Volume transfused (ml).

N of patients	11	15	14	8
Volume transfused (ml)	0	<500	500–900	1000

Conclusion(s): • The use of a post-operative blood recovery system in patients undergoing TKA is safe and reduces the need for postoperative transfusion of heterologous blood. • The method is well-tolerated. • No complications have so-far occurred during the administration of homologous blood in any patient

References:

1 Parker MJ, Roberts CP, Hay D.J. Closed suction drainage for hip and knee arthroplasty. A meta-analysis. Bone Joint SurgAm.2004 Jun; A(6):1146–52.
2 Jensen CM, Pilegaard R, Hviid K, Nielsen JD, Nielsen HJ. Quality of reinfused drainage blood after total knee arthroplasty. J Arthroplasty 1999 apr;14(3):312–8.
3 Hendrych. Use of post-operative drainage and auto-transfusion sets in total knee arthroplasty. Acta Chir Orthop Traumatol Cech 2006;73(1):34–8.

6AP2-2

Massive blood loss treatment during craniofacial block-resection

I. Savvina, V. Novikov, A. Shestov, D. Gulyev

Anaesthesiology and Intensive Care Department, Russian Polenov's Neurosurgical Institute, St. Petersburg, Russian Federation

Background and Goal of Study: Craniofacial tumour removing perculiarity is massive blood loss (more then 50% blood volume during 3 h). Block-resection with thoracodorsal scrap formation is high traumatic with extensive denervation zone and blood volume redistribution surgery. Obviously blood loss includes exernal and internal components from blood volume redistribution. So the main goals of fluid management intraoperatively are to restore and maintain the adequate perfusion and function of vital organs and surgical scrap, stable brain volume and complaence, adequate cerebral perfusion pressure (CPP), local and systemic hemostasis. Our aim was to study 6%HES solutions 200/0, 5 and 130/0,4 influence on hemodynamic parameters and coagulatory function.

Materials and Methods: 34 patients with extra- and intracranial tumour aged 17–72 y.o. were operated by the surgical team during 9,0 ± 0,6 h. General anaesthesia: propofol 2,0 mg/kg/h; fentanyl 5,0 μg/kg/h; clonidine 1,45 μg/kg/h. Monitoring had ECG,HR,SpO2,MAP (Nihon Cohden),CI,CVP ,CVRI,EVLWI (PiCCOplus), etCO_2(NICO Novametrix). Summary blood loss was more than 80% patient's blood volume. Hypovolaemia prophylactics was started before anaesthesia induction and was carried out with isotonic saline 0,9% and colloids 6% HES 200/0,5 (n = 20, group A) or HES 130/0,4 (n = 14, group B) in ratio 1,5:1. Moderate hypervolaemic hemodilution was reached to the thoracodorsal scrap formation.

Results and Discussion: Doses of 6% HES 200/0,5 and HES 130/0,4 were 30 mL/kg. All patients had normal laboratory tests: prothrombin, activated partial thromboplastin time, platelet count, fibrinogen concentration, antithrombin III activity before the operation. The dilutional coagulopathy prophylactics was carried out with fresh frosen plasma transfusion 20 mL/kg in oder to achieve and maintain the coagulation factors concentration above critical levels. The packed red blood cell transfusion was started when Hb concentration became below 6g/dL. More stable hemodynamic parameters were in the group A. In the group B more doses of inotropic therapy were needed to perfuse thoracodorsal scrap and to support the adequate CPP. EVLWI differences between groups A and B were significant (p < 0,001). Nothing distress of coagulatory function assessed by laboratory tests on the 1st postoperative day was marked in all patients.

Conclusion(s): Massive blood loss treatment with 6%HES 200/0,5 and 130/0,4 with moderate hypervolaemic hemodilution regime intraoperatively gives possibility to keep the thoracodorsal scrap adequate perfusion and CPP without coagulatory function distress.

6AP2-3

Blood transfusions in orthopaedics and blood salvage – A cost consideration

M. Staber, R. Junkin, T. Watson

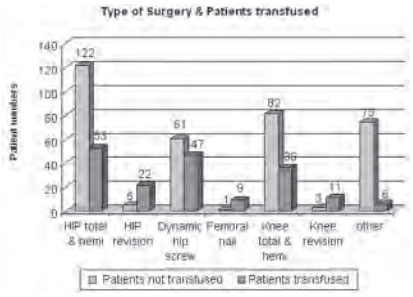
Department of Anaesthesia, Inverclyde Royal Hospital, Greenock, Scotland, United Kingdom

Background and Goal of Study: Orthopaedic patients often require perioperative packed red cell (PRC) transfusions. Studies report conflicting results if salvaged blood reduces allogeneic blood transfusions. This study examined annual PRC transfusion costs and consideration is given on expenditure of autologous blood salvage devices.

Materials and Methods: One year retrospective audit of elective or emergency orthopedic surgery in a district general hospital. Theatre, haematology and blood bank databases were used to identify operations performed and volume of PRCs used. Costs for RBC and blood salvage devices as given by the supplier.

Results and Discussion: 533 patients underwent intermediate or major orthopaedic procedures. 52% of cases were elective and 48% were emergency cases. Average age was 76.5 years. 184 patients required PRC transfusions consuming a total of 480 units. The mean admission Hb was 11.5 g/dL, mean pre-transfusion haemoglobin was 7.8 g/dL and mean post transfusion Hb was 10.2 g/dL. Approximately 1 out of 3 operations necessitated transfusions and on average 2.8 units were transfused, highest in Hip revisions with around 4 units. The National Blood Service charges £139.72 per unit PRC. Over one year orthopaedic patients received RBC transfusions to the cost of approximately £25700. Post operative autologous blood transfusion systems e.g. CellTrans cost around £60 and become cost effective once the reinfused blood saves the equivalent of 0.5 unit of RBC. Intraoperative autotransfusion

systems, e.g. Haemonetics Cell Saver start at £10000 with disposable costs of £120 per use and annual service costs of £2500. In particular, during Hip revision surgery salvaged blood may reduce the requirement for allogeneic transfusions. The costs of disposables are offset once the equivalent of 1 unit of RBC is reinfused, but that does not take into account service costs nor the initial purchase costs.



Conclusion(s): Although in orthopaedics the annual allogeneic transfusion costs are high, wrong patient selection, low volume and poor quality of salvaged blood can make blood salvage systems uneconomical. However, autologous transfusions are associated with reduced morbidity and this alone may outweigh any additional costs.

6AP2-4

Tranexamin acid: Is time and/or dose administration an issue for blood loss in CABG patients?

P. Flamée, M. van Gameren, J. Takkenberg, J. Hofland

Department of Anaesthesiology and Cardiothoracic Surgery, Thoraxcentre Erasmus MC, Rotterdam, Netherlands

Background and Goal of Study: Perioperative blood salvaging techniques are of major concern for anaesthesiologists. Aprotinine, tranexamin acid and ε-aminocaproic acid have clearly demonstrated to reduce perioperative bleeding. However, since aprotinine was reported to increase morbidity and mortality its use in cardiac surgery decreased to nearly zero. In the present study we evaluate whether time administration and dosage of tranexamin acid has an effect on perioperative bleeding in patients undergoing coronary artery bypass grafting (CABG).

Materials and Methods: We analysed our dataset of patients undergoing CABG between October 2006 and June 2008. Although we used a standard anaesthesia protocol, no specific drug dose or timing of administration with respect to blood salvage was predetermined. Patients received: 2 g Tranexamin acid (Tx2-group), timing: 2 g pre-cardiopulmonary bypass (CPB) [T 2-0 group] or 2 g direct post-CPB [T 0-2 group]; or 4 g Tranexamin acid (Tx4-group). Perioperative blood loss was observed at Day 0, Day 1 and at Day 2 of the operation. Also pre- and post-operative levels of serum creatinine and urea are analysed. Data are presented as mean, median and standard deviation (SD). Appropriate statistical tests were performed with use of $p < 0.05$ to determine significance.

Results and Discussion: 342 patients were eligible for this study [Table 1]. No significant differences regarding patient and procedural characteristics were found between groups. A significant difference in blood loss at Day 0 between the T 2-0 and T 0-2 group ($p = 0.04$) was found. No beneficial effect on blood loss at any moment was found when 4 g Tranexamin acid was administered.

Table 1.

	Tx2	Tx2	Tx2	Tx4
	T2-0	T0-2	Combined	
n	83	133	216	126
m/f	63/20	102/31	165/51	98/28
Weight (kg)	84 ± 18	81 ± 15	82 ± 16	85 ± 13
Age (years)	65 ± 10	65 ± 10	65 ± 10	68 ± 10
CPB-time (min)	100 ± 29	105 ± 35	103 ± 33	111 ± 32
Logistic EuroSCORE	4.0 ± 5.4	4.4 ± 6.8	4.3 ± 6.3	4.3 ± 4.6
Blood loss Day0 (ml)	310 ± 315	343 ± 220	331 ± 260	309 ± 172
Blood loss Day1 (ml)	410 ± 301	484 ± 446	456 ± 397	423 ± 370
Blood loss Day2 (ml)	319 ± 249	311 ± 272	314 ± 263	275 ± 219

Mean ± SD

Conclusion(s): Administration of tranexamin acid in patients undergoing CABG is mandatory to reduce blood loss. Administration immediately after induction of anaesthesia, thus before going on CPB, seems best. A second dose of tranexamin acid after weaning from CPB is redundant since it appears to carry no additional benefit for bleeding prevention.

6AP2-5

Reducing the risk of transfusion after establishing a protocol for the use of tranexamic acid in total knee arthroplasty

A. Font Gual, J. Fernández Núñez, A. Martínez López, F. González Carrasco, V. Moral García

Anesthesiology, Reanimaton and Pain Therapy, Hospital de la Santa Creu i Sant Pau, Barcelona, Catalonia, Spain

Background and Goal of Study: Allogenic blood is a limited product, non free of risk and of overhead cost. Tranexamic acid has shown to be effective in reducing blood transfusion. The aim of our study was to observe how starting a protocol of use of tranexamic acid affected the reduction of transfusion.

Materials and Methods: In 2008 we started to administrate systematically 1 g of tranexamic acid before ischemia and 1 g just at the end of ischemia in patients undergoing total knee arthroplasty who had no contraindication to the use of the drug. The prevalence of transfusion in this group of patients was compared with the prevalence of transfusion in patients undergoing knee arthroplasty in 2007, just before the introduction of tranexamic acid as a means of saving allogenic blood. Given the existing evidence about the efficacy of tranexamic acid in reducing the risk of transfusion, we dismissed conducting a randomized double-blind study, and opted for the establishment of a protocol of systematic administration of that drug.(1)

Results and Discussion: Tranexamic acid was given to 72 out of 102 patients included during 2008. Both groups were comparable in terms of preoperative hemoglobin, ischemia time, surgeon, kind of prosthesis, hospital stay, age and BMI. 5.3% of patients who received tranexamic were transfused, while the group of patients who did receive tranexamic acid had a transfusion rate of 30.8%. When looking at data from 2007, when the use of tranexamic acid was not protocolized, 23.5% of patients were transfused. This group of patients was comparable in a similar way (ASA, surgical, medical equipment, comorbidity, etc.) to groups of patients in the year 2008.

Conclusion(s): The establishment of a protocol for the use of tranexamic acid means a significant reduction in the risk of transfusion in prosthetic knee surgery, thus improving the quality of health care that this implies.

Reference:

1 Leal R, Alberca I, Asuero MS et al. Med Clin 2006; 127 (Supl1): 3–20.

6AP2-6

Tranexamic acid as alternative for aprotinin in cardiac surgery: Does the higher heparin need explains the difference in blood loss?

G. Debeuckelaere, R. Vlaeminck, W. Wiertz, I. Rodrigus, C. Van Gompel

Cardiac Surgery, UZ Antwerpen, Antwerpen, Belgium

Background and Goal of Study: At the end of 2007 Bayer decided to take Trasylol temporarily from the market, tranexamic acid was used as alternative. In this study, we compared the effects of a different heparin need on blood loss and use of blood products.

Materials and Methods: Fifty adult cardiac surgery patients that were assigned to the tranexamic acid study group following the institutional guidelines: (TRAN: n = 50): 500mg pump prime load, 10mg/kg bolus and 5mg/kg/hour until end of CPB, have been compared with an historical group of 50 adult cardiac surgery patients on a 'high dose aprotinin regimen' (APR: n = 50): 280mg pump prime load, 280mg bolus and 70mg/hour. Both groups received a bolus of 400IU/kg heparin before start of CPB and the ACT was kept above 480 seconds, measured with Hemochron® Response (ITC Medical, Piscataway, USA). Both groups showed comparable demographic properties. We observed heparin dosage during CPB, blood loss, use of blood products and extra protamine given at the ICU during the first 12h.

Results and Discussion: [table1]*1 Pack = 8 units. **Difference between Celite ACT – protamine ACT in seconds.

Table 1.

	Results		
	Aprotinin	Tranexamic acid	p
Time on pump (min)	108 ± 40	106 ± 34	0.816
Antithrombin III (%)	99 ± 18	104 ± 18	0.156
On pump heparin dosage (mg)	71 ± 102	174 ± 145	0.000
Blood loss at arrival at ICU (ml)	165 ± 138	232 ± 156	0.024
Blood loss after 3 hours (ml)	358 ± 271	506 ± 335	0.018
Blood loss after 6 hours (ml)	447 ± 295	653 ± 427	0.006
Blood loss after 12 hours (ml)	583 ± 365	872 ± 532	0.002
Packed cells in 24 hours (units)	0.44 ± 0.8	0.84 ± 1.4	0.087
Platelets in 24 hours (packs)*	1.92 ± 4.0	3.10 ± 5.2	0.208
Fresh frozen plasma in 24 hours (units)	0.30 ± 0.6	1.20 ± 3.5	0.075
Celite ACT at arrival at ICU (sec)	139 ± 21	140 ± 24	0.691
APTT at arrival at ICU (sec)	62 ± 25	57 ± 30	0.398
Heparin antagonisation (sec)**	17 ± 15	2 ± 23	0.000
Extra protamine given at ICU (mg)	3.0 ± 9.9	21.0 ± 25.4	0.000

Conclusion(s): In adult patients undergoing on pump cardiac surgery, the use of tranexamic acid is associated with significant more heparin use, significant more blood loss and a higher use of blood products and protamine in the first 12 hours postoperatively, compared with the use of aprotinin. Despite complete heparin antagonisation at the end of the cardiac surgery procedure, this could be due to a rebound effect of heparin.

6AP2-7

Effect of antifibrinolytic therapy on transfusion requirements and major complications in high risk cardiac surgery

E. del Barrio, J. Sastre, P. García, J. Rodríguez, C. Muriel

Anestesia y Reanimación, Hospital Clínico Universitario, Salamanca, Spain

Background and Goal of Study: Considerable evidence suggest that transfusion increases the risk of complications and death in critically ill patients, especially in patients who are undergoing cardiac surgery. Application of a standarized transfusion strategy reduce the need of blood transfusion in cardiac surgery patients. In this strategy we use antifibrinolytic agents, Aprotinin and Tranexamic acid. In November 2007, FDA requested the suspension of Aprotinin in the interest of patient safety based on the serious nature of the outcomes suggested in Mangano and colleagues[1] publications. The aim of our study was to analyze the need of allogenic blood transfusion and risk of major complications (cardiac, neurological and reoperation), renal failure and death in high risk heart surgery patients with extracorporeal circulation (EEC) with both drugs.

Materials and Methods: Observational and retrospective analysis of 300 patients (219 men/81 women) who underwent on-pump cardiac surgery. One hundred fifty patients in Aprotinin group were consecutively operated between June 2007 through November 2007 and 150 patients in Tranexamic acid group between November 2007 through September 2008. All the patients were operated by the same anesthetic and cardiac surgery team. Aprotinin patients received full Hammersmith regimen and Tranexamic acid patients received 10mg/kg + 1mg/kg/hour during surgery. Data in both groups were compared using unpaired Student t test or Chi-square test where applicable. *= $p < 0,05$ was considered significant.

Results and Discussion: Data are shown in Table 1

Table 1.

Patients	Aprotinin group: 150	Tranexamic acid group: 150
Age (years) mean ± Std	69,85 ± 10,24	69,67 ± 8,64
Sex (M/F)	45/105	36/114
Euroscore mean ± Std	6,81 ± 3,21	6,39 ± 3,37
ECC (min) mean ± Std	133,58 ± 40,43	137,15 ± 38,51
Coronay surgery	69	83
Valvular/mixed surgery	81	67
Renal failure (%)	24 (16%)	33 (22%)
Major complications (%)	39 (26%)	58 (38,67%) *
Allogenic transfusion (%)	92 (61,33%)	113 (75,84%) *
>4 blood bag (%)	44 (29,33%)	60 (40,27%) *
Death (%)	14 (9,33%)	10 (6,67%)

Conclusion(s): The intraoperative use of Aprotinin in our patients reduced the need of allogenic transfusion. Aprotinin not increased the risk of death, renal dysfunction and others major complications. The more requeriments blood transfusion are asociated with greater morbidity.

Reference:

1 Mangano DT, Tudor IC, et al. The risk associated with aprotinin in cardiac surgery. N Engl J Med. 2006; 354: 353–65.

6AP2-9

Postoperative autotransfusion in total hip arthroplasty

S. Stamenic, M. Mitkovic, M. Stanojlovic, R. Jevtic, K. Velickovic

Clinic for Orthopedic Surgery and Traumatology, Clinical Center, Nish, Serbia

Background and Goal of Study: Since total hip atrhroplasty is followed by significant intra i postoperative hemorrhage, transfusion of allogeneic blood is required. There are several methods of aututransfusion that may be applied in order to reduce the need for allogeneic transfusion and aviod complications that are associated with allogeneic transfusion. We applied the method of postoperative autotransfusion in total hip arthroplasty using Hemovac Autotransfusion system (H.A.S.) of Zimmer Company.

Materials and Methods: The use of this system enables the quality of drainaged blood that is sterile, diluted (Htc. 0,24), represents a good source of viable Er, has the same pH value (7,38) as the patient's blood. The drainaged blood has higher level of 2,3 diphosphoglycerate than conserved blood thus making tissue oxygenation better and contains lower amounts of coagulation factors. Unwanted elements of drainaged blood (detritus, citokynes, free Hgb., FDP, fat drops, mikroagregates) may be the cause of comlplications that are aviod by adequate use of Hemovac system. The use of solutions than may not be administered intravenously is forbidden as fibrinous mousses too. The drains are located only subfascially; vacuum system enabling poor suction is activated; collection and blood reinfusion is done within 6 hours and special system for infusion with filter 40μm in diameter is used. The patients were randomly allocated into a reinfusion group I or a control group II. In group I we used 20 Hemovac systems: nine in revision hip arthroplasty and 11 in uncemented total hip arthroplasty. In group II we used 20 classic wound drainage.

Results and Discussion: Average time of blood colection and reinfusion was 105 min., average amount of reinfusion blood was 607 ml. (min. 360 ml., max. 1150ml.). Average tame for allogeneic transfusion in the group with Hemovac sy. was 700 ml., and 1340 ml. in the group with classic wound drainage ($p < 0,001$). Average amount of plasma in revision hip arthroplasty in the group with Hemovac sy. was 660 ml. and 1100 ml. in group with classic wound drainage ($p < 0,001$).

Conclusion(s): During postoperative period, the patients in Hemovac group had Htc. and Hgb. levels that no required blood compensation. In addition, they had good protein and coagulation status. Transfusion of drainaged blood caused no complications in our patient.

6AP3-1

Impact of PlateletMapping® service on surgical cancellation rate

J. Kaur, N. Jones, K. James, S. Mallett

Department of Anaesthesia, Royal Free Hospital, London, United Kingdom

Background and Goal of Study: A failure to omit antiplatelet medication prior to surgery may be hazardous. This may lead to cancellation of elective cases due to an increased risk of bleeding and emergency cases may require platelet transfusions prior to surgery. PlateletMapping®(PM), a thromboelastographic technique allows quantification of individual patient response to antiplatelet therapy. Greater than 50% platelet inhibition (PI) confers a higher bleeding risk. We chose <30% PI as a cut off to allow safe surgery in major procedures and adopted a more liberal approach for minor procedures. During a pilot study we were able to prevent cancellation in 75% of cases. Following this initial experience we established PM as a routine perioperative service.

Materials and Methods: We conducted a prospective assesment of the impact of our PM service on patient care.

Results and Discussion: 33 tests were ordered over a 7 month period, 23 in elective and 10 in emergency surgical patients. All were still taking or had only recently (< 5 days) stopped aspirin ± clopidogrel. Only 4 elective cases were postponed on the basis of PM results; these were patients taking aspirin with platelet inhibition >30%. (3 neurosurgical, 1 urological case). The remaining 18 elective cases proceeded, of which 6 had >30% platelet inhibition. Of these 6, only 1 needed a platelet transfusion for platelet inhibition >80%. The other 5 cases were undergoing only minor procedures and PI was <50%. All proceeded without any excessive bleeding. 8 out of 10 emergency cases, proceeded with surgery, all had platelet inhibition of greater than 30%. In 4 of these cases platelet transfusion was advised due to PI > 70% and all were undergoing major

blood loss surgery. All emergency procedures also proceeded without excessive blood loss.

Conclusion(s): Utilisation and interpretation of perioperative PM prevented surgical cancellation in 85% of elective cases in patients taking antiplatelet medication. Our cut off of <30% PI for major surgery and more liberal approach to minor surgery proved to be safe. PM also allowed informed rather than empirical platelet transfusion in elective and emergency cases. We believe PM to be a useful service, leading to improved patient care.

6AP3-2

Effects of absorbable microporous polysaccharide hemospheres on coagulation and platelet function in patients after cardiopulmonary bypass

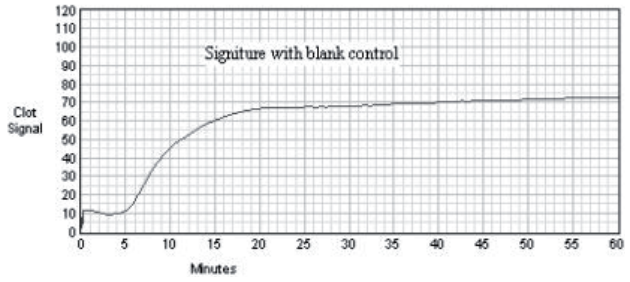
W. Zhu, T. Xu, W. Zhang, Y. Liu, X. Deng

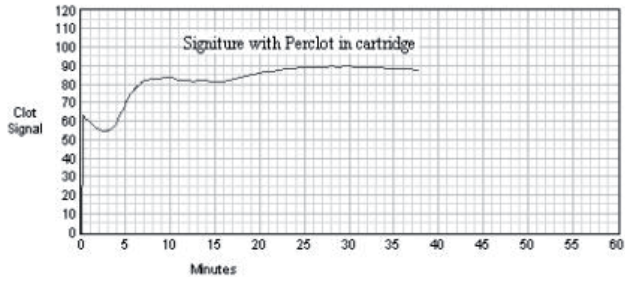
Anesthesiology, Changhai Hospital, Shanghai, China

Background and Goal of Study: Bleeding during and after cardiopulmonary bypass (CPB) continues to be one of the most commom complications in cardiac surgery. Superclot and Perclot are novel microporous polysaccharide hemospheres. The effects of products on coagulation cascade and platelet function are still unknown. The purpose of this research is to estimate the effects of two absorbable microporous polysaccharide hemospheres Superclot and Perclot on coagulation and platelet function tested by sonoclot analyzer in patients after cardiopulmonary bypass.

Materials and Methods: 300μl whole blood of thirty patients after CPB with normal coagulation preoperatively were collected to put in sonoclot cartridges contained with Arista, Superclot and Perclot hemospheres 5mg respectively and blank control cartridges. The coagulation and platelet function were tested by sonoclot analyzer. The original data of sonoclot and signature were read. The parameters included sonoclot activated clotting time (sonACT), clot rate (CR), maximal clot signal (MCS), time to peak (TP) and platelet function (PF).

Results and Discussion: SonACT with hemospheres in cartridges were significantly lower than blank controls ($p < 0.05$), sonACT with Perclot was even lower than those with Arista and Superclot ($p < 0.05$). CR with Perclot was significantly greater than those with others and blank control ($p < 0.05$). PF with Perclot and Arista were greater than blank control ($p < 0.05$). MCS with Perclot and Arista were greater than blank control ($p < 0.05$). There were no difference among cartridges in TP.





Conclusion(s): We believed than polysaccharide hemospheres Superclot and Perclot can accelerate blood coagulation by accelerating the formation from liquid to gel or solid state of blood, and the procedure will speed up significantly along with augmentation of hemosphere's dose in cartridge. Compared with others, Perclot can improve platelet function to some extent.

6AP3-3

Multiplate: Validation of the normal range in our local population

J. Nicola, K. Jasmeet, K. Thompson, S. Mallet

Department of Anaesthesia, Royal Free Hospital, London, United Kingdom

Background and Goal of Study: Patients taking anti-platelet agents have an increased risk of bleeding which poses problems should they require surgery. It is recognised that there is a wide inter-individual variation in response to treatment making it difficult to quantify this risk. Point of care platelet function analysers have been developed that may now make this possible. One such analyser is the Multiplate®, which utilises the principle of impedance aggregometery to measure platelet activity in whole blood. The action of drugs such as antiplatelet agents and GPIIb/IIIa antagonists can be assessed following the addition of appropriate agonists. Platelet activity is measured as an area under an aggregation curve (AUC) and normal values have been established by analysis of blood from healthy volunteers and blood donors. Prior to using the analyser in our practice we sought to validate the reference range in our local population.

Materials and Methods: Blood was taken from 20 healthy volunteers and Multiplate® analysis performed as recommended by the manufacturers; 0.3ml of isontonic saline was added to 0.3ml of whole blood in the test cell followed by incubation for 3min at 37°C. The agonist (either TRAP, ADP or arachadonic acid) was added and the AUC was measured over 6mins. The median AUC and 10–90th percentiles for each reagent were calculated and compared to those published by the manufacturer.

Results and Discussion: Our median AUC for the TRAP test was 106 (69–133) compared to the manufacturers median of 74 (94–156). Our median AUC for the ADP test was 70 (51–109) and the ASPI test (arachadonic acid) 85 (60–104) vs the manufacturers range of 84 (53–122) and 57 (75–136) respectively.

Conclusion(s): Our locally determined values were comparable to the manufacturers thus validating this reference range in our population. Multiplate® offers the advantage of studying platelet function on surfaces in whole blood, mimicking in vivo conditions, and is sensitive to the effects of anti-platelet agents. It has the potential to aid management of patients taking antiplatelet agents during the peri-operative period, allowing informed decisions regarding timing of surgery and enabling targeted transfusion of platelets.

6AP3-4

Assessment of platelet function: Comparison of Platelet Mapping® with Multiplate® analysis

N. Jones, J. Kaur, K. Thompson, S. Mallett

Dapartment of Anaesthesia, Royal Free Hospital, London, United Kingdom

Background and Goal of Study: Patients taking antiplatelet agents have an increased risk of bleeding which, not only hazardous, also poses problems should they require surgical intervention. Currently, this risk is difficult to quantify, as there is wide inter-individual variation in response to anti-platelet agents and standard laboratory tests do not detect their effects. However, point of care analysers have been developed which may enable this. We sought to compare the findings of two such techniques; Platelet Mapping® (PM), a modified form of thromboelastography, and Multiplate® (MP) a test based upon impedance aggregometery.

Materials and Methods: MP analysis was performed on patients referred by clinicians for PM studies at our institution over a three month period. Impairment of platelet function due to aspirin or clopidogrel was defined as >30% inhibition of platelet activity on PM or a reduction in the MP area under the aggregation curve to below the normal range on addition of appropriate agonist (AA and ADP respectively).

Results and Discussion: In total, 12 patients underwent analysis using both techniques. 8 patients were on or had recently taken (< 7 days) aspirin, 3 clopidogrel and 1 neither. See Table 1:

Table 1.

	aspirin ≤7 days	clopidogrel ≤7 days	aspirin or clopidogrel >7 days
PM > 30% inhibition	4/8	2/3	0/1
MP AUC < normal range	8/8	2/3	1/1

Conclusion(s): To our knowledge this is the first reported direct comparison of the findings of PM with MP in clinical practice. Our study shows that inhibition

of platelet function was demonstrated more frequently using MP. This may because the technique is more sensitive or because it is less specific than PM for detecting the action of antiplatelet agents; the significance of these results is as yet unclear. A larger prospective study is necessary to confirm these findings and relate the results of each technique with clinical outcome to determine which, is the better predictor of bleeding risk.

6AP3-5

Prediction of transfusion requirements by two whole-blood platelet function analyzers

C. Solomon, M. Winterhalter, A. Osthaus, J. Hartmann, N. Rahe-Meyer

Department of Anesthesiology, Hannover Medical School, Hannover, Germany

Background and Goal of Study: Methods assessing whole-blood platelet activity, like multiple electrode aggregometry (MEA), have shown predictive value for total transfusion of allogeneic blood products in patients undergoing coronary artery bypass grafting (CABG). The cone and plate analyzer Impact R (DiaMed AG, Cressier FR, Switzerland) measures whole blood platelet adhesion and aggregation under arterial flow conditions and has proven useful in monitoring platelet function in perioperative setting. The goal of our study was to compare the predictive value of the two methods for blood products transfusion, particularly for platelet concentrates (PC), in patients undergoing either CABG or aortic valve (AV) surgery.

Materials and Methods: Blood samples were obtained preoperatively from 30 patients with CABG and 20 patients with AV surgery. MEA was performed in blood anticoagulated with hirudin and activated with adenosine diphosphate (ADPtest), collagen (COLtest) and arachidonic acid (ASPItest). The analyses on Impact R were performed in blood anticoagulated with hirudin or citrate. For the light microscopy images obtained, the parameter surface covered (SC) was calculated automatically by the Impact R device.

Results and Discussion: The results of all three MEA tests performed in CABG patients correlated significantly with intra- and postoperative PC transfusion, with Pearson correlation coefficient r between – 0.4 and – 0.62 ($P < 0.03$). ASPItest showed the highest correlation with intraoperative (r – 0.62) and postoperative (r – 0.51) PC transfusion. In AV patients, only COLtest correlated significantly with transfusion requirements (r – 0.56 for intraoperative PC transfusion). In the Impact R measurements performed in citrated blood from CABG patients (citrate being the standard anticoagulant for this analysis), no correlations were found between SC and transfusion parameters. For the samples anticoagulated with hirudin, highly significant correlations were found between SC and intra/postoperative transfusion of all types of blood products (r between – 0.42 and – 0.49) in CABG patients. SC did not correlate with transfusion parameters in AV patients.

Conclusion(s): Preoperative whole blood aggregometry correlated with transfusion of blood products, particularly of platelet concentrates, in patients undergoing CABG or AV surgery. The cone and plate analyzer showed comparable correlation with transfusion requirements only in patients undergoing CABG.

6AP3-6

Anticoagulation monitoring with thrombelastometry (ROTEM®) and impedance aggregometry (Multiplate®) in a patient with an INCOR ventricular assist device

K. Görlinger, L. Bergmann, H. Macek, G. Marggraf, M. Kamler

Klinik für Anästhesiologie und Intensivmedizin, Universitätsklinikum Essen, Essen, NRW, Germany

Background and Goal of Study: Thromboembolic events, cerebrovascular accidents, as well as septic and bleeding complications are frequent in patients with ventricular assist devices (VAD) (1). These complications occur under anticoagulation with heparin or oral anticoagulants with aPTT and INR within the targeted range. Therefore, intensified anticoagulation with antiplatelet drugs is more and more common. In this case report we describe the possibilities of thrombelastometry (ROTEM) and impedance aggregometry (Multiplate) in detecting hypercoagulability and evaluation of efficacy of antiplatelet therapy in a patient with an INCOR VAD.

Materials and Methods: After implantation of an INCOR VAD anticoagulation was monitored with thrombelastometry and impedance aggregometry. EXTEM, FIBTEM, INTEM and HEPTEM tests were performed with the ROTEM system. Arachidonic acid (ASPItest), collagen (COLtest), adenosine diphosphate (ADPtest) and thrombin receptor activating peptid 6 (TRAPtest) were used as an activator in the Multiplate analysis.

Results and Discussion: Despite aPTT and INR values within the targeted range, ROTEM was able to detect hypercoagulability with an increase of maximum clot firmness (MCF) in EXTEM, INTEM and HEPTEM up to 78 mm and MCF in FIBTEM up to 36 mm. These values have been shown to be associated with an increased incidence of postoperative thromboembolic events and myocardial infarction (2). Furthermore, Multiplate analysis could verify that oral administration of acetylsalicylic acid (ASA) was not effective in this patient. On the other hand, direct spiking of ASPItest with ASA and intravenous administration of ASA resulted in a sufficient inhibition of platelet activation over the arachidonic acid pathway. Later on the patient developed an increased reactivity of his platelets, which could only be managed by a triple antiplatelet therapy with ASA, dipyramidol and clopidogrel. The dosage of a rescue therapy with eptifibatide could be calculated by in vitro titration of the effect in the TRAPtest.

Conclusion(s): ROTEM and Multiplate can detect hypercoagulability, increased platelet reactivity and efficacy of an antiplatelet therapy in patients with VAD. This enables an individualised antithrombotic therapy in patients with VADs and may avoid or reduce the incidence of thromboembolic events in these patients (3).

References:

1 Sharples L, et al. Health Technology Assessment 2006; 48: 21–38.
2 McCrath DJ et al. Anesth Analg 2005; 100: 1576–83.
3 Pitsis AA, et al. Current Opinion in Critical Care 2008; 14: 569–78.

6AP3-7

Platelet activation at onset of cardiopulmonary bypass measured with the Multiplate®

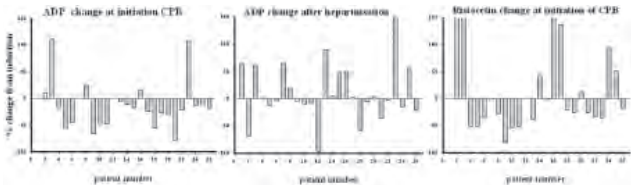
R. Huet, V. Cernak, T. Lisman, H. de Vries, J. van der Maaten

Anesthesiology and Surgery, University Medical Center Groningen, Groningen, Netherlands

Background and Goal of Study: The onset of cardio pulmonary bypass (CPB) induces shear stress and platelet activation; the von Willebrand Factor A1 domain unfolds and interacts with Gp1b-IX-V (1). Ajzenberg et al. found that platelets of patients with subacute stent stenosis after PCI, were more vulnerable to shear stress (2). Platelet activation involves ADP, serotonin (3) and ULVWF release from granules. We, therefore observed platelet activation at the onset of CPB.

Materials and Methods: Cardiac surgical patients were included after informed consent. Only aspirin was allowed as antiplatelet therapy. We measured platelet aggregation with the Multiplate and used ADP, Ristocetin and TRAP as activators. Samples were taken after induction, onset of CPB and from heparinised blood. Hemodynamic and respiratory changes were observed. The extracorporeal circuit included roller pumps, a 3% HES 0.5/RL prime and a 32°C minimum. Anesthesia included sufentanil, TCI propofol and PCV.

Results and Discussion: In 26 patients, ADP activation decreased at the initiation of CPB ($p = 0.013$) and in comparison to heparinised controls ($p = 0.001$), but individual differences were remarkable. Ristocetin induced also large individual differences, end result NS (fig 1). In 6 patients (# 4,6,10,26 CABG, 11,20 AVR) a substantial 57% decrease of MV was seen minutes after the onset of CPB, before AoX, without hypotension. A directly taken second CPB blood sample showed a further decrease after ADP in 5 and an increase after Ristocetin activation in 4 of them. The onset of CPB decreased ADP activated platelet aggregation and gave in 6 pats (24%) bronchoconstriction, possibly related to serotonin release. Individual diversity in aggregation responses testified to the complex mechanisms underlying haemostasis. The clinical relevance of individual platelet sensitivity to shear stress or vWF susceptibility is unclear.



Conclusion(s): Platelet aggregation changes at the onset of CPB and can be measured with a POC device. Many individual responses were observed.

References:

1 Borgdorff P, et al. Journal Thoracic and Cardiovascular Surgery (2006) 131, 813–21.
2 Ajzenberg N et al. J Am Coll Cardiol (2005) 45, 1753–56.
3 Borgdorff P, et al. Circulation (2002) 106, 2588–93.

6AP4-1

Haemodilution with mannitol demonstrates a dose related, impairment of coagulation as assessed by TEG

G. Ogweno, A. Reed, R. Dyer, M. James

Department of Anaesthesia, University of Cape Town, Cape Town, Western Cape Province, South Africa

Background and Goal of Study: Hypertonic mannitol remains a key agent for control of intracranial pressure in neurosurgery. Despite mannitol's long history, its effects on coagulation have not been fully investigated. The purpose of this study was to investigate whether normal blood coagulation is altered when diluted with mannitol in vitro. The hypothesis was that hypertonic mannitol induces a hypocoagulable state.

Materials and Methods: Blood was collected from 20 healthy human volunteers and diluted to 20%v/v with mannitol (20%w/v), mannitol (5%w/v) and saline (0.9%w/v); and another sample diluted to 5%v/v with mannitol (20%w/v). Undiluted sample acted as control. Thrombelastography 5000 (TEG®, Haemoscope, Skokie, Il, USA) was used to assess r and k times, alpha-angle and maximum amplitude (MA) coagulation parameters. Analysis of variance (ANOVA) was used to analyze data.

Results and Discussion: At 20% v/v blood volume dilution, both 5% and 20% w/v mannitol significantly decreased the alpha-angle and MA indicating impaired clot strength, suggesting an impairment of fibrinogen and platelet functions. Mannitol 20%w/v also significantly increased k values at 20%v/v dilution.

Mean (+SD) values of TEG parameters for various solutions

Solution	r (mins)	K (mins)	Alpha-angle (degrees)	MA (mm)
Control	10.1 (±2.1)	3.1 (±1.05)	51.8 (±10.5)	60.4 (±6.86)
0.9% saline	15.6 (± 21.4)	2.6 (± 0.77)	53.1 (± 11.8)	57.4 (± 6.89)
5%w/v mannitol (20% dilution)	12.6 (± 4.5)	4.8 (± 4.33)	43.9 (± 13.35)*	50.3 (± 8.35)*
20%mannitol	18.2 (± 20.6)	12.4 (± 2.93)*	13.6 (± 5.95)*	17.4 (± 9.26)*
20%mannitol	9.9 (± 2.8)	4.1 (± 2.49)	45.5 (± 13.75)	57.0 (± 7.73)

*significant, $p < 0.05$

Conclusion(s): This in vitro study demonstrates that dilution of blood with mannitol to 20% v/v impairs clot strength, suggesting impairment of platelet, and fibrinogen functioning as assessed by TEG. This effect of dilution is potentiated by increasing the dose of mannitol. A 5% v/v dilution containing equivalent doses of mannitol did not demonstrate any significant effect on coagulation, suggesting that a combination of dilution beyond 5% is required before mannitol's effects become evident. This may have implications on total doses utilized in clinical practice. Biochemical and molecular investigations may be desirable to explain the mechanism.

6AP4-2

Quantitative standard laboratory method versus point-of-care functional rotation thrombelastometry to measure fibrinogen

N. Urwyler, M. Hirschberg, L. Theiler, C. Luyet, R. Greif

Department of Anaesthesiology and Pain Therapy, University Hospital of Bern, Bern, Switzerland

Background and Goal of Study: Intraoperative real-time monitoring of coagulation is an unsolved problem. Transfusion-Guidelines for blood products and procoagulatory substances based on point-of-care rotation thrombelastometry were published recently. This pilot study compared quantitative standard laboratory fibrinogen measurement with point-of-care functional rotation thrombelastometry fibrinogen measurement. Rotation thrombelastometry might provide on time information.

Materials and Methods: Blood was sampled from both genders aged 18 to 90 years undergoing major surgery. The decision to test was based on the clinical judgment of the attending anaesthetisiologist. Standard coagulation tests were performed in the haematology laboratory (BCS, Siemens Healthcare Diagnostics, USA) and thrombelastometry by study personnel with Rotem® (Pentapharm, Germany). Main interest was in the comparison of quantitative laboratory fibrinogen tests (clauss) and the functional Fibtem-MCF (maximum clot firmness) test of fibrinogen cross linking. Patients were grouped according to their blood loss, more than 20% blood loss of estimated total blood volume (70ml/kg) qualified as major bleeding.

Results and Discussion: Blood from 38 patients (21 females, aged 55 ± 17 years, height 169 ± 8 cm, weight 71 ± 12 kg) was measured, 17 had major bleeding. Spearman correlation coefficient over all is 0.71, for patients with minor blood loss it is 0.55, for patients with major blood loss it is 0.86. The scatter plot shows the correlation of fibrinogen clauss and Fibtem-MCF and the crosstabulations show agreement and differences of normal and pathologic values.

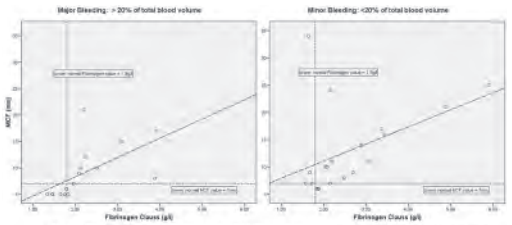


Figure 1: Fibrinogen Clauss values plotted against MCF fibtem, with the corresponding regression lines (bold dotted lines)

crosstabulation of patients with minor bleeding

	Fibrinogen path.	Fibrinogen normal	Sum
Fibtem path.	2	5	7
Fibtem normal	2	12	14
Sum	4	17	21

crosstabulation of patients with major bleeding

	Fibrinogen path.	Fibrinogen normal	Sum
Fibtem path.	6	3	9
Fibtem normal	0	8	8
Sum	6	11	17

Conclusion(s): Fibtem-MCF showed a higher sensitivity for fibrinogen impairment, which could mean that fibrinogen cross-linking is impaired before fibrinogen-deficiency can be measured in the standard coagulation test according to clauss.

6AP4-3

Point of care testing: The influence on FFP transfusion practice in hepatic resection

J. Kaur, S. Mallett

Department of Anaesthesia, Royal Free Hospital, London, United Arab Emirates

Background and Goal of Study: Following the implementation of point of care testing (POCT)(sysmex pocH-100*i* for measurement of FBC and Hemochron® Jr Signature + for INR)in our theatre complex, we performed a review of our perioperative transfusion practice for hepatic resection. We compared practice pre and post introduction of POCT.

Materials and Methods: We identified 28 consecutive patients undergoing hepatic resection before POCT availability and 30 patients after. We reviewed the casenotes for details of perioperative transfusion.

Results and Discussion: Patient demographics and operative case mix were similar between groups. A significantly greater proportion of patients received a transfusion of FFP intraoperatively in the pre POCT group compared with the post POCT group (64% vs. 30%, $p = 0.005$). 61% of FFP transfusion were for 2 units pre POCT vs 22% in post POCT group. There was no significant difference in post op INR despite differing FFP transfusion practice between the 2 groups. (1.43 ± 0.23 pre vs 1.45 ± 0.28 post). 57% of patients pre POCT received packed red cell (PRC) transfusion intraoperatively vs 37% in post POCT group There was no significant difference in transfusion of FFP or PRC on ICU for the two groups. Both groups had a similar length of ICU stay: pre (2.96 ± 3.02 days) vs. post (2.64 ± 1.08).

Conclusion(s): Major hepatic resection is commonly performed without the need for PRC transfusion, however FFP is often administered prophylactically.[1,2] Our study shows that prior to the introduction of POCT a 2 unit FFP transfusion was common practice. POCT has led to a significant reduction in the number of patients receiving FFP; suggesting a shift towards a more appropriate use of FFP. There is much concern over the inappropriate use of blood products in view of their costs and associated morbidity, thus the use of POCT to guide transfusion is of increasing interest. We believe development of a transfusion protocol based on POCT will help to reduce transfusion further.

References:

1 DeMatteo et al.*Semin Surg Oncol* 2000;19:200–207.
2 Martin RCG et al. *J Am Coll Surg*. 2003 Mar;196(3):402–9.

6AP4-4

The combined *in vitro* effect of mannitol and Ringer's acetate or hydroxyethyl starch (HES) on whole blood coagulation

A. Lindroos, A. Schramko, P. Tanskanen, T. Niemi

Department of Anaesthesiology and Intensive Care Medicine, Helsinki University Central Hospital, Töölö Hospital, Helsinki, Finland

Background and Goal of Study: Mannitol is often administered to lower intracranial pressure before craniotomy. Ringer's acetate and HES have different effects on haemostasis (1,2). Since normal coagulation capacity is required during craniotomy, we aimed to find out possible effect of mannitol with or without HES or Ringer's acetate on blood coagulation.
Materials and Methods: Venous blood was withdrawn from 10 volunteers. We prepared 10 and 20 vol.% dilutions with mannitol (15% Mannitol®), as well as with mannitol and Ringer's acetate or HES 130/0,4 (Voluven®) at a ratio of 1:1. Blood samples were analyzed by thromboelastometry (ROTEM®, EXTEM, FIBTEM)). Statistics included ANOVA.
Results and Discussion: Baseline haematocrit, platelet count and ROTEM® parameters were within normal range. Dilutional effects of tested solutions were similar. Clot formation time was prolonged in both mannitol dilutions ($p < 0.05$) without effect of Ringer's acetate or HES. There was a significant decrease in maximum clot firmness (MCF) in 10 and 20 vol.% dilutions of mannitol. MCF decreased more in 20 vol.% dilution of mannitol with HES than with Ringer's acetate and more than in mannitol vol.10% alone ($p < 0.05$).

Maximum clot firmness

	EXTEM MCF mm, % of undiluted value	FIBTEM MCF mm, % of undiluted value
0% Control	66,0 (60,8–68,0) 100%	15,5 (12,5–16,5) 100%
10% mannitol	57,0 (53,5–59,0) 86,4% •	10,0 (7,8–10,5) 64,5% (P < 0,057)
20% mannitol	48,0 (39,0–49,3) 72,7% •	6,5 (5,0–9,3) 41,9% •
10% mannitol/RAC	61,5 (54,0–62,3) 93,2% •	13,0 (10,5–14,5) 83,9% •
20% mannitol/RAC	57,0 (50,3–59,5) 86,4%) •	9,5 (7,3–12,0) 61,3% •
10% mannitol/HES	60,0 (55,3–62,3) 90,9% •	11,0 (6,8–12,0) 71,0%•
20% manitol/HES	54,0 (49,5–58,3) 81,8% •†	6,0 (3,8–8,0) 38,7% •†

Medians (25th/75th percentiles) are shown. • $p < 0.05$ compared with the undiluted sample
† $p < 0.05$ compared with mannitol 10%

Conclusion(s): Mannitol impairs clot propagation and clot strength *in vitro* mainly by disturbing the fibrin-fibrinogen interaction. This disturbance is more pronounced when mannitol is combined with HES (130/0,4) but remains almost unchanged with Ringer's acetate. Our results may indicate that neurosurgical patients recieving mannitol should not be given HES especially if the patient is bleeding.

References:

1 Niemi TT, Kuitunen AH. Acta Anaesthesiol Scand. 1998;42:1104–9.
2 Fries D, Innerhofer P, Klingler A et al. Anesth Analg 2002;94:1280–7.

6AP4-5

Detection of coagulation factor VIII and XIII deficiency in the peri-operative setting by spiking of ROTEM® analysis with coagulation factor concentrates

K. Görlinger, C. Weber, D. Dirkmann, A. Hanke

Klinik für Anästhesiologie und Intensivmedizin, Universitätsklinikum Essen, Essen, NRW, Germany

Background and Goal of Study: Thrombelastometry (ROTEM) is useful to characterise whole blood coagulation capacity, but is not routinely used for detection of specific coagulation factor deficiencies. On the other hand, results of coagulation factor analysis for factor VIII and XIII performed in the central laboratory are not always contemporary available in the peri-operative setting. Therefore we tested, if patients with an deficiency of coagulation factor VIII and XIII can be detected by specific test constellations in ROTEM and spiking tests with coagulation factor concentrates.
Materials and Methods: EXTEM, APTEM (EXTEM test with additional aprotinin), INTEM and HEPTEM (INTEM test with additional heparinase) were performed in case of diffuse peri-operative bleeding. Coagulation factor VIII deficiency was suspected in patients with prolonged coagulation time (CT) of more than 240 sec as well in INTEM and HEPTEM. Under these conditions a second INTEM test was spiked with 0.2 IU factor VIII and the resulting CT was compared to the CT of conventional INTEM and HEPTEM test. Coagulation factor XIII deficiency was suspected in patients with an increased clot lysis index 60 (CLI60) of less than 88% in EXTEM and lack of stabilisation in APTEM (CLI60 < 90%). Under these conditions a second EXTEM test was spiked with 0.2 IU factor XIII and the resulting CLI60 was compared to the CLI60 of conventional EXTEM and APTEM test.
Results and Discussion: In all patients with a distinct reduction of CT in INTEM after spiking with factor VIII a deficiency of coagulation factor VIII could also be detected in the central laboratory. This has been demonstrated in patients with haemophilia A and patients with acquired factor VIII deficiency because of therapy with activated protein C. In all patients with a distinct increase in CLI60 after spiking with factor XIII a coagulation factor XIII level of less than 60% could be detected in the central laboratory. This has been demonstrated in patients with hereditary factor XIII deficiency as well as in patients with acquired coagulation factor XIII deficiency during tumour surgery and liver transplantation.
Conclusion(s): Spiking of ROTEM tests with specific coagulation factor concentrates can be helpful to detect specific coagulation factor deficiencies and thereby may enable a contemporary substitution therapy in the peri-operative setting. But it has to be considered, that deficiencies of specific coagulation factors may be masked in ROTEM analysis by an increased activity of other coagulation factors or platelets.

6AP4-6

Effects of two different types of cardio-pulmonary bypass systems on coagulation during cardiac surgery

C. Solomon, K. Tanaka, M. Winterhalter, K. Johanning, N. Rahe-Meyer

Department of Anesthesiology, Hannover Medical School, Hannover, Germany

Background and Goal of Study: The contact between blood and large areas of synthetic, non-endothelial surface within the cardio-pulmonary bypass (CPB) system used in heart surgery causes platelet activation and a systemic inflammatory reaction that leads to activation and consumption of coagulation factors, resulting in a deleterious effect on hemostasis. The minimal extracorporeal circulation (MECC) was developed as an improvement of the standard CPB. MECC has a reduced dimension of the tubing system, which decreases the required priming volume and the consequent blood dilution effect. With MECC, dilution, mechanical stress and blood contact with air and foreign surfaces are also decreased. The aim of the study was to assess by means of standard laboratory and point-of-care methods changes induced by CPB in coagulation parameters, particularly in platelet function, and to determine whether these changes differ depending on the type of CPB used: minimal extracorporeal circulation system (MECC) and standard CPB.
Materials and Methods: 88 patients undergoing coronary artery bypass surgery performed on-pump were enrolled in the study. 44 interventions were performed with MECC and 44 with standard CPB. Blood was sampled preoperatively, after 30 minutes on CPB, after weaning from CPB and 24 hours postoperatively. Standard coagulation laboratory tests were performed, as well as thromboelastometry (EXTEM test and FIBTEM test) and multiple electrode aggregometry activated by adenosine diphosphate (ADPtest), collagen (COLest) and thrombin receptor activating peptide (TRAPtest).
Results and Discussion: Thromboelastometry and standard laboratory reflected significantly impaired hemostasis after weaning from CPB but no significant differences between the two groups at different time points. Aggregation decreased significantly in both groups as early as 30 minutes after institution of CPB ($P < 0.05$, Mann-Whitney *U*-test) and recovered within the first 24 hours postoperatively, without reaching the preoperative level. Intraoperatively, aggregometry values obtained with the ADPtest and COLtest reflected a significantly more severe reduction of platelet function in the standard CPB group than in the MECC group ($P < 0.01$, ProcMixed test).
Conclusion(s): Our findings suggest that multiple electrode aggregometry and thromboelastometry reflect impairment of coagulation in cardiac surgery performed on different types of CPB and that platelet function is less affected by MECC then by standard CPB.

6AP4-7

Intrarater and interrater reliability of coagulation testing using thromboelastometry

N. Koepfer, A. Kutter, J. Mauch, A. Frotzler, C. Madjdpour

Department of Anaesthesia, University Children's Hospital, Zurich, Switzerland

Background and Goal of Study: Rotation thromboelastometry (ROTEM® *delta;* Pentapharm GmbH, Munich, Germany) enables a fast and differentiated analysis of blood clotting directly in the operating theatre. The study aimed to investigate intrarater and interrater reliability of point of care (POC) coagulation testing by the ROTEM® *delta* device.
Materials and Methods: Blood from 17 piglets was taken and paired tested for clotting time (CT), clot formation time (CFT), maximum clot firmness (MCF) and the alpha angle in the EXTEM, INTEM, FIBTEM and APTEM tests. Paired simultaneous testing was performed either by a single operator (intrarater) or by two different operators (interrater). Reliability was analysed using intraclass correlation coefficient (ICC) and Spearman correlation and Bland-Altman analysis was performed.
Results and Discussion: ICC for CT, CFT, MCF and alpha in EXTEM, INTEM and FIBTEM and MCF in APTEM ranged from 0.61 to 0.985 ($p < 0.05$). Interrater reliability were high for CFT and alpha in EXTEM, CT, CFT, MCF and alpha in INTEM, CFT, MCF and alpha in FIBTEM and MCF in APTEM (0.754 to 0.984; $p < 0.05$).

Table 1. Bias/precision (median) of intrarater Bland-Altman analysis

Intrarater	CT [s]	CFT [s]	MCF [mm]	alpha [°]
Extem	0.3/23.3 (58.5)	1.1/14.9 (52.5)	0.5/3.7 (66.5)	0.0/2.1 (80.0)
Intem	–8.3/37.7 (135.5)	2.0/5.9 (37.0)	–1.0/2.4 (67.5)	–0.5/1.1 (83.0)
Fibtem	2.3/10.8 (59.0)	9.1/17.9 (112.0)	–2.3/3.3 (40.5)	–0.8/3.9 (71.5)
Aptem	–6.9/18.2 (74.5)	–2.3/10.1 (40.5)	0.3/0.5 (68.0)	0.4/2.1 (82.0)

Table 2. Bias/precision (median) of interrater Bland-Altman analysis

Interrater	CT [s]	CFT [s]	MCF [mm]	alpha [°]
Extem	2.9/14.0 (57.5)	3.0/8.8 (40.5)	–0.8/5.7 (67.0)	–0.6/1.5 (82.0)
Intem	3.1/15.1 (131.5)	2.4/6.8 (39.0)	–0.6/1.5 (66.5)	–0.6/1.0 (82.0)
Fibtem	6.4/18.0 (57.5)	15.0/28.3 (92.0)	0.4/5.8 (43.5)	–2.7/7.9 (75.0)
Aptem	4.8/23.1 (59.0)	2.1/12.1 (40.5)	–2.8/8.0 (64.0)	–0.6/2.3 (82.0)

Conclusion(s): Based on our preliminary results POC coagulation testing by ROTEM® *delta* has a considerably good intrarater and interrater reliability. The poor reliability of the APTEM test has minor impact in clinical practice, since the APTEM test is used only for the detection of hyperfibrinolysis in conjunction with the EXTEM test.

Acknowledgements: This study was realised in collaboration with the Equine Department Vetsuisse Faculty, Zurich, Switzerland.

6AP4-8

Effect of intravenous fluids on blood coagulation assessed by rotation thromboelastometry

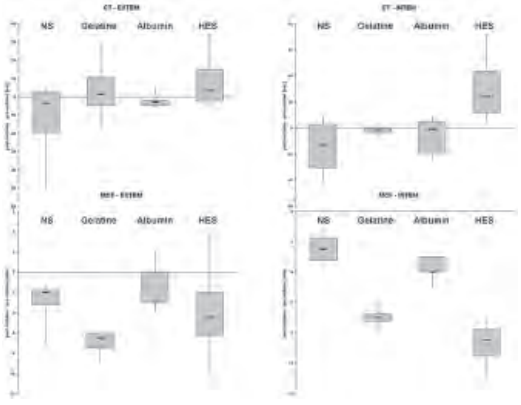
C. Madjdpour, N. Koepfer, A. Kutter, A. Frotzler, J. Mauch

Department of Anaesthesia, University Children's Hospital, Zurich, Switzerland

Background and Goal of Study: Perioperative volume losses are replaced with cristalloids and colloids. Colloids are preferred in case of a more severe intravascular volume deficit due to their stronger volume effect. However, impairment of blood coagulation is one of the main side effects of colloids, particularly with artificial colloids such as hydroxyethyl starch (HES) and gelatine preparations. This pilot animal study aimed to evaluate the effect of a standard cristalloid or colloid intravenous fluid bolus on blood coagulation assessed by rotation thromboelastometry.

Materials and Methods: Piglets (n = 17, weight 5 ± 0.3 kg) were anesthetized with sevoflurane and endotracheally intubated. The internal jugular vein and internal carotid artery were cannulated for infusion and blood sampling, respectively. 20 ml/kg fluid boluses were given over a period of 2 min. with either normal saline (0.9% NaCl, NS) (n = 4), 4% gelatine (Physiogel®) (n = 4), 5% albumin (n = 5) or 6% HES (HES 130/0.4, Voluven®) (n = 4). Blood samples were analyzed with rotation thromboelastometry (ROTEM®; Pentapharm GmbH, Munich, Germany) before and 1 min. after fluid administration and the following ROTEM® parameters were analyzed: MCF (maximum clot firmness [mm]) and CT (clotting time [sec]) in the EXTEM and INTEM test and MCF in the FIBTEM test. Boxplots (median; range) of differences before (pre-volume) and after the fluid bolus (post-volume) are shown.

Results and Discussion: Compared to the other fluids HES showed a clear trend towards prolongation of CT in the INTEM test. MCF showed clear tendencies to decrease with gelatine and HES in both the EXTEM and INTEM test (figure 1). MCF in the FIBTEM test showed the most prominent decrease with HES (median –11.5 mm; range –4.0 to –13.0 mm) and gelatine (–8.0 mm; –3.0 to –11.0 mm) while NS (–3.0 mm; –2.0 to –6.0 mm) and albumin (–4.0 mm; 0.0 to –7.0 mm) caused less decrease.



Conclusion(s): HES and gelatine showed a stronger trend towards impairment of blood coagulation compared to albumin or NS. Remarkably, this trend was observed after only moderate volume loading in this pig model.

Acknowledgements: This study was supported by departmental resources and realised in collaboration with the Equine Department Vetsuisse Faculty, Zurich, Switzerland.

6AP5-1

Recombinant factor VIIa in trauma: An audit of knowledge of the guidelines amongst anaesthetists in a major trauma centre

O. Shalaby, M. Ingram

Anaesthetic Department, James Cook University Hospital, Middlesbrough, United Kingdom

Background and Goal of Study: Massive blood transfusion is associated with significant complications. The use of recombinant factor VIIa (rFVIIa) in the management of major haemorrhage has been shown to reduce transfusion requirements [1]. Use of rFVIIa is now incorporated in many local and national guidelines for the management of major haemorrhage [2]. This audit assesses knowledge of rFVIIa use amongst anaesthetists in a major trauma centre where rFVIIa has been incorporated into the major transfusion policy.

Materials and Methods: Audit methodology was by clinical case orientated questionnaire, completed without reference to literature, and anonymity maintained by a sealed envelope technique. Standards set were 100% of respondents should be aware of local or national guidelines, have knowledge of the preconditions required before consideration of rFVIIa use in trauma, and understand the need to request a coagulation profile and exclude DIC prior to administration of rFVIIa.

Results and Discussion: Forty six respondents completed the questionnaire (74% of department). 27 (59%) of respondents were aware of either local or national guidelines for the use of rFVIIa in trauma. Twenty-five (54%) correctly identified the ideal preconditions required prior to rFVIIa administration in trauma. Twelve (26%) of respondents requested an appropriate clotting profile to exclude DIC prior to administration of rFVIIa.

Conclusion(s): This audit identified a knowledge deficit in an area of practice where interventions may be time critical. Departmental discussion identified difficulty locating guidelines on the hospital intranet as a potential problem. Re-structuring the intranet anaesthetic portal has improved visibility of many hospital guidelines in our trust

References:

1 Bowley DM, Robertson SJ, Boffard KD, Bhagwanjee S. Resuscitation and anaesthesia for penetrating trauma. *Current Opinion in Anaesthesiology*; 16(2):165–71, 2003.

2 "Clinical transfusion: surgery and critical illness," in *Handbook of Transfusion Medicine,* 4th edn, McClelland DBL, ed., TSO, Edinburgh, p.23, 2007.

6AP5-2

Activation of coagulation and fibrinolysis in patients with malignancy after elective open hepatic resection

L. Weinberg, N. Scurrah, C. Smith, F. Parker, D. Story

Departments of Anaesthesia & Haematology, Austin Hospital, Heidelberg, Victoria, Australia

Background and Goal of Study: It remains unclear where the balance lies between the prothrombotic and antithrombotic systems in patients undergoing hepatic resection for malignancy. Therefore, the aim of this study is to evaluate the conventional laboratory markers of hypocoagulabilty in addition to select biochemical markers of coagulation activation and subsequent fibrinolysis.

Materials and Methods: Prothrombin fragments 1 + 2 (PF1 + 2) and thrombin-antithrombin III complex (TAT), which are select markers of thrombin generation that signify activation of haemostatic system, were prospectively investigated in 21 patients undergoing elective hepatic resection. In addition, plasma von Willebrand Factor antigen (vWF-Ag), essential for primary haemostasis and coagulation and a predictive marker of endothelial cell injury was evaluated. Markers of fibrinolysis (D-dimer), fibrinogen levels, and conventional laboratory coagulation tests such as prothrombin time (PT), activated partial thromboplastin time (APTT), and platelet count were measured. All values were measured preoperatively, immediately postoperatively, and on postoperative Days 1, 3 and 5.

Results and Discussion: Preoperative PT, PTT and platelets values were normal in all patients. In contrast, preoperative levels of PF 1 + 2 and TAT were elevated in over 60% of patients indicating enhanced thrombin generation and a tendency towards a preoperative hypercoagulable state. On Day 1 postoperatively, the PT was elevated in 8 (38%) patients (range 16–22 seconds). Prothrombin time normalised in all but one patient by postoperative Day 5. In contrast PF 1 + 2, TAT and vWF-Ag were elevated early in the postoperative period and remained elevated until postoperative Day 5. Almost all patients had

significantly elevated levels of fibrinogen and D-dimers, suggesting a preliminary state of hyperfibrinolysis. Platelet count was unaffected in the postoperative period.

Conclusion(s): This study demonstrates that postoperative elevations in PT in patients undergoing hepatic resection for malignancy are systematically associated with high levels of PF 1 + 2, TAT and vWF-Ag. Despite PT being prolonged in a significant proportion of patients, this was transient and of low magnitude. Absolute values of markers of coagulation activation and thrombogeneis were always higher than those of hypocoagulation, suggesting a postoperative hypercoagulable state. Activation of blood coagulation and fibrinolysis occurred in most patients. This has significant implications for timing of thromboembolic chemoprophylaxis.

6AP5-3

Assay discrepancy of fibrinogen following dilution with colloid plasma expander

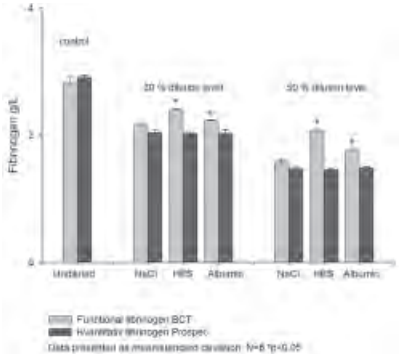
C. Fenger-Eriksen, E. Tønnesen, J. Ingerslev, B. Sørensen

Department of Anaesthesiology, Aarhus University Hospital, Aarhus, Denmark

Background and Goal of Study: Measurement of plasma-fibrinogen is often required in critically ill patients or massive bleeding patients being resuscitated with colloid plasma expander. The present study aimed at evaluating different assays of plasma fibrinogen following dilution with commonly used plasma expander and challenged the hypothesis that levels of fibrinogen are estimated significantly higher in plasma diluted with colloid plasma expander compared with isotonic saline.

Materials and Methods: Measurements were performed in eight plasma samples (Cryo-check Dartmouth, Canada) each diluted in vitro to levels of 30%, 50% and 0% (control) with isotonic saline 0.9% (NaCl Nycomed A/S, Roskilde, Denmark), Hydroxyethyl starch 130/0.4 (Voluven, Fresenius Kabi AB, Uppsala, Sweden) and human albumin (Human albumin 5%, CSL Behring, Marburg, Germany). Fibrinogen assays. Two different assays were applied: i) Fibrinogen according to the Clauss method (standard in most laboratories) measured on an automated coagulation analyzer (BCT, Dade Behring Coagulation Timer; Dade Behring, Marburg, Germany) based on absorption photometry using thrombin in excess as substrate (Multifibrin U, 50 IU/ml, Dade Behring), and ii) Antigen levels of fibrinogen were determined by means of nephelometry (BN ProSpec, Dade Behhring), (N antiserum from rabbit against human fibrinogen, Dade Behring).

Results and Discussion: During haemodilution, at both 30% and 50%, values of plasma fibrinogen are reported significantly higher when measured by a functional Clauss method compared with the antigen levels of fibrinogen. The most distinct difference was observed in plasma diluted with hydroxyethyl starch.



Conclusion(s): The presence of colloid plasma expander significantly induces an overestimate in levels of functional fibrinogen when compared to antigen levels of fibrinogen. This serious assay discrepancy may hinder hypo-fibrinogenaemic patients suffering from dilutional coagulopathy from proper haemostatic treatment with fibrinogen.

6AP5-4

Recovery of fibrinogen plasma level after administration of fibrinogen concentrate for hemostatic therapy in complex cardiac surgery

N. Rahe-Meyer, M. Winterhalter, A. Osthaus, S. Piepenbrock, C. Solomon

Department of Anesthesiology, Hannover Medical School, Hannover, Germany

Background and Goal of Study: Recent studies have shown that decreased fibrinogen plasma concentration is a predictor of perioperative bleeding. Fibrinogen concentrate has been increasingly administered as hemostatic agent for the correction of acquired hypofibrinogenemia in cardiac, liver and orthopedic surgery. Our study assessed recovery parameters of fibrinogen plasma levels after administration of pasteurized human fibrinogen concentrate for hemostatic therapy during aortic surgery.

Materials and Methods: Patients undergoing aortic valve and ascending aortic surgery (AV-AA), as well as thoracoabdominal aortic aneurysm surgery (TAAA) were included in the study. Exclusion criteria were non-elective, emergency intervention, age < 18, recent intake of drugs influencing coagulation, re-do's and terminal illness. The patients with microvascular non-surgical bleeding after weaning from bypass were treated with fibrinogen concentrate (Haemocomplettan P, CSL Behring, Marburg, Germany) using a self-developed hemostatic therapy algorithm. The fibrinogen recovery was calculated as rise of fibrinogen (mg/dL)/dose (mg/kg body weight). In vivo recovery was calculated as rise of fibrinogen (mg/dL)*100/expected rise of fibrinogen (mg/dL), where the expected rise of fibrinogen represented dose of fibrinogen concentrate (mg)/plasma volume. The plasma volume was estimated as 41*kg body weight*mL/kg.

Results and Discussion: From the 16 patients (3 female : 13 male) prospectively included in the trial, 6 patients underwent TAAA correction and 10 patients had AV-AA surgery. A mean dose of 7.83 ± 2.7 g fibrinogen was administered (96 mg/kg body weight). The median recovery was 2.3 mg/dL (range 1.5 – 3.6) and the median in vivo recovery was 125% (range 82–171), comparable with results reported in administration of fibrinogen concentrate for the therapy of acquired hypofibrinogenemia in other settings than cardiac surgery (in vivo recovery 109%). Recovery values of above 100% in perioperative setting may be explained by the slightly hypovolemic conditions following surgery.

Conclusion(s): In the present study, apart from the satisfactory hemostatic effect and the association with significant reduction in transfusion parameters, the fibrinogen concentrate administered proved good efficacy in increasing the fibrinogen plasma level. These findings support its application for coagulation therapy in aortic surgery.

6AP5-5

Associations between complement system activation and acute traumatic coagulopathy

G. Nardai, A. Gombkötö, M. Basta, L. Rosivall, J. Szebeni

Department of Anesthesiology and Intensive Care, Péterfy Hospital and Trauma Center, Budapest, Hungary

Background and Goal of Study: Clinically relevant coagulopathy is a common complication during the management of patients with multiple injuries. Moreover, it is an independent risk factor of multiorgan failure and higher mortality ratio in these patients. In spite of this, the pathophysiology of this coagulation disorder is not fully clarified. According to the classical concept acidosis, factor dilution and consumption are responsible for the haemostasis failure. But there is an increasing number of data which supports the possible role of additional events (hyperfibrinolysis, protein C activation) and the cooperation between coagulation and complement system. Aim: to identify the associations between complement system activation and trauma induced coagulopathy

Materials and Methods: Prospective study on adult, multiple injured patients transferred to hospital within 3 hours after trauma; blood was taken at admission and 1, 3, 6, 12, 24 hours later for complement measurement and at admission and as many times as clinically indicated for coagulation tests. Complement proteins (terminal complex, Bb fragment) were measures by ELISA. Coagulopathy was determined as prothrombin time > 18 sec. Biometric data, haemodinamic and treatment parameters were collected during the first 48 hour, outcome parameters were registered until discharge or day 30. Statistics: one-way ANOVA, Mann-Whitney, khi-square tests; significance: $p < 0.05$.

Results and Discussion: Evaluation of more that 100 patients showed that coagulopathy was associated to higher ISS (22 vs. 30,5, $p < 0,05$) and with signs of tissue hypoperfusion (hypotension: 55% vs. 31%, $p < 0,05$, base excess: – 4,97 ± 3.7 vs. – 7,03 ± 4.2, $p < 0,05$, elevated serum lactate: 75% vs. 21%, $p < 0,001$). There was no correlation between coagulation parameters and complement levels at admission, but coagulopathy during the first 24 hour and factor substitution were more common among patients with high complement level at admission (58% vs 72%, NS; 2 U/patient vs 5.8 U/patient, $p < 0.0.5$). Coagulopathy during the in-hospital phase was also frequently associated to complement activation. Analysis of the kinetic curves did not suggest that complement activation have been a role in the initiation of traumatic coagulopathy.

Conclusion(s): These results reinforce observations in the association of injury severity and coagulopathy, support very recent result as tissue hypoperfusion could be a trigger of coagulation disorders after trauma, moreover hypoperfusion is suspected to be a common cause of complement activation and coagulopathy.

6AP5-6

Type of anaesthesia did not affect the efficacy and safety of dabigatran etexilate compared with enoxaparin for primary venous thromboembolism prevention following total knee or hip replacement surgery

N. Rosencher, H. Noack, M. Feuring, R. Friedman, B. Eriksson

Paris Descartes University, Cochin Hospital (AP HP), Paris, France

Background and Goal of Study: Dabigatran etexilate (Pradaxa®), an oral direct thrombin inhibitor, is approved in multiple countries including the EU, Canada, Brazil and Australia for preventing venous thromboembolism (VTE) after knee or hip replacement surgery. We aimed to determine if the type of anaesthesia used had any effect on study outcomes.

Materials and Methods: Three pivotal trials investigated the efficacy and safety of dabigatran etexilate. RE-MODEL™ and RE-NOVATE™ compared 220 mg and 150 mg dabigatran etexilate once daily (qd) with 40 mg subcutaneous (sc) enoxaparin qd following knee and hip surgery, respectively. RE-MOBILIZE™ compared 220 mg and 150 mg qd dabigatran etexilate with 30 mg enoxaparin sc twice daily after knee replacement surgery. A post hoc pooled analysis was performed in patients receiving general vs neuraxial anaesthesia and focussed on major VTE and VTE-related mortality and major bleeding events (MBE), including surgical-site bleeds, which were blindly adjudicated.

Results and Discussion: In the pooled safety population 3200 patients received general, while 4875 received neuraxial anaesthesia; if patients received both peripheral nerve blockades and general anaesthesia (18–20%) they were assigned to the general anaesthesia group. Analysis of major VTE and VTE-related mortality show similar results for the dabigatran groups compared with enoxaparin in both anaesthesia sub-groups. Comparisons between treatments in the anaesthesia sub-groups are shown in Table 1. Of the patients receiving general anaesthesia, the occurrence of MBE was 9/1060 patients (0.8%) in the 220 mg dabigatran etexilate group, 14/1099 (1.3%) in the 150 mg dabigatran etexilate group and 15/1041 (1.4%) in the enoxaparin-treated group; in the neuraxial anaesthesia group the rates were 29/1606 (1.8%), 14/1623 (0.9%) and 24/1646 (1.5%), respectively.

Table 1. Odds ratios with 95% confidence intervals for the comparison of dabigatran etexilate with enoxaparin by anaesthesia sub-groups

Event	Dabigatran etexilate 220 mg qd		Dabigatran etexilate 150 mg qd	
	General	Neuraxial	General	Neuraxial
Major VTE and VTE-related mortality	0.98 (0.58, 1.67)	0.85 (0.53, 1.37)	1.23 (0.75, 2.01)	1.08 (0.69, 1.69)
MBE	0.61 (0.25, 1.48)	1.24 (0.71, 2.16)	0.91 (0.41, 2.03)	0.59 (0.30, 1.16)

Conclusion(s): The efficacy and safety profiles of dabigatran etexilate are comparable with enoxaparin and did not differ regardless of type of anaesthesia used during orthopaedic surgery.

6AP5-7

150 mg dabigatran etexilate once daily has a good safety profile and comparable efficacy to enoxaparin for primary prevention of venous thromboembolism after total knee or hip replacement surgery in patients > 75 years or with reduced renal function

N. Rosencher, A. Kurth, A. Clemens, H. Noack, B. Eriksson

Paris Descartes University, Cochin Hospital (AP HP), Paris, France

Background and Goal of Study: The oral direct thrombin inhibitor dabigatran etexilate (Pradaxa®) was recently approved in Europe and Canada for preventing venous thromboembolism (VTE) in patients undergoing knee or hip replacement surgery. With any renally excreted drug special consideration should be given to patients with moderate renal impairment (creatinine clearance [CrCl] ≥ ≥ 30 and < 50 ml/min) and those > 75 years (as renal function naturally declines with age). We aimed to determine the efficacy and safety of dabigatran etexilate in these two sub-groups.

Materials and Methods: The RE-MODEL™ and RE-NOVATE™™ trials studied the efficacy and safety of 220 mg and 150 mg dabigatran etexilate compared with 40 mg subcutaneous enoxaparin and demonstrated non-inferiority for the primary endpoint, total VTE and all-cause mortality. A post hoc pooled analysis was performed in the designated sub-groups. The secondary, clinically relevant efficacy endpoint was major VTE and VTE-related mortality; the primary safety outcome was major bleeding events (MBE; including surgical-site bleeds and blindly adjudicated).

Results and Discussion: Of 5539 treated patients, 883 (16%) were >75 years and 337 (6%) had moderate renal impairment. The average CrCl in the >75 years group was 62 ml/min. Results for the study endpoints are shown in Table 1.

Conclusion(s): In patients with reduced renal function or > 75 years who underwent hip or knee replacement, oral 150 mg dabigatran etexilate was effective and safe and is the recommended dose in these sub-populations. These data confirm the dose recommended by the EMEA.

6AP5-8

The inhibition of factor Xa by the use of low-molecular weight heparin, nadroparin and reviparin in urological patients

S. Pavlovic, V. Milic, S. Zivkovic, Z. Kalcic, A. Pavlovic

Urology Clinic, Clinical Center Nis, Nis, Serbia

Background and Goal of Study: The inhibition of factor Xa (FXa) by the use of low molecular weight heparin (LMWH) is important clinical procedure in patients with moderate and high risk for the development of venous thromboembolism (VTE) and pulmonary embolism (PE). The aim of this study was to dermine the level of inhibition of FXa by the use of prophylactic doses of LMWH nadroparin-calcium and reviparine-sodium which were applied in urological patients with moderate risk for VTE i PE.

Materials and Methods: The examination included 120 urological patients divided into 4 grops after urological, uroradiological and anestesiological preoperative preparation and categorization of anesteziological risk according to ASA clasification. The first two groups of 30 patients received recommended doses of low LMWH in accordance with the preoperative risk, and an inhibition of FXa 48 hours after surgical operation and 4 hours after administration of LMWH was determined. Heptest and hromogenous anti-Xa test were used for monitoring of FXa inhibition. Since obtained anti-Xa values were not satisfactory, two more groups were formed and given double the recommended doses. In these new groups, inhibition of FXa was in recomended range. Standard descriptive statistical parameters were used for describing the charateristics of the people from the formed groups.

Results and Discussion: All the patients examined were clinically estimated as patients of moderate risk, for VTE and PE. There were no statistically singificantly difference in body weight of the patients who received nadroparin-calcium 0.3ml and reviparine-sodium 0.25ml and those who received thir double doses, respectively. The level of FXa inhibition in the group in which the dose of nadroparine-calcium of 0,6 ml was applied was statistically significautly higher than in the group which received doses of 0,3ml ($p < 0,0001$). The level of FXa in the group given reviparine-sodium 0,5ml was significantly higher than in the group which received half of dose ($p < 0,0001$). This research did not confirm a statistically difference in the levels of FXa inhibition in patients who received nadroparin-calcium as VTE and PE prophilaxis in the dose of 0.6ml and those who received reviparin-sodium 0.5 ml ($p > 0.05$).

Conclusion(s): According to biochemical monitoring, the recomended doses of LMWH are insufficient for the prophylactic inhibition of FXa in urological patients with moderate risk for VTE and PE, so the higher doses which inhibit FXa are recomended.

Abstract 6AP5-7 – Table 1. Event rates and comparisons between treatment groups in the two sub-groups analysed.

Event	Dabigatran etexilate 220 mg qd	Dabigatran etexilate 150 mg qd	Enoxaparin 40 mg qd
Patients > 75 years			
Major VTE and VTE-related mortality	1.9% (4/216) (CI 0.5%–4.7%) p = 0.045	4.5% (10/221) (CI 2.2%–8.2%) p = 0.53	6.0% (13/218) (CI 3.2%–10.0%)
MBE	3.7% (11/295) (CI 1.9%–6.6%) p = 0.65	1.4% (4/282) (CI 0.4%–3.6%) p = 0.27	2.9% (9/306) (CI 1.4%–5.5%)
Patients with moderate renal impairment			
Major VTE and VTE-related mortality	1.2% (1/83) (CI 0.0%–6.5%) p = 0.04	4.3% (3/70) (CI 0.9%–12.0%) p = 0.35	9.0% (8/89) (CI 4.0%–16.9%)
MBE	5.3% (6/113) (CI 2.0%–11.2%) p = 0.82	0.0% (0/96) (CI 0.0–3.8%) p = 0.04	4.7% (6/128) (CI 1.7%–9.9%)

p-values for comparisons with enoxaparin were determined using Fisher's exact test.

Neurosciences

7AP1-1

Incidence of air embolism in neurosurgical patients operated in sitting position

A. Hoxha, K. Pilika, M. Demneri, M. Saraci, G. Huti

Dept. Anaesth&Critical Care, Clinic of Neurosurg, University Hospital Centre "Mother Theresa", Tirana, Albania

Background and Goal of Study: Use of the sitting position in neurosurgery operative theatre presents unique challenge for the anesthesiologist concerning the complications related to it. Venous air embolism (VAE) is a major threatening occurring during operations in such position (1). Our aim was to evaluate incidence of VAE, as well as its effects on haemodynamics and post-operative morbidity and mortality.

Materials and Methods: 118 patients were prospectively studied during the period 2004–2007. Besides basic monitoring (NIBP, IAP, ECG, SaO2, $EtCO_2$, Temp.) was routinely used. $EtCO_2$ was used for detection of VAE. Before positioning patients received 10 ml/kg macromolecular iv infusion and PEEP = 5 cm H_2O was used during ventilation in sitting position. Every sudden fall from baseline of $EtCO_2$ of more than 5 mm Hg (in the absence of sudden haemodynamic change) was recorded as an episode of VAE. Hypotension was defined as a decrease of systolic blood pressure more than 20% of baseline. Multiple tail t-test analysis was performed and $p \leq 0.05$ was considered significant.

Results and Discussion: Capnography detected VAE in 26 (22.03%) patients. The highest incidence (18 patients–69.2% from suffered VAE) occurred from opening to suturing the dura. During the VAE episode hypotension occurred in 26.9% (5.95% of all patients), 14% developed ventricular arrhythmias (3.1% of all patients) and in 1patient (0.85%) occurred cardiac arrest with asystoly. Nether less there were no deaths during the operation period. There were no statistically significant differences neither in the incidence of VAE, nor in the frequency of hypotension or arrhythmias, among different localizations or histology of brain pathologies ($p = 0.14$). Post-operative morbidity caused by VAE was in 26.92% (7 patients after VAE episodes). 4 patients (15.38%) developed hemiparesis after operation and 3 others (11.54%) developed coma and other neurological damage. ARDS was observed in all comatose patients. Mortality related to ARDS and MOF after episodes of VAE was 2.54% (3 from 118 patients-mortality related to VAE).

Conclusion(s): Our data suggests that VAE is a frequent event during operation in sitting positioned patients in neurosurgery, Capnography is helpful in early detection of VAE offering the time needed for prevention of complication. In our patients VAE had not show serious impact on post-operative patients' mortality and morbidity.

Reference:

1 Harrison EA, et al. Br. J. of Anaesth. 2002:98; 12–7.

7AP1-2

Permutation entropy and approximate entropy as measures of isoflurane anaesthesia: A study using local field potentials recordings in the rat thalamocortical axis

A. Silva, H. Cardoso-Cruz, F. Silva, V. Galhardo, L. Antunes

CECAV, Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal

Background and Goal of Study: Recent studies suggested permutation entropy (PE) and approximate entropy (AE) as measures of anaesthetic effect on the EEG. Local Field Potentials (LFPs) signals have fewer artefacts than electroencephalogram and are better suited to study anaesthetics action pathways in the brain. In this study, the ability of these parameters to reflect the isoflurane anaesthetic depth was evaluated by analysis of rat's LFPs.

Materials and Methods: Five adult male Sprague-Dawley rats chronically implanted with microelectrodes matrices were used to record LFPs in the somatosensory cortex and ventroposterior thalamic nuclei. Six periods were considered:5 minutes before induction of anaesthesia (PBI); last five min of randomised 20 minute steady state endtidal 0.8%, 1.1%, 1.4% and 1.7% isoflurane concentrations (P0.8, P1.1, P1.4 and P1.7) and five minutes after recovery (PAR). PE, AE and the spectral edge frequency 95% (SEF95) were estimated using epochs of 8 seconds. A correction factor for burst suppression (BS) (Rampil, 1998) was applied to SEF95 and PE. The Spearman rank correlation coefficient (r) was calculated between the studied parameters and etISO. Statistical comparisons between the recorded areas and the different anaesthesia periods were performed using the Friedman test with Dunn's post test.

Results and Discussion: No significant differences were found between the two recorded areas across the studied parameters. The BS correction increased the r of PE and SEF with etISO (from – 0.36 and – 0.60 to – 0.93 and – 0.91 ($p < 0.001$), respectively). The r obtained between AE and etISO was – 0.85 ($p < 0.001$). In addition, all of the studied parameters varied significantly between awake and anesthetized states ($p < 0.001$) and no significant differences were found between P0.8 and P1.1.

Conclusion(s): These results suggest that PE, when corrected for BS can be an adequate measure to study the isoflurane effect using LFPs signals.

Acknowledgements: FCT projects POCTI/CVT/59056/2004 and PTDC/EEA-ACR/69288/2006

Reference:

1 Anesthesiology (1998); 89: 980–1002.

7AP1-3

The effect of addition of nitrous oxide to a propofol versus sevoflurane anesthetic on state entropy and bispectral index

M. Ozcan, Q. Khan, Q. Lobb, C. Burwell, P. Chetty

Department of Anesthesiology, University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma, USA

Background and Goal of Study: Several studies showed that Bispectral Index (BIS) did not change when nitrous oxide (N_2O) was given alone or added to intravenous and inhalation anesthetics. While one study demonstrated no change in State Entropy (SE) with N_2O given as the sole agent, others showed a decrease in SE when N_2O was added to sevoflurane. Since the addition of N_2O is known to cause second gas effect, the observed decrease in SE may be due to an increased concentration of sevoflurane rather than N_2O per se. To our knowledge, there are no data on the effect of N_2O on SE during maintenance of an intravenous anesthetic. We aimed to compare the effect of adding N_2O to a propofol versus sevoflurane based anesthetic on SE and BIS.

Materials and Methods: With IRB approval, 28 patients were recruited after informed consent. Following IV induction, they were randomly assigned to anesthetic maintenance with either 2% end-tidal Sevoflurane (n = 14) or 120 µg/kg/min Propofol (n = 14) for the duration of study. Both SE and BIS were monitored in addition to standard monitoring. After surgical incision, 20 minutes were allowed as baseline period, followed by the addition 60% N_2O with oxygen for 20 minutes. N_2O was then discontinued and the study was concluded after 20 minutes of washout period. SE and BIS values were recorded every 10 seconds. Data collected during the last 5 minutes of each 20 minute period was used for analysis. Paired t-test was used to compare the means of SE and BIS in each period.

Effect of N_2O on SE and BIS in the Propofol Group

	Baseline	Nitrous Oxide	Washout
SE	44 ± 12	43 ± 13	44 ± 11
BIS	39 ± 11	37 ± 12	38 ± 10

Data as mean ± SD

Effect of N_2O on SE and BIS in the Sevoflurane Group

	Baseline	Nitrous Oxide	Washout
SE	36 ± 10	30 ± 11*	36 ± 10
BIS	35 ± 7	32 ± 7*	35 ± 7

Data as mean ± SD.

*Nitrous oxide vs. Baseline, Nitrous oxide vs. Washout, $p < 0.05$ using paired t-test

Results and Discussion: Addition of 60% N_2O did not change the SE and BIS values in the Propofol group. There was a statistically significant decrease in both indices when 60% N_2O was added in the Sevoflurane group. Considering that the amount of N_2O used was equal to 0.5 MAC, the changes in SE and BIS were clinically modest. The observed decrease in SE and BIS can be due to second-gas effect or a true additive or synergistic effect between N_2O and Sevoflurane.

Conclusion(s): Addition of N_2O to a propofol based anesthetic does not change SE or BIS. There is a clinically modest decrease in both indices when N_2O is added to Sevoflurane.

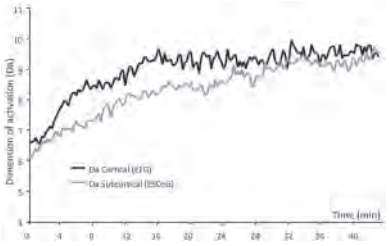
7AP1-4

Role of the cortex and sub-cortex during recovery from general anesthesia

L. Pellegrini, L. Velly, M. Rey, F. Gouvitsos, N. Bruder

Service d'Anesthésie-Réanimation, CHU Timone Adultes, Marseille, France

Background and Goal of Study: Respective involvement of cortical and subcortical structures during general anaesthesia remains unclear. The aim of this study was to compare the respective kinetics of activation of these two structures during recovery from anaesthesia.
Materials and Methods: After Ethics Committee approval, 12 ASA II–III informed patients (58 ± 10 years) suffering from Parkinson disease were included. Enrolled patients were to undergo implantation of an electrode in the subthalamic nucleus under general anesthesia. All patients received a standardized anesthesia with a target control infusion of propofol (Diprifusor®) in association with alfentanil. Cortical (EEG) and subcortical (ESCoG) electrogenesis were continuously recorded during recovery of anesthesia. EEG was acquired with a frontal montage (F3-C3; System 10–20) and ESCoG through the subthalamic electrode (model 3387; Medtronic) between poles p0 and p3 (impedance <1,500 ΩΩ; distance = 10.5 mm). EEG and ESCoG spectral analysis: spectral edge 90% (SEF90), median frequency (MEF) and non linear analysis: Dimension of activation[1] (Da) calculations were performed. Results are expressed as mean ± SD. Statistical analysis used ANOVA followed by Tuckey's test. P < 0.05 was considered significant.
Results and Discussion: Before cessation of propofol ([Pro]effect: 3.9 ± 0.8 µg/ml), EEG and ESCoG SEF90, MEF, Da were comparable. After cessation of propofol, there was a differential kinetic of activation, with a rapid increase in cortical Da compared to the sub-cortical Da (figure). At eye opening after verbal stimulation (33 ± 15 min; [Pro]effect: 1.3 ± 0.2µg/ml) cortical Da was significantly higher than sub-cortical Da (10.2 ± 0.6 vs 9.0 ± 1.0 P < 0.05). At extubation (43 ± 19 min; [Pro]effect 1.2 ± 0.3µg/ml) no significant difference was found between EEG and ESCoG SEF90, MEF, Da.



Conclusion(s): Our study reveals a differential kinetic of activation with a faster activation of cortical structures during recovery from anesthesia. Eye opening was possible even in the absence of complete recovery of sub-cortical structures. These data suggest that in humans, the transition from unconsciousness to consciousness mainly involves cortical structures.
Reference:
1 Velly et al. Anesthesiology. 2007;107:202–12.

7AP1-5

Relationship between Bispectral Index, Spectral Entropy and dreams recall during desflurane anaesthesia

M. Oggiano, E. Congedo, I. Damato, A. Dottarelli, P. Aceto

Anaesthesiology and Intensive Care, A. Gemelli Hospital, Rome, Italy

Background and Goal of Study: Bispectral Index (BIS) and Spectral Entropy has been proposed, in recent years, as electroencephalographic monitors of anaesthesia depth (1). The aim of this study was to estimate the relations between Bispectral Index (BIS) and Spectral Entropy values and any explicit or implicit memory or dreams recall during desflurane anaesthesia.
Materials and Methods: 30 patients, aged 20–70 years, with American Society of Anesthesiologists physical status I–III, undergoing minor elective surgery were enrolled. Anaesthesia was induced with propofol 2 mg/kg, fentanyl 3 mcg/kg and cis-atracurium 0.15 mg/kg. Anaesthesia was maintained by using desflurane at MAC values useful to maintain BIS values below 60. An audiotape containing one of two stories was presented to patients during anaesthesia. Cardiovascular parameters, BIS, SE (State Entropy) and RE (Response Entropy) were continuously recorded during anaesthesia. Postoperative analgesia was standardized. Patients were interviewed on dream recall immediately upon emergence from anaesthesia. Declarative and nondeclarative memories for intraoperative listening were assessed 24 h after awakening. Mann-Whitney test, Pearson correlation and regression analysis were used for statistical purpose. p < 0.05 was considered statistically significant.
Results and Discussion: Two patients reported dream recall after anaesthesia. Mean BIS values registered during anaesthesia period were significantly higher in patients with dream recall (p < 0.05) when compared with patients without dream recall. Only mean BIS values showed correlation with presence of postoperative dreams recall (p < 0.05) and were able to predicted it (<0.01). There were not correlations between dreams recall and the other registeres parameters (SE, RE, cardiovascular parameters and end tidal desflurane concentration). Dreams content was always unrelated to listened stories or any events occurred during anaesthesia.
Conclusion(s): Higher mean BIS values registered throughout anaesthesia, even if below 60, may reflect cerebral activity associated to recall of no-stimulus related events. However, the precise moment of dream generation remains unknown.
Reference:
1 Martorano P, Falzetti G, Pelaia P. J Neurosurg Anesthesiol 2006;18:205–10.

7AP1-7

Performance of non-linear EEG parameters applied on isolated cortical networks

M. Kreuzer, B. Drexler, B. Antkowiak, E. Kochs, G. Schneider

Department of Anaesthesiology, Klinikum rechts der Isar der TU München, Munich, Germany

Background and Goal of Study: Nonlinear parameters were introduced to EEG analysis in order to obtain additional information to spectral parameters. They were used to analyse drug-induced effects on EEG activity and on down states of local field potential activity (LFP). Pk was calculated to evaluate drug-specific differences of propofol (propo) and sevoflurane (sevo) of in vitro and EEG recordings.
Materials and Methods: Cultured slices from rats neocortex were washed with increasing sevo [0–1MAC] or propo [0.2, 0.4µM] concentrations. LFP was recorded at each stage. EEG was recorded at 5 distinct anaesthetic levels awake, loss of consciousness (LOC), burst suppression (BS) and two intermediate levels inter 1/2 during sevo or propo anaesthesia. In vitro and EEG signals were analysed with Approximate Entropy ApEn, Correlation Dimension CD and Lempel-Ziv-Complexity LzC. Pk was calculated comparing level 0 MAC vs.0.25 to 1 MAC for sevo and 0 µM vs. 0.2 to 0.4 µM for propo (in vitro) and level awake vs. all anaesthetic levels w/o BS (EEG).
Results and Discussion: In vitro: All parameters allow separation of 0 MAC from higher concentrations. Different levels of propofol can not be distinguished. EEG: ApEn and CD quite reliably separate the awake state from all other levels. There was no difference in the result between sevo and propo.

In vitro: Sevo		Pk 0 MAC vs. [0.25; 1MAC]
	ApEn	0.84 (0.76–0.90)
	CD	0.87 (0.81–0.94)
	LzC	0.84 (0.77–0.91)
in vitro: Propo		0 µM vs. [0.2; 0.4 µM]
	ApEn	0.55 (0.50–0.70)
	CD	0.55 (0.50–0.70)
	LzC	0.58 (0.50–0.72)
		Awake vs. levels w/o BS
EEG: Sevo	ApEn	0.91 (0.78–1.00)
	CD	0.0.79 (0.60–0.94)
	LzC	0.64 (0.51–0.80)
EEG: Propo	ApEn	0.92 (0.73–1.00)
	CD	0.89 (0.68–1.00)
	LzC	0.69 (0.53–0.89

Conclusion(s): A general effect of sevo and propo was detected by the parameters in in vivo signals, i.e. EEG, while in vitro they only detected sevo effects. This result may be an indicator for different effects of sevo and propo on cortical activity, which is not obvious in the EEG data. While we demonstrated an effect of sevo on ApEn and CD of down states of cortical cell cultures, this is not detected for propo. This suggests differences in cortical effect mechanisms of these drugs, while anaesthetic-induced EEG effects are detected for both anaesthetic agents by non-linear methods.

7AP2-1

Effects of anesthetic agents on somatosensory evoked potentials during spinal operations

I. Asouhidou, P. Ioannou, D. Zilianaki, G. Vaidis, G. Georgiadis

Second Department of Anesthesiology, G.Papanikolaou, Thessaloniki, Greece

Background and Goal of Study: Somatosensory evoked potentials (SSEP) have been introduced for neurological investigation and monitoring of the integrityof the neural pathways during surgical procedures. This technique allows an on-line surveillance and earlydiagnosis of spinal cord dysfunction and aims to provide warning signals before an irreversible damage has occurred. Intraoperative neurophysiologic monitoring is affected by the choice and management of the anesthetic agents chosen. This study aims to reveal and calculate the effect of intravenous anesthetic agents, propofol and remifentanyl on SSEPs during spinal surgery.

Materials and Methods: Twelve patients were submitted for spinal surgery. Anesthesia was induced with propofol (2mg/Kg), fentanyl (2γ/Kg) and cicatracurium (0,15mg/Kg), followed by infusion of remifentanyl (0,2-1γγ/kg/min) and propofol infusion (4–8mg/kg/min). The depth of anesthsia was monitor by Bispectral Index (BIS) in order to be maintained in the same level in all patients. SSEPs were recorded intraoperative from the tibial nerve (P40), 15 minutes after induction of anesthesia and during the operation and data were analysed over that period. The electrophysiological equipment was purchased from Inimed GmbH. Data were expressed as mean ± and were analyzed statistically using the SPSS program package, version 9.0. Groups were inspected for normality and pairwise comparisons were performed using the paired samples t-test. Differences were considered significant at p value < 0.05.

Results and Discussion: Anesthesia induced a significant and comparable prolongation of the tibial SSEP onset, P40 latencies. Intraoperative SSEPs latencies was significantly prolonged (p = 0,002) meanwhile intraoperative values of μV were strongly reduced (p = 0,007).

Conclusion(s): These results demonstrated that propofol and remifentanyl produced a depression of cortical SSEP amplitude and clinically significant alterations in latency. Since intravenous anesthetic agents have different effect on evoked potentials, chose and management of the suitable anesthetic agent is essential for the neurophysiological monitoring and also for the surgical decision made during spinal operation.

References:

1 Sloan TB, Heyer EJ. Anesthesia for intraoperative neurophysiologic monitoring of the spinal cord. J Clin Neurophysiol. 2002;19(5):430–43.

2 Lotto LM, Banoub M, Schubert A. Effects of Anesthetic Agents and Physiologic Changes on Intraoperative Motor Evoked Potentials. J Neurosurg Anesthesiol 2004;16(1): 32–42.

7AP2-2

Perioperative atrial fibrillation in patients undergoing open intracranial neurosurgical procedures: Prevalence, incidence and relation with 6 months outcome

F. Pizzichetta, F. Bilotta, V. Cuzzone, A. Doronzio, G. Rosa

Anesthesiology, Critical Care and Pain Medicine, Sapienza, University of Rome, Policlinico Umberto I, Rome, Italy

Background and Goal of Study: Atrial fibrillation (AF) is the most common perioperative cardiac arrhythmias. Because of the risks related to anticoagulant therapy, fluid and electrolyte shift and inadequate cardiac output and cerebral perfusion, AF deserves special consideration in neurosurgical patients. Aim of this study was to determine its prevalence, incidence and relation with 6 months outcome in patients undergoing intracranial neurosurgical procedures.

Materials and Methods: Prevalence of preoperative AF and the incidence of new onset postoperative AF, in patients undergoing elective and emergency cerebral neurosurgical procedures, was recorded. Neurological outcome, using the modified Rankin Scale, and survival rate at 6 months follow-up was also recorded.

Results and Discussion: A total of 1870 patients were enrolled, 1183 underwent elective procedures, and 687 underwent emergency procedures. In the observed population the prevalence of preoperative AF was 3.8% among patients undergoing elective procedures, and 11.1% among patients who underwent emergency procedures [p = 0.0012]). The incidence of new onset AF was 2.1% (p < 0.0001) among patients who underwent elective procedures and 8.4% (p < 0.0001) among those undergone emergency procedures. At six months patients with preoperative AF who underwent elective procedures had neurological outcomes and survival rates similar to that of patients who presented with sinus rhythm (modified Ranking Scale grade 0–3, 84% vs. 87%; survival 93% vs. 95%). In patients presenting for emergency procedures with preoperative AF compared to those presenting with sinus rhythm the 6 months neurological outcome was significantly worse (modified Rankin Scale grade 0–3, 37% vs 54% [p < 0.05]), while the survival rate at 6 months follow-up was similar (74% vs 78% [p = 0.1]). Patients who developed postoperative AF presented 6-months follow-up neurological status similar to that of patients with sinus rhythm (modified Rankin Scale grade 0–3, 81% vs. 88.7% [p = 0.09]; 50% vs.54% [p = 0.06]) but significantly lower survival rate (85% vs. 95% [p < 0.05]; 48% vs.78% [p < 0.01]).

Conclusion(s): Preoperative AF is not an additional risk factor for poor neurological outcome or lower survival rate at 6 months for patients undergoing elective cerebral procedures. However for patients undergoing emergency procedures, preoperative AF is related to poorer neurological outcomes at 6 months follow-up. Patients who develop new-onset postoperative AF have a survival rate significantly lower when compared to age and disease matched patients.

7AP2-3

Early postoperative cognitive recovery and gas exchange patterns after balanced anesthesia with sevoflurane or desflurane in overweight and obese patients undergoing craniotomy: A prospective randomized double-blind trial

F. Pizzichetta, A. Doronzio, V. Cuzzone, G. Rosa, F. Bilotta

Department of Anesthesiology, Critical Care and Pain Medicine, University of Rome "Sapienza", Rome, Italy

Background and Goal of Study: Overweight and obese patients are at especially high risk for delayed awakening after general surgery. Whether this risk applies also to cerebral neurosurgical procedures remains unclear. This study evaluated early postoperative cognitive recovery and gas exchange patterns, after balanced anesthesia with sevoflurane or desflurane, in overweight and obese patients undergoing craniotomy for supratentorial expanding lesions.

Materials and Methods: Fifty-six patients were consecutively enrolled, and randomly assigned to one of two study groups to receive balanced anesthesia withsevoflurane or desflurane. Cognitive function was evaluated with the Short Orientation Memory Concentration Test (SOMCT) and the Rancho Los Amigos Scale (RLAS) and gas exchange patterns (pH, PaO_2 and $PaCO_2$) were recorded in all patients at 5 time-points: preoperatively and postoperatively, after patients reached an Aldrete score ≥ 9, at 15, 30, 45 and 60 min.

Results and Discussion: Preoperative cognitive status was similar in the 2 treatment groups. Early postoperative cognitive recovery was more delayed and SOMCT scores at 15 and 30 min postanesthesia were lower in patients receiving sevoflurane-based anesthesia than in those receiving desflurane-based anesthesia (21.5 ± 3.5 vs. 14.9 ± 3.5; P < 0.005 and 26.9 ± 0.7 vs. 21.5 ± 1.4; P < 0.005), and the postoperative RLAS grade VIII showed a similar trend (25/28 patients 89% vs. 8/28 patients 28%; P < 0.005 and 28/28 patients 100% vs. 13/28 patients 46%; P < 0.005). Similarly, gas-exchange analysis showed higher $PaCO_2$ at 15 and 30 min and lower pH up to 45 min postextubation in patients receiving sevoflurane-based anesthesia.

Conclusion(s): In overweight and obese patients undergoing craniotomy desflurane-based anesthesia allows earlier postoperative cognitive recovery and reversal to normocapnia and normal pH.

7AP2-4

Anaesthetic requirements and stress hormone responses in acute cord-injured patients undergoing surgery at the injured spine

K. Yoo, S. Chung, S. Kim, S. Jeong, C. Jeong

Anesthesiology and Pain Medicine, Chonnam National University Medical School, Gwangju, Korea

Background and Goal of Study: Neuraxial anaesthesia has been shown to produce a sedative and anaesthetic-sparing effect. The present study was aimed to determine the effects of acute spinal cord injury (SCI) on sevoflurane requirement and stress hormonal responses during the spinal surgery at the injured level.

Materials and Methods: Thirty-five patients with traumatic complete SCI undergoing spinal surgery at the injured level were studied. They were grouped into quadriplegics (above C7; $n = 20$) and paraplegics (below T1, $n = 15$) according to the level of injury. Patients ($n = 35$) with spine trauma without neurological impairment undergoing spinal surgery at the respective level served as control. Bispectral index score (BIS) was maintained at 40–50 throughout the surgery. Measurements included end-tidal sevoflurane concentrations, mean arterial pressure (MAP), heart rate (HR), and plasma concentrations of catecholamines and vasopressin (AVP).

Results and Discussion: During the surgery, MAP was significantly lower both in the quadriplegics and paraplegics ($P < 0.05$). HR did not significantly differ in the quadriplegics, but was higher in the paraplegics, compared with their control. However, end-tidal sevoflurane concentrations and BIS were comparable with the control both in the quadriplegics and paraplegics. Throughout the study, plasma AVP concentrations were not altered, although norepinephrine and epinephrine concentrations were lower in the quadriplegics. No stress hormones differed significantly between the groups having thoraco-lumbar surgeries.

Conclusion(s): SCI neither alters the anaesthetic requirement regardless the level of injury during the spinal surgery at the injured level, nor enhances AVP release. However, it blunts catecholamine responses in the quadriplegics.

7AP2-5

Are surgeons at risk for increased exposure to volatile sevoflurane during intracranial surgery compared with the anaesthetist?

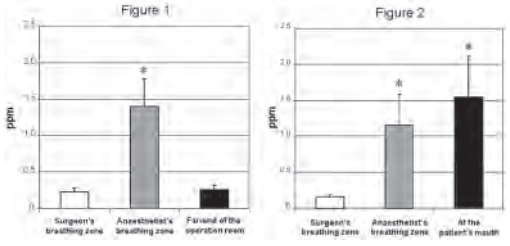
B. Tankó, C. Molnár, T. Büdi, C. Petö, B. Fülesdi

Department of Anesthesiology and Intensive Care, Health and Medical Science Centre, University of Debrecen, Debrecen, Hungary

Background and Goal of Study: Whether evaporation of volatile gases from the operational area poses an additional source of risk for the surgeon during the operation remains unknown. The brain has high blood perfusion, extensive capillary network, and high fat content, all facilitating rapid and marked tissue accumulation of a lipophylic gas. However, sevoflurane has a low blood: gas partial coefficient, which implies rapid evaporation from the blood when the circulation is open for exchange with air. The aim of the study was to investigate whether intracerebral surgery increases the relative exposure of the surgeon with reference to the aneasthetist.

Materials and Methods: The subjects were 51 men and women (mean age 51.5 years) undergoing craniotomy for removal of intracerebral tumors. In the first series (n = 35), sevoflurane release was monitored using portable gas detectors placed in the surgeon's breathing zone, the anaesthesist's breathing zone, and the far-end corner of the operation room. In a second series (n = 16), the third gas detector was placed in the proximity of the patients' mouth. Sevoflurane captured by the absorber was quantified by an independent chemist using gas-chromatography.

Results and Discussion: Absorbers in the surgeon's breathing zone captured significantly lower amount of sevoflurane compared with absorbers in the anaesthetist's breathing zone and was comparable with that in the far-end corner of the operation room (fig.1). The quantity of released sevoflurane did not show significant correlation with the size of the craniotomic window when corrected for the duration of the operation. In the second series, absorbers placed in the proximity of the patient's mouth captured the highest amount of sevoflurane followed by the anaesthetist's and the surgeon's absorber (fig. 2).



Conclusion(s): The close proximity of the breathing zone of the surgeon to the craniotomic window do not seem to be a source of enhanced exposure to sevoflurane. The more pronounced exposure of the anaesthetist can be ascribed to an apparent "escape" of the gas, driving factors of which need further exploration in future studies.

7AP2-6

Inflammation mediates postoperative cognitive dysfunction in mice after major surgery

N. Terrando, M. Cibelli, A. Rei Fidalgo, B. Foxwell, M. Maze

Department of Anaesthetics, Pain Medicine, and Intensive Care, Imperial College London, London, United Kingdom

Background and Goal of Study: Postoperative cognitive dysfunction (POCD) is a common complication amongst elderly patients who have undergone surgery (1). It is characterized by impairment in cognitive performance, especially memory and concentration (2). Recently, neuroinflammation has been correlated with cognitive decline (3–4). We sought to understand the role of cytokines and inflammation in POCD-associated behaviour after major surgery.

Materials and Methods: Adult (12 weeks) male mice were randomly assigned and treated as follows: Group C – untreated naïve animals; group A – general anaesthesia (GA) with isoflurane + buprenorphine for analgesia; groups S and M – tibia surgery under GA and analgesia, additionally M received minocycline. Separate cohorts of animals were assessed for plasma cytokines (ELISA), microglia activation (OX-42), and hippocampal-dependent cognition using trace fear conditioning (TFC). Animals were tested postoperatively at day 1, 3 and 7.

Results and Discussion: Up-regulation of systemic pro-inflammatory cytokines, including IL-1 beta and IL-6, was found at day 1 in group S compared to groups C and A ($p < 0.001$). In addition, reactive microglia staining (OX-42) was found in the hippocampus of group S compared to groups C, A, and M ($p < 0.05$) at day 1. Administration of minocycline (group M) reduced both systemic inflammation and microglia activation compared to group S ($p < 0.01$ and $p < 0.05$ respectively). TFC assessment revealed a reduction in freezing time in group S one day after surgery, which was attenuated by minocycline ($p < 0.05$). Exposure to GA only (group A) did not affect either inflammation or behaviour.

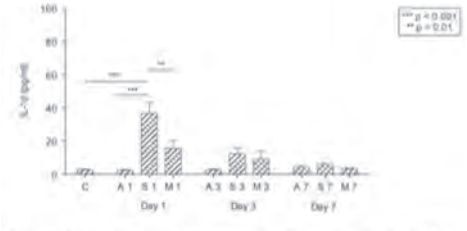


Figure 1. Plasma interleukin-1β (IL-1β) in C57BL/6 male mice at day 1, 3, and 7 post intervention.

Adult mice received anaesthesia (A) (2.1% isoflurane), surgery (S) (tibial fracture), surgery + minocycline (M) under 2.1% isoflurane or no intervention (naïve control (C)). IL-1β in plasma was measured by ELISA. Mean ± SEM (n = 6).

Conclusion(s): Cognitive dysfunction following major surgery is associated with an inflammatory response. Release of systemic cytokines and the presence of reactive microglia in the hippocampus correlate in a temporal fashion with the behavioural changes seen in our mouse model of POCD. These data suggest that inflammation is a putative factor in the development, and possible perpetuation, of cognitive dysfunctions.

References:

1 Moller J.T. et al. Lancet 1998;351:857–61.
2 Gao L. et al.Chest 2005; 128:3664–70.
3 Wan Y. et al.Anesthesiology 2007;106:436–43.
4 Rosczyk H.A. et al.Exp Gerontol 2008;43:840–46.

7AP2-8

The incidence and severity of metabolic acidosis related with topiramate: Preoperative evaluation

H. Türe, P. Imer, U. Ferdi, A. Bora, U. Türe

Department of Anesthesiology and Reanimation, Nephrology, Neurology and Neurosurgery, Yeditepe University School of Medicine, Istanbul, Turkey

Background and Goal of Study: Metabolic acidosis has been reported as an infrequent side effect following topiramate therapy. Since metabolic acidosis can be deepened during the surgery, careful preoperative assessment of the patients taking topiramate therapy is essential. With the expanding use of topiramate, anesthesiologists more frequently face patients under topiramate therapy. We planned a prospective study to determine the incidence and severity of the metabolic acidosis in patients using topiramate for seizure control, and being prepared for elective craniotomy.

Materials and Methods: Patients above 18 years old, and who were on topiramate therapy for seizure control, undergoing elective neurosurgical operations were enrolled in this study in a three-year period. Preoperatively signs of metabolic acidosis were questioned. Blood chemistry, hemoglobin levels were examined, urine and blood gas analyses were performed. The severity of metabolic acidosis was defined according to base excess (BE) levels; mild acidosis with a BE less than –5, moderate acidosis with a BE between –5 and –10, severe acidosis with a BE below –10. In patients with moderate or severe acidosis, topiramate therapy was discontinued, and anti-epileptic therapy was changed if required. The number of patients requiring a change in anti-epileptic therapy was recorded. Results were expressed as the mean ± standard deviation.

Results and Discussion: During the three years period, 36 patients were enrolled in the study. High respiratory rate was reported in 7 patients (20%) who had moderate acidosis. None of the patients had topiramate related other side effects. Blood evaluation results were within the normal range in all patients. Incidence of metabolic acidosis was 55% (n:20); 13 of the patients (35%) had mild, 7 of the patients (20%) had moderate metabolic acidosis (Table 1,2). Topiramate therapy was changed to another anti-epileptic drug in 7 patients. Metabolic acidosis resolved in a 2 to 4 days with discontinuation of topiramate therapy.

Conclusion(s): In patients receiving topiramate as a part of the antiepileptic regimen, preoperative evaluation should include signs of metabolic acidosis, and baseline laboratory tests should be obtained to determine the presence and severity of metabolic acidosis.

7AP2-9

Role of anemia on outcome after severe traumatic brain injury

G. Audibert, H. Doudoux, C. Latarche, P. Mertes

Service d'Anesthésie-Réanimation, Hôpital Central, Nancy, France

Background and Goal of Study: In critically ill patients, a restrictive red blood cell transfusion strategy is considered as safe as a liberal approach to transfusion. However, after severe traumatic brain injury (TBI), anemia may add a secondary brain damage. The aim of this study was to determine if anemia is a predictor of outcome after severe TBI.

Materials and Methods: We reviewed the charts of 176 patients admitted during a 30-month period after severe TBI. They were included if their initial GCS was < 8 and if they stayed in the ICU at least 3 days. Every day during the first 10 days, we recorded hemoglobin level and other secondary brain injuries. Anemia was defined as a mean value of hemoglobin <10g/dL. Neurologic outcome was assessed at ICU discharge and after 6 months using Glasgow Outcome Scale (GOS) dichotomized in bad outcome (GOS1-3) and good outcome (GOS 4-5).

Results and Discussion: Mortality at ICU discharge and after 6 months was 15.9 and 21.6% respectively. Anemia was observed in 89 (51%) patients of whom 76 (85%) were transfused. Anemia was not related to mortality (with anemia: 19.1% vs without 12.6%; p = 0.33), nor to length of mechanical ventilation (with anemia: 13.1 ± 10.3 d vs without: 13.7 ± 9.1 d; p = 0.69) nor to length of ICU stay (with anemia: 18 ± 11 d vs without: 16 ± 12 d; p = 0.35). Anemia was associated with a 6 month bad neurological outcome (GOS 1–3: 58% vs GOS 4–5: 32%; p = 0.002). In a multivariate analysis controlling for age, admission GCS and admission papillary reactivity, at 6months, anemia was an independent factor of bad outcome (absence of anemia: odds ratio 0.28; 95% confidence interval 0.10–0.80; p = 0.017).

Conclusion(s): This study confirmed that anemia is associated with bad neurological outcome 6 months after severe TBI. As blood transfusions may not improve outcome of these patients (McIntyre L, Neurocrit Care 2006) or may induce nosocomial infections (Kramer A, Crit Care Med, 2008), randomized trials that compare transfusion strategies are warranted.

7AP2-10

Postoperative analgesia in patients after craniotomy using transdermal therapeutic system (TTS) with fentanyl

A. Imaev, E. Dolmatova, A. Lubnin

Anaesthesiology, Burdenko Neurosurgery Institute, Moscow, Russian Federation

Background and Goal of Study: As many as 80% of patients report moderate to severe pain after craniotomy. In this study, we compared efficacy of transdermal therapeutic system (TTS) with fentanyl to scalp nerve block and analgesia requested by the patient to treat existing pain.

Materials and Methods: One hundred and eighty four patients, ages 16 to 70, were recruited. Exclusion criteria were the inability to understand Russian language, prior frontal lobe surgery, prolonged artificial ventilation or extended stay in an intensive care unit for any reason, epilepsy, history of drug abuse, mental disorders and prior minimally invasive surgery. Patients were randomly assigned to 3 groups: group 1 (n = 73) received lornoxicam (a Non-Steroidal Anti-Inflammatory Drug) on request; group 2 (n = 71) were subject to scalp nerve block with 20ml of ropivacain 0.75% and skin infiltration with 10 ml of ropivacain 0.75% prior to surgery; and group 3 (n = 40) had TTS providing 25mkg of fentanyl per hour commencing 24 hours prior to surgery, and 54 hours postoperatively. We measured visual analogue scale (VAS) scores, mean blood pressure (MBP) and heart rate (HR) at 6, 18, 30, 42 and 54 hrs after surgery and compared differences in these parameters among groups.

Results and Discussion: No significant differences in age, sex, weight, height and duration of surgery between groups were observed. Patients subject to scalp nerve block with ropivacain experienced less pain (mean ± SD: 2.86 ± 1.76) than patients who received lornoxicam on request (3.74 ± 2.33) (p < 0.05). Patients receiving TTS with fentanyl had significantly lower pain scores (1.94 ± 1.35) than patients in other groups (p < 0.05). There was a significant increase in pain scores at 18 and 30 hours postoperatively (3.07 ± 2.06 and 3.31 ± 1.88 respectively) compared to scores at 6 hours (2.86 ± 1.82) in patients subject to scalp nerve block (p < 0.05). There were no significant differences in MBP and HR among all groups before surgery. A significant increase in HR compared to preoperative values was observed at 6 hours after surgery (p < 0.05) with subsequent significant decrease by 54 hrs postoperatively in all groups (p < 0.05). No significant time-dependent changes or between group differences in MBP were observed.

Conclusion(s): Scalp nerve block provides better postoperative analgesia compared to lornoxicam on request after craniotomy. TTS with fentanyl is more effective for postoperative analgesia than scalp nerve block and lornoxicam on request in postcraniotomy patients.

7AP3-1

The influence of the timing of administration of propofol or ketamine on oxygen-glucose deprivation-reperfusion injury in rat mixed cortical cultures

S. Lee, B. Moon, J. Yoo, S. Min, J. Kim

Anesthesiology and Pain Medicine, Ajou University School of Medicine, Suwon, Gyunggi-Do, Republic of Korea

Background and Goal of Study: Propofol and ketamine have been known to have neuroprotective effects. Since, not all patients can receive the drugs before cerebral ischemia occurs, we investigated whether the timing of drug administration influence the neuroprotective effect on in vitro ischemia-reperfusion model in rat mixed cortical cultures

Materials and Methods: Animal care and all procedures were performed in accordance with a protocol approved by our institutional animal care committee. Thirteen–day–old primary mixed cortical cultures were exposed to a 5–min combined oxygen–glucose deprivation (OGD, in vitro ischemia model), followed by 2 hr reoxygenation (reperfusion). Propofol (1, 10, 25, 50, 100 μM) or ketamine (1, 2.5, 5, 10, 50 μM) were added from 1 hr prior to the OGD injury (pre-treatment group), the initiation of the OGD injury (co-treatment group) or the initiation of the reperfusion (post-treatment group) to the end of the reperfusion periods. The survived cells were counted using trypan–blue staining. The data were converted to cell death rate (CDR) and expressed as mean ± SD. Statistical analysis were done by One-way ANOVA test and Bonferroni test. P < 0.05 were considered as statistically significant.

Results and Discussion: Pre-treated 10–100 μM of propofol decreased the CDR compared to no drug treated group (69.93% vs 57.74%, 52.88%, 46.64% and 43.51%, P < 0.05). Co-treated 50 and 100 μM of propofol decreased the CDR compared to no drug treated group (72.52% vs 54.43% and 52.70%, P < 0.05). Post-treated propofol demonstrated no neuroprotective effects. Pre-treated 5–50 μM of ketamine decreased the CDR compared to no drug treated group (69.84% vs 48.22%, 43.27% and 39.86%, P < 0.05). Co-treated 5–50 μM of ketamine decreased the CDR compared to no drug treated group (71.03% vs 53.90%, 46.26% and 41.28%, P < 0.05). Post-treated 10 and 50 μM of ketamine decrese the CDR compared to no drug treated group (76.61% vs 59.94% and 55.01%, P < 0.05).

Conclusion(s): The administration timing of propofol or ketamine affect the neuroprotective effects on oxygen-glucose deprivation-reperfusion injury in rat mixed cortical cultures.

Reference:

1 Ammakawa K, Adachi N, Liu K, Ikemune K, Fujitani T, arai T.: Effects of pre- and post-ischemic administration of thiopental on transmitter amino acid release and histologic outcome in gerbils. Anesthesiology 1996; 85(6): 1422–30.

7AP3-2

Effect of propofol on neurogenesis in aged rat's dentate gyrus of hippocampus impaired by chronic cerebral ischemia

W. Mi, G. Chen, J. Cao, H. Wang

Department of Anaesthesiology, Chinese PLA General Hospital, Beijing, China

Background and Goal of Study: To investigate the effects of propofol on neurogenesis in the dentate gyrus of hippocampus in aged rats after chronic cerebral ischemia.

Materials and Methods: Aged SD rats were randomly allocated into 4 groups (n = 12 in each): control group (group C), chronic cerebral ischemis group (group I), low dose propofol group (group P1) and high dose propofol group (group P2). The chronic cerebral ischemis rat-model was obtained with two cerebral vessel occlusion in group I, group P1 and group P2. The rats in group C received only operation but no vessel was occluded. Following operation, the rats in group P1 and group P2 received intraperitoneally propofol at doses of 10 mg/kg and 50 mg/kg in 2.5 ml NS respectively twice per day for 7 days. Rats in othe two groups received only 2.5 ml NS intraperitoneally twice per day for 7 days. Twelve hours after last propofol or NS injection, BrdU at dose of 50 mg/kg was injected intraperitoneally in all rats twice per day for two and half days. Rats in each group were killed by cervical dislocation in the 10th day (n = 6 in each group) and the 40th days (n = 6 in each group) after operation. The brain slices of the dentate gyrus of hippocampus were made. The numbers of BrdU-labelled cells and BrdU/NSE immunofluorescense Double-labelled cells were counted.

Results and Discussion: In the 10th day, the numbers of BrdU-labelled cells in group I were more than those in group C ($P < 0.05$). The numbers of BrdU-labelled cells in group P1 were more than those in group I ($P < 0.05$), but those cells were less in group P2 than in group I ($P < 0.05$). In the 40th day, BrdU/NSE

immunofluorescense Double-labelled cells were found with similar numbers in each group.

Conclusion(s): The results suggested that chronic cerebral ischemia stimulates neurogenesis in the dentate gyrus of hippocampus in aged rats, and propofol at dose of 20 mg/kg per day can further promote neurogenesis in aged rat's dentate gyrus of hippocampus impaired by chronic cerebral ischemia. However, propofol at high dose (100 mg/kg per day) would suppress neurogenesis in aged rat's dentate gyrus of hippocampus provocated by cerebral ischemia. Otherwise, only a few neogenesis neurons can differentiate into mature neurons.

7AP3-3

Effects of erythropoietin on the intracellular calcium concentration of rat primary cortical neurons

N. Echigo, T. Andoh, Y. Kamiya, T. Goto

Anesthesiology and Critical Care Medicine, Yokohama City University Graduate School of Medicine, Yokohama, Japan

Background and Goal of Study: Erythropoietin (Epo) is a hypoxic responsive cytokine required for proliferation and differentiation of erythroid cells. It has been shown that Epo and its receptor (EpoR) are expressed in the nervous system and that Epo exerts anti-apoptotic action through activating a number of pro-survival signal cascades. There is increasing evidence that Epo protects neurons from glutamate and hypoxic damage and exerts strong neuroprotective actions in many experimental models for stroke, trauma, status epileptica. Although the cytosolic Ca concentration ($[Ca^{2+}]i$) is an important factor regulating cell survival, effects of Epo on $[Ca^{2+}]i$ of neurons are not fully elucidated. We studied effects of Epo on $[Ca^{2+}]i$ of cortical neurons in normal and excitotoxic conditions.

Materials and Methods: Rat primary cortical cultures were established and maintained in the serum free medium. Changes in $[Ca^{2+}]i$ in response to externally applied human recombinant Epo was measured with fura-2 microfluorometry. We recorded fluorescence intensity at 510 nm elicited by 340 and 380 nm and determined the fluorescence ratio. Measurements were done in two different solutions; one with 2 mM Mg for control and the other without Mg but supplemented with 10 μM glycine for sustained activation of N-methyl-D-asparate (NMDA) receptors.

Results and Discussion: In control, Epo application at the final concentration of 4 u/ml significantly increased the fluorescence ratio (before: 1.03 ± 0.16, after 12 min: 2.04 ± 0.69). Epo-induced increase in the fluorescence ratio was strongly diminished by omission of Ca^{2+} from the bath solution and abolished by cadmium. Mg-free condition resulted in the basal and periodic increases in the fluorescence ratio, which were sensitive to AP5, an NMDA receptor antagonist. Epo 4 u/ml significantly decreased the fluorescence ratio in this condition (before: 1.32 ± 0.13, after 12 min: 1.07 ± 0.1), and this effect of Epo was attenuated by the phosphoinositide 3-kinase (PI3K) inhibitors, LY 294002 and wortmannin, and by a Ca-dependent K channel blocker, iberiotoxin.

Conclusion(s): These results indicate that Epo increased $[Ca^{2+}]i$ in cortical neurons by inducing Ca entry in control condition but decreased $[Ca^{2+}]i$ in excitotoxic condition at least in part via PI3K-dependent activation of Ca-dependent K channels. The modest increase in $[Ca^{2+}]i$ may lead to activation of prosurvival signaling, and the inhibition of increases in $[Ca^{2+}]i$ due to NMDA receptor stimulation may afford protection from excitotoxicity.

Reference:

1 Nat Rev Neurosci 6: 484–494, 2005.

7AP3-4

Denervation increases junctional and extrajunctional expression of fetal acetylcholine receptors

C. Kramer, H. Fink, C. Frick, A. Kretschmer, M. Blobner

Klinik für Anaesthesiologie der Technischen Universität München, Klinikum rechts der Isar, München, Germany

Background and Goal of Study: Innervated skeletal muscle expresses acetylcholine receptors (AChRs) of the adult isoform restricted to the neuromuscular junction. Denervation increases expression of AChRs. Previous studies were limited to analysis of total expression of AChRs or subtype determination on the mRNA-level. Little is known about differential isoform up-regulation on a protein level in the junctional and extrajunctional areas. We, therefore, investigated the qualitative and quantitative expression patterns of AChR subtypes as well as histological changes in the diaphragm muscle after 8 days of denervation.

Materials and Methods: 20 male Sprague-Dawley rats were either unilaterally cervically phrenicotomized or sham-operated. After 8 days, animals were killed and both hemidiaphragms excised. Protein levels of adult and fetal AChR isoforms were determined by Western Blot (WB). Receptor isoform expression was localized by immunohistochemistry (IHC) using antibodies against the epsilon and gamma subunit. Fiber type composition and histomorphological changes were evaluated on ATPase and HE stains. Data were statistically analyzed by t-test ($p < 0.05$).

Results and Discussion: Compared to the sham-operation, fetal AChR in denervated hemidiaphragms were significantly up-regulated (WB: 144.6 ± 178.7 vs. 0.6 ± 0.8). This increase was not only seen at the junctional site (IHC-score: 3.0 ± 0.0), but also extrajunctionally throughout the muscle membrane (IHC score: 2.6 ± 0.5). Denervation for 8 days did not change expression of adult AChR (WB: 0.5 ± 0.5 vs. 1.1 ± 1.0; IHC-score junctional: 0.5 ± 0.5 vs. 0.4 ± 0.5, IHC-score extrajunctional: 0.0 ± 0.0 vs. 0.0 ± 0.0) and muscle fiber type composition. Fetal AChRs were evenly expressed on type1 and type2 muscle fibers. There was a significant increase of atrophic and necrotic fibers and proliferation of sarcolemmal nuclei following denervation.

Conclusion(s): Our model displayed the typical histomorphological signs of denervation. For the first time we could demonstrate that 8 days of denervation selectively up-regulates junctional and extrajunctional fetal AChRs without changing the expression of adult AChRs. In contrast to previous findings in human neuromuscular disorders, up-regulation in our model was irrespective of muscle fiber type.

7AP3-6

The nitroglycerine-induced nitric oxide release was enhanced by propofol in rats striatum – In vivo microdialysis study

Y. Adachi, K. Kimura, S. Mimuro, M. Doi, S. Sato

Intensive Care Unit of University Hospital, Hamamatsu University School of Medicine, Hamamatsu, Shizuoka, Japan

Background and Goal of Study: Previously, we demonstrated that propofol anesthesia decreased the extracellular concentration of nitric oxide (NO) products in the rat striatum using in vivo microdialysis study (1). In another experiment, we found that systemic administration of nitroglycerine, known as NO donor, increased the NO release in the brain. NO is known as an important neurotransumitter in the brain (2). In the current investigation, we studied the effect of propofol anesthesia on the extracellular concentration of NO products modulated by nitroglycerine in the rat striatum.

Materials and Methods: Male Sprangue-Dawley rats, weighing 280–320 g, were used. Microdialysis probe was inserted into the right striatum and perfused with modified Ringer solution after recovering from the surgery. Samples were collected every 15 min and directly injected into an online analytical HPLC system. $NO2^-$ and $NO3^-$ (NOx) were mixed with a Griess reagent to form a purple azo dye and the absorbance was measured by a flow-through spectrophotometer. The rats were freely moving before anesthesia. Propofol (30 and 100 mg/kg) and nitroglycerine (2 and 5 mg/kg) were administered intraperitoneally.

Results and Discussion: Propofol anesthesia decreased $NO3^-$ and NOx in a dose dependent manner. Systemic administration of nitroglycerine increased NOx in a dose dependent manner. Nitroglycerine-induced NO release was not changed at low dose (2 mg/kg) by propofol anesthesia, whereas, the large dose of nitroglycerine-induced NO release (5 mg/kg) was significantly enhanced by small dose of propofol (30 mg/kg) co-administration. The larger dose of propofol (100mg/kg) administration failed to increase the concentration of NO.

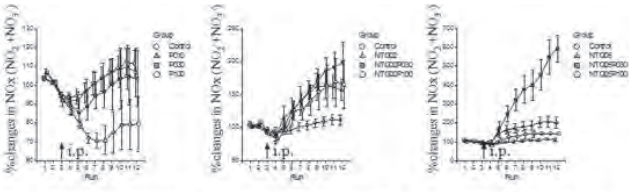


Figure. The effect of propofol and nitroglycerine on the extracellular concentration of NO products. P010, P030 and P100 : propofol 10 , 30 and 100 mg/kg i.p. NTG02 and NTG05 : nitroglycerine 2 and 5 mg/kg i.p. respectively. Data are expressed as mean ± SE.

Conclusion(s): The results of current investigation demonstrated that nitroglycerine increased NO release in the rat brain and the additional propofol anesthesia showed a biphasic effect on the nitroglycerine-induced NO release.

References:

1 Adachi YU et al. ESA2008 9AP6 (abstract)
2 Barbosa RM et al. Methods Enzymol 2008; 441: 351–67.

7AP3-7

The release of nitric oxide was enhanced by GABAergic inhibition and NMDAergic potentiation and the both effects were antagonized by propofol and sevoflurane anesthesia in rats striatum

Y. Adachi, K. Kimura, S. Mimuro, M. Doi, S. Sato

Intensive Care Unit of University Hospital, Hamamatsu University School of Medicine, Hamamatsu, Shizuoka, Japan

Background and Goal of Study: Previously, we demonstrated that propofol anesthesia decreased the extracellular concentration of nitric oxide (NO) products in the rat striatum using in vivo microdialysis study (1). Potentiation of GABAergic activity and inhibition of NMDAerigc modulation are one of the most typical effects of general anesthesia and NO is known as an important neurotransumitter in the brain (2). In the current investigation, we studied the effect of anesthesia on the extracellular concentration of NO products and the interaction between anesthesia and GABA and NMDA activity on NO release in the rat striatum.

Materials and Methods: Male SD rats were used. Microdialysis probe was inserted into the right striatum and perfused with modified Ringer solution. Samples were collected every 15 min and directly injected into an online analytical HPLC system. NO2 – and NO3 – (NOx) were mixed with a Griess reagent to form a purple azo dye and the absorbance was measured by a flow-through spectrophotometer. The rats were freely moving before anesthesia. Propofol was administered intraperitoneally and sevoflurane was inhaled 45 min. Bicuculline and NMDA were perfused through a dialysis probe.

Results and Discussion: Both anesthesia decreased NO3 – and NOx in a dose dependent manner. Perfusion with bicuculline 25 and 50 mM showed a significant increase of NOx. NMDA perfusion (100 and 1000 mM) also increased NO concentration. Bicuculline- and NMDA-induced NO release were antagonized by propofol and sevoflurane anesthesia.

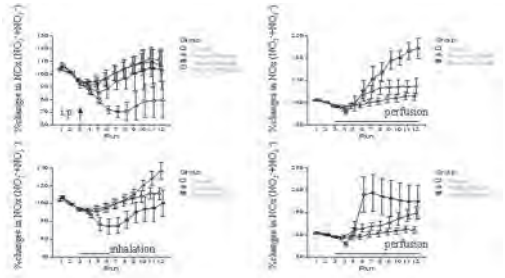


Figure 1. The effect of propofol, sevoflurane anesthesia, bicuculline, NMDA perfusion on the extracellular concentration of nitric oxide products. Data are expressed as mean ± SE.

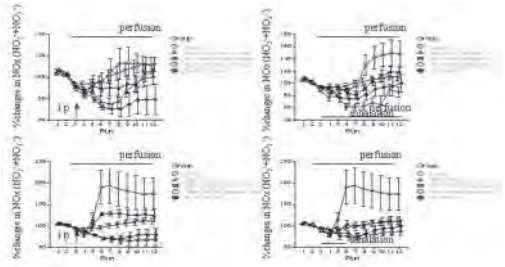


Figure 2. The interaction between propofol or sevoflurane anesthesia and bicuculline or NMDA perfusion on the extracellular concentration of nitric oxide products. Data are expressed as mean ± SE.

Conclusion(s): The results of current investigation demonstrated that both propofol and sevoflurane anesthesia might decrease NO release by the potentiation of GABAergic activity and the inhibition of NMDAergic pathway. In central nervous system, the NO regulation has a possibility to explain the anesthetic properties.

References:

1 Adachi YU. ESA2008 9AP6 (abstract).
2 Barbosa RM. Methods Enzymol 441: 351–67.

7AP4-1

Volatile induction/maintenance anesthesia with sevoflurane increases lumbar cerebrospinal fluid pressure and jugular venous oxygen saturation in patients undergoing craniotomy

R. Liao, J. Liu

Department of Anesthesiology, West China Hospital, Chengdu, Sichuan, China

Background and Goal of Study: Sevoflurane is a widely used volatile agent in neuroanesthesia, and the nonirritant property for respiratory track makes sevoflurane suitable for volatile induction/maintenance anesthesia (VIMA). The authors hypothesized VIMA would increase intracranial pressure and jugular bulb venous oxygen saturation ($SjvO_2$) compared with total intravenous anesthesia (TIVA) by remifentanil and propofol continous infusion in patients undergoing craniotomy.

Materials and Methods: 26 adult patients undergoing elective craniotomy for supratentorial expanding lesions were randomly allocated to either remifentanil-propofol group (Group TIVA) or sevoflurane group (Group VIMA). Mean arterial blood pressure (MAP), heart rate, lumbar cerebrospinal fluid pressure (LCSFP), cerebral perfusion pressure (CPP), $SjvO_2$, arteriojugular venous oxygen content difference ($A\text{-}JDO_2$), and cerebral oxygen extraction rate (COER) were compared in the two groups at different time points under Bispectral monitoring.

Results and Discussion: Heart rate was significantly lower in Group TIVA than Group VIMA (Figure 1A). MAP and CPP were significantly lower at 5, 15 min after intubation and 5 min after skin incision in Group TIVA than Group VIMA (Figure 1B, D). Lumbar CSF pressure increased in Group VIMA and decreased in Group TIVA from intubation to 5 min after incision (Figure 1C). $PjvO_2$ and $SjvO_2$ were significantly lower, and $A\text{-}JDO_2$ and COER were significantly higher with TIVA compared with VIMA (Figure 2).

Conclusion(s): Sevoflurane VIMA increases lumbar CSF pressure, cerebral perfusion pressure, $SjvO_2$ and decreases COER, which suggested that VIMA could be a better choice for patients with the risk of cerebral hypoperfusion or insufficient oxygen delivery.

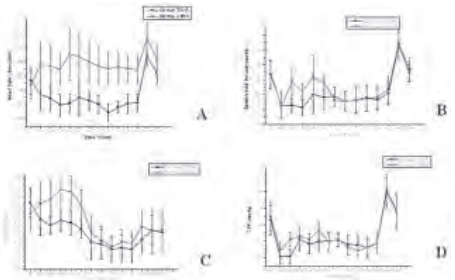


Figure 1. Changes of HR, MAP, LCSFP, and CPP at different time points

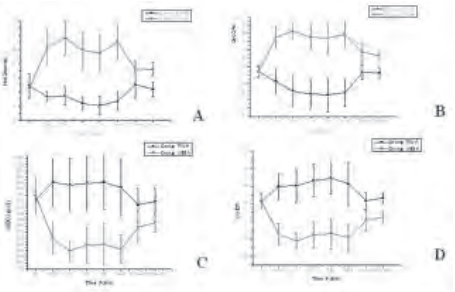


Figure 2. Changes of $PjvO_2$, $SjvO_2$, $AJDO_2$ and COER at different time points

7AP4-2

Combined ketamine and propofol total intravenous anesthesia does not increase lumbar cerebrospinal fluid pressure in patients undergoing craniotomy

R. Liao, J. Liu

Department of Anesthesia, West China Hospital, Chengdu, Sichuan, China

Background and Goal of Study: Ketamine has proved neuro-protective properties and it stimulates cardiovascular system to increase the heart rate and blood pressure. Some studies demonstrated that ketamine increased cerebral blood flow (CBF) and intracranial pressure (ICP), which led to a recommendation against patients undergoing neurosurgery. Propofol decreases cerebral oxygen consumption and ICP, but it decreases mean arterial pressure (MAP) and cardiac output to reduce the cerebral perfusion pressure (CPP). Theoritically, combination of ketamine and propofol could neutralize their adverse effects and get a better neuro-protection. The aim of this study is to analyses the feasibility of combination of ketamine and propofol, and to provide a new choice for neuro-surgery.

Materials and Methods: 20 patients with supratentorial tumor undergoing craniotomy were randomly allocated to either ketamine-propofol group (Group K) or remifentanil-propofol group (Group R). MAP, BIS value, lumbar cerebral-spinal fluid pressure (LCSFP) and cerebral perfusion pressure (CPP) was compared at different time points including base value (T0), 5 minutes after intubation (T1), 5 minutes, 1 hour and 2 hours after incision (T2, T3, T4), the end

of operation (T5), and 15 minutes and 30 minutes after operation (T6, T7). Data were analyzed statistically.

Results and Discussion: Difference of data at baseline (T0) had no statistical significance. 5 minutes after intubation, MAP and CPP in Group K were higher than those in Group R significantly ($p < 0.05$). LCSFP in Group K was higher than that in Group R ($p < 0.05$), and lower than that of baseline significantly ($p < 0.05$)from the time point of 5 minutes after incision to the end of operation, and higher than that in Group R ($p < 0.05$), but had no difference with that of baseline at the time points of 15 and 30 minutes after operation ($p > 0.05$). BIS value in Group K was lower than that in Group R significantly at 15 and 30 minutes after operation ($p < 0.05$).

Table 1. Comparison of MAP, BIS, LCSFP, and CPP at different time points

	Group	T0	T1	T2	T3	T4	T5	T6	T7
MAP (mmHg)	Group K	86±9	91±5	89±9	82±11	83±9	81±12	88±7	87±8
	Group R	85±11	78±8*	76±12*	79±8	81±11	79±8	86±9	87±12
BIS value	Group K	93±6	42±6	45±4	42±7	40±3	41±4	62±5	79±8
	Group R	92±9	41±7	41±5	41±7	42±5	40±8	88±7*	90±5*
LCSFP (mmHg)	Group K	11±2	10±3	8±2#	9±1#	8±2#	8±1#	11±2	10±2
	Group R	11±2	9±3#*	8±2#	7±1#*	6±2#*	7±2#*	9±2#*	9±3#*
CPP (mmHg)	Group K	69±9	77±5	78±6	71±8	69±9	68±5	78±7	75±6
	Group R	70±6	65±7*	66±5*	68±9	68±6	69±7	77±5	74±8

*p<0.05, compared with Group K #p<0.05, compared with T0

Conclusion(s): Combined ketamine-propofol TIVA does not increase LCSFP, and does not decrease MAP and CPP, but has longer recovery time than that of remifentanil-propofol. Remifentanil-propofol TIVA decreases LCSFP, MAP and CPP.

7AP4-3

Effect of xenon on central nervous system electrical activity at different stages of xenon anaesthesia

A. Rylova, O. Sasonova, A. Lubnin

Anaesthesiology, Burdenko Neurosurgery Institute, Moscow, Russian Federation

Background and Goal of Study: Xenon is a promising anaesthetic agent in neurosurgery. But there are few studies of its electrophysiological effects. The aim is to evaluate neurophysiological effects of xenon in neurosurgical patients.

Materials and Methods: After local ethical committee approval 20 xenon anaesthesias were carried with Taema Felix Dual machine (Taema, France) in patients with skull base tumors and no history of seizures and no paroxysmal activity on preoperative EEG. After standard induction and intubation with midazolam 2,5–5 mg, propofol 1–2 mg/kg, fentanyl 3–6 mkg/kg a 10-min denitrogenation was hold, then xenon delivery started. Till xenon accumulation anaesthesia was maintained with propofol and when BIS fell below 40 (BIS, Aspect Medical Systems, USA) propofol infusion was stopped and single-agent xenon anaesthesia was maintained. EEG was enregistered with 10–20% international scheme with Nihon Cohden electoencephalograph (Japan) and analysed with MBN software (Russia). EEG was analysed preoperatively (baseline study) and at different stages of xenon anaesthesia: 1) after denitrogenation, 2) at 50% xenon concentration, 3) at 65% xenon concentration, 4) at steady state xenon anaesthesia (40 min from intubation and 15 min from propofol infusion stop) and 5) finally, to provoke paroxysmal activity, after 3-minute hyperventilation.

Results and Discussion: In baseline study in all patients signs of irritation in fronto-medio-basal and diencephalic regions were enregistered according to tumor localisation. Intraoperaively, after denitrogenation there was a reduction of cortical activity and alpha-rythm reduction in occipital leads; increase in alpha-oscillations amplitude in frontal and central regions (synchronised bilateral bursts); increase in delta activity in occipital, frontal and central regions. Quantative analysis showed increase in alpha activity in frontal and central regions and decrease in occipital regions ($p < 0,005$); generalised increase in delta-rythm; increase in interhemispheric coherence in frontal and central regions ($p < 0,005$). Xenon inhalation (50% and 65% concentration) even with hyperventilation provoked no changes in EEG. No paroxysmal activity was enregistered.

Conclusion(s): Passing from propofol to xenon anaesthesia xenon doesn't induce any changes in EEG. The EEG during xenon anaesthesia with different xenon concentration (50% and 65%) and ventilation mode (normoventilation and hyperventilation) doesn't differ from the EEG seen with propofol anaesthesia. Xenon doesn't induce paroxysmal activity.

7AP4-4

Xenon increases intracranial pressure in neurosurgical patients without intracranial hypertension

A. Rylova, A. Lubnin

Anaesthesiology, Burdenko Neurosurgery Institute, Moscow, Russian Federation

Background and Goal of Study: Xenon has excellent properties but its use in neurosurgery has been limited because of controversial data on its effect upon intracranial pressure (ICP). The aim is to evaluate the effect of xenon on ICP and cerebrovascular reactivity during xenon anaesthesia.

Materials and Methods: After local ethical committee approval 20 anaesthesias were carried with TAEMA *Felix Dual* station (Taema, France) in patients with skull base tumors and no intracranial hypertension and no cerebrospinal fluid (CSF) flow obstruction. After induction and intubation with midazolam 2,5–5 mg, propofol 1–2 mg/kg and fentanyl 3–5 mkg/kg and a period of oxygen in air inhalation a 10-min denitrogenation was hold, then xenon delivery was started. Till xenon accumulation anaesthesia was maintained with propofol and when BIS (BIS, Aspect Medical Systems, USA) fell to 40 propofol infusion was stopped and single-agent xenon anaesthesia was maintained. After intubation a lumbar puncture was performed and a drainage was inserted. Each patient needed lumbar drainage for surgery. Transducer connected to the drainage, CSF pressure was transduced to the Philips CMS V24/V26 monitor (Philips, Holland); in the absence of CSF flow obstruction CSF pressure correlates with ICP. CSF pressure was measured 1) during propofol anaesthesia with 30% oxygen in air inhalation (baseline), 2) after denitrogenation, 3) at 65% of xenon (1 MAC anaesthesia), 4) at steady state xenon anaesthesia (40 min from intubation and 15 min from propofol infusion stop), and 5) after 10-min hyperventilation with a decrease in $etCO_2$ from 35 mm Hg to 25 mm Hg. Statystical analysys was done with SPSS 9.0 software with Wilcoxon Signed Ranks Test.

Results and Discussion: The baseline median of CSF pressure was 4,0 mm Hg, the same for denitrogenation. Xenon increased it to 5,0 mm Hg at 65% of xenon and 8,0 mm Hg at steady state. Hyperventilation decreased it to 5,50 mm Hg. Therefore, denitrogention has no impact on ICP. Reaching 1 MAC of xenon is accompanied with a 25% increase in ICP comparing to baseline ($p < 0,005$). During steady state there is a 60% increase in ICP comparing to 1 MAC anaesthesia ($p < 0,005$). Hyperventilation partly reverses increases in ICP.

Conclusion(s): Denitrogenation has no impact on ICP. Comparing to propofol xenon increases ICP. Maximal increase in ICP is observed during steady state anaesthesia, but the ICP values didnt exceed normal. Xenon preserves cerebrovascular reactivity, though hyperventilation doesnt return ICP to baseline.

7AP4-5

Effects of intraoperative hypocapnia on cerebral blood flow velocity during neurosurgical recovery

L. Velly, O. Darchen, P. Grillo, S. Cronly, N. Bruder

Service d'Anesthésie-Réanimation, CHU Timone Adultes, Marseille, France

Background and Goal of Study: Cerebral hyperemia has been demonstrated during emergence from anesthesia in neurosurgical patients, but its mechanism remains unclear.[1] This study was performed to test the hypothesis that this could be induced by returning intraoperative hypocapnia to normocapnia during recovery. Therefore, we examined the effect of moderate intraoperative hypocapnia on cerebral blood flow velocity during anesthesia and recovery.

Materials and Methods: After IRB approval, 28 neurosurgical patients with supratentorial brain tumors were included in a prospective, randomised study. Patients were maintened at moderate hypocapnia (Group H; $PaCO_2 = 29 \pm 2$ mm Hg; $n = 16$), or at normocapnia (Group N; $PaCO_2 = 38 \pm 4$ mm Hg; $n = 12$). Measurements included jugular venous oxygen saturation (SjO_2), transcranial Doppler mean velocity from cerebral middle artery (Vm_{MCA}), mean arterial blood pressure (MAP), and heart rate. Data were recorded after induction under normoventilation in both groups (Tbase), and then ventilation was adapted. The following measurements were performed in both groups during anesthesia (Tanesth), at extubation (Textub), 15 and 30 min after extubation (T_{15} and T_{30}). Oxygen transport (DO_2) and changes in estimated cerebral metabolic rate of oxygen consumption ($eCMRO_2$) were calculated for each time. Statistical analysis was performed using a two-way analysis of variance (ANOVA). Data were expressed as mean[SD].

Results and Discussion: Intraoperative moderate hypocapnia significantly reduced Vm_{MCA} (40 ± 11 *vs.* 58 ± 14 cm·s^{-1}; $P < 0.05$), SjO_2 (60 ± 8 *vs.* 74 ± 6%; $P < 0.05$), and DO_2 (655 ± 159 *vs.* 932 ± 244 ml.min^{-1}; $P < 0.05$) compared

with normocapnic patients. In Group H, mean $eCMRO_2$ was increased above baseline (+ 60 ± 45%) during hyperventilation. Moreover, a significant increase in intraoperative SjO_2 desaturation time (SjO_2 < 55%) was observed during moderate hypocapnia *vs.* normocapnia (110 ± 81 *vs.* 7 ± 14 min; $P < 0.05$). Finally, at recovery (extubation, and at T_{15}, T_{30}), a significant increase in Vm_{MCA} (+ 100% mean increase above baseline values) and SjO_2 was observed in both groups with no significant difference between groups (N *vs.* H; Vm_{MCA} = 79 ± 22 *vs.* 81 ± 21 cm·s^{-1}, SjO_2: 81 ± 8 *vs.* 82 ± 6%).

Conclusion(s): In patients with supratentorial brain tumors, moderate intraoperative hypocapnia doesn't seem to explain the hyperemic response observed during recovery. However, moderate hypocapnia dramatically increased duration of SjO_2 <55% suggesting that hyperventilation should be cautiously applied in neurosurgical patients.

Reference:

1 Bruder N, et al. Anesth Analg. 2002;94:650–4.

7AP4-6

The dose effects of remifentanil boluses on the hemodynamic response to skull pin insertion

A. Perks, D. Wong, R. Diddee, D. Wijayatilake, A. Prabhu

Anesthesia, Toronto Western Hospital, UHN, University of Toronto, Toronto, Ontario, Canada

Background and Goal of Study: Skull pin insertion is commonly required for neurosurgery. It is a highly stimulating maneuver, which may provoke significant rises in blood pressure, heart rate & intracranial pressure. This study aimed to validate the safety & effectiveness of using remifentanil as a bolus.(1)

Materials and Methods: After ethics board approval & informed consent, 66 patients were recruited. Three groups 20–40yrs (Y), 65–75yrs (O) & a second 65–75 yr hypertensive (H) group were randomized to 3 different doses of remifentanil (1, 1.25 & 1.50 µg/kg or 1.25, 1.50 & 1.75 µg/kg for 65–75 and 20–40 yr groups respectively). After a standardized general anesthetic a blinded dose of remifentanil was given 90 seconds prior to skull pinning. Serial mean arterial pressure (MAP) & heart rate (HR) readings were recorded. Statistical analysis was with repeated measures ANOVA. A 20% change in HR or MAP was considered significant.

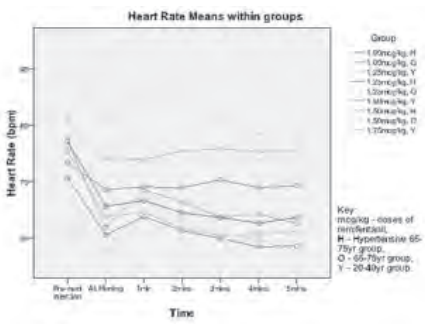
Results and Discussion: 24, 24 & 16 patients were recruited to the Y, H & O groups respectively. Baseline demographics between the groups were similar. There was no significant difference between the MAP & HR changes between remifentanil doses within each group. In the younger group the low dose was less effective at controlling HR. The two 65–75 yr groups had similar hemodynamic changes, but the hypertensive group was given more vasopressors post-induction of general anesthesia. Bradycardia <40bpm was seen in 2 patients and was not dose dependent.

Conclusion(s): Remifentanil is effective in reducing the hemodynamic response to skull pin fixation. Within the 1.00 to 1.50 µg/kg dose range for 65–75 yr olds & the 1.50–1.75 µg/kg range for 20–40 yr olds; no single dose is better than another.

Change in hemodynamics following skull pin insertion

	Change in MAP	Change in HR
20–40yrs	3.0 (16.4)	–4.8 (12.3)
65–75yr non-hypertensive	8.2 (14.7)	–3.5 (9.2)
65–75yr hypertensive	–5 (18.2)	–2.0 (11.0)

Values are given as mean (standard deviation). MAP = Mean Arterial Pressure, mm Hg. HR = Heart Rate, beats per minute.



Reference:

1 Egan TD et al. Remifentanil by bolus injection: a safety, pharmacokinetic, pharmacodynamic and age effect investigation in human volunteers. Br J Anaesth, 2004. 92(3): p.335–43.

7AP4-7

Xenon blocks hippocampal long-term potentiation in acute mice brain slices

S. Kratzer, R. Haseneder, E. Kochs, M. Eder, G. Rammes

Department of Anaesthesiology, Klinikum rechts der Isar der TU München, Munich, Bavaria, Germany

Background and Goal of Study: The molecular mechanisms of the gaseous anaesthetic Xenon (Xe) are not yet fully understood. NMDA receptors are playing a crucial role for the induction of long-term potentiation (LTP), a cellular correlate for learning and memory (1–3). Since Xe impairs NMDA receptor mediated synaptic transmission (4), we investigated whether Xe affects synaptic plasticity in the acute hippocampal brain slice preparation of mice.

Materials and Methods: Coronar slices of the hippocampus (350 µm thick) were obtained from male mice (Bl6, d21–30). In these slices, the Schaffer collateral-commissural pathway was stimulated electrically via two independent inputs. The resulting excitatory postsynaptic field potentials (fEPSP) were recorded from the CA 1 stratum radiatum. After 30 min of stable baseline recordings, LTP was induced with a high frequency stimulus (HFS; 100 Hz/1s) either in the absence or in the presence of Xe. LTP was quantified as magnification of the fEPSP slopes (20–80% of the fEPSP amplitude) after 20 min relative to the fEPSP slopes before HFS stimulation. Under control conditions, the slices were kept in artificial cerebro-spinal fluid (ACSF) gassed with 65% N_2/30% O_2/5% CO_2. For Xe application, the ACSF was gassed with 65% Xe/30% O_2/5% CO_2, resulting in final Xe concentration of 1.9 mM measured by gaschromatography.

Results and Discussion: In the absence of Xe, HFS induced an LTP of the fEPSP slopes of 130.8 ± 14.7% (n = 6). Application of 1.9 mM Xe reversibly diminished the fEPSP slopes to 79.2 ± 7.7% of control (n = 7). In the presence of Xe, delivering HFS produced only a short-term potentiation of the fEPSP slopes, which returned to baseline level after 15–20 min (relative fEPSP slopes of 92.1 ± 12.9%, which is not significant different to fEPSP slopes before HFS, $p > 0.05$, n = 5).

Conclusion(s): In the present study we could show that, in the hippocampus of mice, Xe reduces synaptic transmission and blocks LTP, a form of synaptic plasticity. This action might be a key mechanism for the amnestic properties of Xe, protecting patients from undesirable memories during surgery.

Reference:

1 Malenka RC & Bear MF Neuron 2004; 44:5–21.
2 Pastalkova E, Serrano P, Pinkhasova D et al. Science 2006; 313:1141–4.
3 Whitlock JR, Heynen AJ, Shuler MG et al. Science 2006; 313:1093–7.
4 Haseneder R, Kratzer S, Kochs E et al. Anesthesiology 2008; 109:998–1006.

7AP4-8

Xenon-induced reduction of AMPA receptor-mediated postsynaptic currents in the mouse amygdala is dependent on receptor deactivation

R. Haseneder, S. Kratzer, E. Kochs, M. Eder, G. Rammes

Department of Anaesthesiology, Klinikum rechts der Isar der TU München, Munich, Bavaria, Germany

Background and Goal of Study: Recently, it has been shown that the inhalational anaesthetic Xenon (Xe) reduces α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid (AMPA) receptor-mediated synaptic transmission in the brain slice preparation of the basolateral amygdala (1). Using heterologous expression systems, an interaction of Xe with AMPA receptor desensitization has been suggested (2). In the present study, by blocking receptor desensitization with cyclothiazide (Cyc), we intended to further elucidate the mechanisms of Xe-induced reduction of AMPA receptor-mediated excitatory postsynaptic currents (AMPA EPSCs). For these experiments, we used an acute mice brain slice preparation, which provides a considerable degree of pre- and postsynaptic functionality.

Materials and Methods: Coronar brain slices were obtained from male mice (Bl6; d 28–35). From neurones in the basolateral amygdala, pharmacologically isolated AMPA EPSCs were recorded using whole-cell patch clamp technique. Currents were evoked upon electrical stimulation of the external capsule. Under control conditions, the slices were kept in artificial cerebro-spinal fluid (ACSF) gassed with 65% N_2/30% O_2/5% CO_2. For Xe application, the ACSF was gassed with 65% Xe/30% O_2/5% CO_2.

Results and Discussion: Xe reduced AMPA EPSCs to 56.2 ± 4.9% of control responses (n = 6). Bath application of 100 µM Cyc increased amplitudes and prolonged decay time constants of AMPA EPSCs as previously reported (3). In the presence of Cyc, the Xe-induced reduction of AMPA EPSCs was significantly attenuated (71.4 ± 3.7% of control responses; $p < 0.05$, n = 5).

Conclusion(s): Blocking AMPA receptor desensitization and prolonging deactivation time reduces the antagonistic potency of Xe. There is strong evidence, that the decay of fast synaptic transmission is governed rather by deactivation

kinetics and not receptor desensitization (4). Cyc exerts its effect on AMPA receptor desensitization and deactivation presumably by increasing glutamate affinity (5). Thus, our data provides evidence, that the Xe induced reduction of AMPA EPSCs is – at least in part – due to a decrease in glutamate affinity.

References:

1 Haseneder R, Kratzer S, Kochs E et al. Anesthesiology 2008; 109:998–1006.
2 Plested AJ, Wildman SS, Lieb WR et al. Anesthesiology 2004; 100:347–58.
3 Rammes G, Swandulla D, Collingridge GL et al. Br J Pharmacol 1996; 117:1209–21.
4 Rammes G, Swandulla D, Spielmanns P et al. Neuropharmacology 1998; 37: 1299–320.
5 Fleck MW, Bahring R, Patneau DK et al. J Neurophysiol 1996; 75:2322–33.

7AP5-1

Decrease in lymphocyte count and leukocytosis occurring after SAH could be used as a predictor of later cerebral vasospasm

A. Hoxha, K. Pilika, M. Demneri, M. Saraci, G. Huti

Dept. Anaesth&Critical Care, Clinic of Neurosurg, University Hospital Centre "Mother Theresa", Tirana, Albania

Background and Goal of Study: Cerebral arteries vasospasm occurring after subarachnoid hemorrhage (SAH) remains the main factor contributing to morbidity and mortality. Identification of patients at an increased risk for cerebral vasospasm through more aggressive treatment may improve outcome. As far as today, the blood clot size on admission after SAH remains the major factor consistently demonstrated to increase the risk for cerebral vasospasm. It was reported that also leukocytosis may be an independent risk factor for the development of cerebral vasospasm (1). Therefore, we reviewed all the patient's laboratory exams of last year at the moment of admission for SAH.

Materials and Methods: 67 patientsts were included in the study admitted on the day 1.63 ± 0.96 after SAH due to aneurism showing WFNS score 2.13 ± 0.53. Clipping of aneurism was performed whenever any amelioration in neurological state was observed. 19 of them had on admission GCS ≤ 8 and 7 other pts developed neurological worsening (GCS below 8) during the first hours after bleeding, necessitating admission to the neuro ICU. Leukocyte and absolute lymphocyte count were considered on admission. T-paired test was used values of $p \leq 0.05$ are considered as statistically significant.

Results and Discussion: Overall mortality in this group of patients was 14.9% (10 patients). Symptomatic vasospasm occurred in 19 patients (28.6%). Neurologic damage due to vasospasm correlates WFNS grade 3 SAH on admission. Leukocytosis greater than 12.6 x 109/L and lymphocyte absolute count less than 1.37 x 109/L were independently associated with a 2.8 fold increase for leukocytosis ($p < 0.05$) and 3.78 fold for the decrease of lymphocyte count ($p < 0.01$) in the likelihood of developing cerebral vasospasm. At the same time although there is a difference in the predictive power between them we found it not significant ($p = 0.11$). We do not observe any correlation between admission leukocytosis and the presence of fever.

Conclusion(s): Leukocytosis was already reported as a predictor for the development of cerebral vasospasm. We observed that especially lymphocyte count on admission may have the greatest predictive power signaling for more aggressive and earlier treatment of cerebral vasospasm.

Reference:

1 McGirt et al., J of Neurosurgery 2003:98, p:1222–6.

7AP5-2

Cerebral oximetric response to increase in alveolar concentration of desflurane: Effect of remifentanil and end-tidal concentration of carbon dioxide

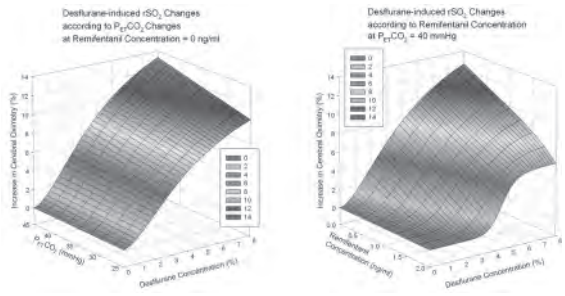
J. Lee, Y. Lee, Y. Lee, J. In, H. Cho

Anesthesiology and Pain Medicine, Ilsan Hopital, Dongguk University College of Medicine, Goyang-si, Gyeonggi-do, Korea

Background and Goal of Study: It is known that sympathetic stimulation and increase in cerebral blood flow can be induced by introduction of desflurane. Aim of this study is to elucidate that cerebral oxygen imbalance induced by desflurane can be reduced by combination with remifentanil.

Materials and Methods: Twenty ASA I and II subjects were allocated randomly into 5 groups by remifentanil target concentration (0, 0.5, 1.0, 1.5, 2.0 ng/ml). After effect site concentration of remifentanil attain as arranged concentration, propofol and vecuronium were administered and mechanical ventilation was done with 8% desflurane by facial mask ventilation technique. Subsequently cerebral oximetries (rSO_2), continuous mean arterial pressure, heart rate, cardiac index, concentration of desflurane (PET_{desf}), ET_{CO2} were recorded for the following 10 minutes. According to concentration of desflurane and remifentanil, rSO_2 and hemodynamic factors were analyzed.

Results and Discussion: PET_{desf} is useful variable to predicted increase in rSO_2, and rSO_2 showed S-shape increasing pattern. PET_{CO2} and concentration of remifentanil decreased maximal increase of rSO_2 ($P < 0.0001$, $P < 0.0001$) and slope of curve was influenced by concentration of remifentanil ($P = 0.0292$).



Conclusion(s): With desflurane induction, rSO_2 increases maximum 18%. and Hyperventilation and use of remifentanil can reduce the increase of rSO_2.

7AP5-3

A strategy for reducing blood transfusion cross-matching requirements in cerebral aneurysm surgery: Steps towards using only type and screen ordering schedule

S. Mikulandra, J. Deutsch, B. Golubic Cepulic, N. Paklar

Dpt. Of Anesthesiology and Critical Care, Division of Neuroanesthesia and NICU, University Hospital Center Zagreb, Zagreb, Croatia

Background and Goal of Study: The maximum surgical blood order schedule (MSBOS) is a viable option for reducing unnecessary expensive crossmatching and achieving significant cost savings in the blood bank. Almost all of the recommendations for MSBOS for cerebral aneurysm surgery advise 2–6 units of crossmatched blood, and very rare ABO-Rh type and screen.[1]The study was undertaken to review transfusion practices for cerebral aneurysm surgery during two periods at our institution, and propose recommendations for the blood ordering schedule.

Materials and Methods: A retrospective chart review of 106 patients operated on between January 2001 and May 2003 (group G1), as well as 108 patients operated on between September 2006 and August 2008 (group G2) was performed. All patients underwent supraorbital "keyhole" cerebral aneurysm surgery. We analysed blood transfusion index (TI), transfusion probability (TP), MSBOS and cross-match to transfusion ratio (C/T) in both groups.

Results and Discussion: TI was 0,2 in G1 and 0,1 in G2. Transfusion probability was very low in both groups as well as MSBOS (G1 TP 0,15 and MSBOS 0,3, G2 TP 0,06 and MSBOS 0,1). C/T was well above recommended limit of 2 (G1 12,3 and G2 20,5). All values were considered of significant blood usage. In G1 there were 102 (97%) patients with cross-matched blood and 4 (3%) patients with type and screen. According to very low MSBOS in G1, we recommended to reduce the routine practice to perform cross-matching for nearly all of the blood and step towards type and screen ordering schedule. As a consequence, there was a 41% drop in the number of units of blood crossmatched in G2, and 47 patient (44%) in the same group were typed and screened. Analysis revealed a high level of unnecessary cross-matched blood that had not been used in both groups (92 and 95%, respectively). No type nad screen blood was used in any patients in G2. Overall, 16 (15%) patients in G1 and 4 (4%) patients in G2 required crossmatched blood transfusions.

Conclusion(s): There is substantial evidence that at our institution cross-matching of blood, which has been ordered excessively, is unnecessary in cerebral aneurysm surgery. We recommend that routine cross-match ordering can be safely substituted by only type and antibody screened blood.

7AP5-4

Preliminary experience with the use of statins in the treatment of vasospasm after spontaneous subarachnoid hemorrhage

H. Mangoyan, R. Hakobyan, G. Harutyunyan

Anesthesiology and Intensive Care, Yerevan State Medical University, Erebouni Medical Center, Yerevan, Armenia

Background and Goal of Study: Aneurysmal subarachnoid hemorrhage (aSAH) remains a therapeutic challenge due to unacceptably high levels of mortality and morbidity. For survivors of the initial insult, cerebral vasospasm and related delayed ischemic deficits are the major determinants of final outcomes.

Statins may be an alternative for conventional treatments of vasospasm due to their beneficial pleiotropic effects on cerebral vasomotor reactivity. The goal of our study was to examine the hypothesis that acute atorvastatin therapy could reduce the severity of vasospasm in ICU patients after spontaneous aSAH.
Materials and Methods: After institutional approval 52 adult patients (27–65 years of age) with aSAH were randomly allocated to receive either atorvastatin 40 mg/day for 14 days (n = 28) or nimodipine 0.05mg/kg/hr i/v (n = 24) within first 72 h. after the incident. Groups were identical in demographics, severity of aSAH according to World Federation of Neurosurgeons Scale, and radiological evidence by Fisher grade. Exclusion criteria were contraindications to statins, traumatic SAH, pregnancy. Cerebral vasospasm was assessed by repeated transcranial Doppler (CBS-USB Module, Edan Instruments, Inc) performed by a single user. Systolic (Vs), diastolic (Vd), mean (Vm) flow velocities (FV), pulsatility index (Pi) and Lindegaard ratio (LR) in both middle cerebral arteries were measured (50 to 56 mm depth) before treatment (basal FV), on 7-th day after admission (intermediate FV) and on 14-th day (final FV). Repeated measurements were analysed by Friedman's chi squre with subsequent Wilcoxon sign test. Between groups variables were analysed using Mann-Whitney U test. All p values were two sided. All parameters are presented as median (interquartile range).
Results and Discussion: Groups did not differ significantly by basal FV: Vs in atorvastatin group–1.63 (43.90) vs. Vs in nimodipine group–1.74 (65.68) ($p = 0.425$). Basal measurements of Vm, Vd, Pi and LR were not also significantly different between groups. There was significant decrease in repeated measurements of all monitored parameters in both groups ($p < 0.05$) except for Pi ($p > 0.05$). There was also significant between group differences in final parameters: Vs in atorvastatin group 1.20 (40) vs. 1.57 (43) in nimodipine group ($p = 0.003$), LR in atorvastatin group 2.20 (1.55) vs. 3.35 (1.48) in nimodipine group ($p = 0.004$).
Conclusion(s): Acute treatment with atorvastatin after aSAH was as effective as nimodipine in management of cerebral vasospasm.

7AP5-5

Regional cerebral oxygen saturation can detect unexpected brain perfusion disturbances during neuroendoscopic pituitary surgery. A pilot study

V. Ricard, C. Enrique, T. Javier, E. Joaquim, F. Neus

Anesthesiology, Hospital Clínic de Barcelona, Barcelona, Spain

Background and Goal of Study: Pituitary surgery needs to be mostly performed under controlled hypotension. Monitoring of brain perfusion during these procedures can provide information about the lowest safe mean arterial pressure. Regional saturation of oxygen (rSO_2) monitoring using NIRS (near-infrared spectroscopy) has not been previously reported during pituitary tumour resection. rSO_2 has been useful in neuroangioradiology (1) and carotid surgery (2).
Materials and Methods: Ten patients submitted to neuroendoscopic excision of hypophyseal tumours were bilaterally monitored with NIRS (INVOS 4100; Somanetics). Procedures were done under total intravenous anaesthesia (TCI), mechanical ventilation was set up to achieve PCO_2 values of 35 mm Hg, and standard monitoring (invasive BP, HR, SaO_2, BIS, TOF, Temperature) was conducted in all patients. Trend values of rSO_2 were bilaterally recorded during all the procedures. No controlled hypotension lower than a mean arterial blood pressure of 60 mm Hg was used in any case.
Results and Discussion: Two patients out of ten developed a unilateral sudden and sharp decrease on SrO_2 (from 72% to 45% and from 61% to 31%, respectively) no related to other factors than surgical manipulation of the homolateral carotid artery at the end of the resection period. No changes in blood pressure or heart rate were simultaneously detected during these episodes. In each case, a bilateral hyperaemic response started approximately twenty minutes after the lowest unilateral rSO_2 achieved value. These hyperaemic responses were greater in the homolateral side of the manipulated carotid artery. No patient developed any complication and did not present any clinical repercussion at the end of surgery. A third patient had a severe bradycardia during the surgical procedure and, immediately after the arrhythmia, rSO_2 value of the homolateral manipulated carotid artery underwent a sharp increase from 75% to 98%. This high unilateral rSO2 was maintained for 20 minutes before it returned to previous values. The other seven studied patients had not significative changes on rSO2 during the surgery.
Conclusion(s): Cerebral regional saturation of oxygen can be useful in detecting perfusion pressure disturbances during neuroendoscopic pituitary surgery. In this pilot study, we have observed important unilateral changes, reaching ischemic level values, that would be unidentified without rSO_2 specific monitoring.
References:
1 Bhatia R, et al. J Neurosurg Anesthesiol. 2007;19(2):97–104.
2 Moritz S et al. Anesthesiology. 2007; 107(4):563–9.

7AP5-6

Monitoring of absolute cerebral oxygen saturation (Fore-Sight Technology) during craniotomy for acute intracerebral bleeding

D. Dylst, C. De Deyne, F. Weyns, F. Jans, R. Heylen

Department of Anaesthesia & Neurosurgery, Ziekenhuis Oost-Limburg, Genk, Belgium

Background and Goal of Study: Cerebral oximetry, based on NIRS, measures regional cerebral tissue oxygen saturation ($SctO_2$) non-invasively at the microvascular level. The FORE-SIGHT absolute cerebral oximeter, a recently introduced monitoring device, uses 4 precise wavelengths to determine absolute $SctO_2$. In the present study, we wanted to report on the changes in absolute SctO2 occurring during craniotomy for acute intracerebral hematoma.
Materials and Methods: Thirteen pts suffering from acute intracerebral bleeding necessitating urgent craniotomy were included. All pts presented with reduced consciousness (GCS < 8) and with signs of increased intracranial pressure (CT imaging). Pts received systemic stabilization (intubation, ventilation, hemodynamic support) and were transferred as soon as possible from the emergency department into the operating theatre (OR). As soon as pt arrived in the OR, bilateral SctO2 monitoring was started (sensors applied bilaterally over patient's forehead).
Results and Discussion: Pts arrived in the OR after a mean of 1.3hrs after hospital admission. Five pts suffered from acute intracerebral bleeding, while 4 pts presented with acute subdural hematoma and 4 pts presented with acute epidural hematoma. In 2 of 13 pts, excessive ambient light interfered with SctO2 monitoring and no SctO2 data could be obtained. In the other 11 pts, SctO2, ipsilateral to the intracerebral bleeding, was significantly lower than contralateral SctO2. In 2 pts, ipsilateral SctO2 values below 55% were observed. One of these pts suffered from epidural hematoma, the other pt presented with a subdural hematoma. Bone removal resulted in a significant increase in ipsilateral SctO2 in 2 pts. Opening of the dura resulted in a significant increase in ipsilateral SctO2 in 7 pts, while in 2 pts (with intracerebral bleeding) a significant increase in ipsilateral SctO2 occurred after effective removal of the bleeding. In no pts, any significant change in contralateral SctO2 was observed during the whole procedure. In all pts, ipsilateral SctO2 increased further during procedure and ipsilateral SctO2 values were higher than 80% in all pts at postoperative transfer to the ICU department.
Conclusion(s): Non-invasive monitoring of absolute cerebral oxygen saturation at the microvascular level might offer new opportunities for the management of pts suffering from acute intracerebral bleeding. Information obtained during urgent craniotomy might guide further neuro-critical care management.

7AP5-7

Minimal invasive supra-orbital incision for cerebral aneurysm clipping: Influence on intra- and post-operative course

V. De Sloovere, C. De Deyne, J. Wuyts, F. Jans, R. Heylen

Department of Anaesthesia & Neurosurgery, Ziekenhuis Oost-Limburg, Genk, Belgium

Background and Goal of Study: Supra-orbital incision offers a minimal invasive surgical approach for cerebral aneurysm surgery and clipping. Since 2004, we introduced this technique for all pts presenting for elective cerebral aneurysm surgery. In this paper, we want to present a retrospective analysis of this 5-years experience.
Materials and Methods: Over this 5-years period, 98 pts scheduled for elective cerebral aneurysm surgery underwent craniotomy by supra-orbital incision performed by the same neurosurgeon. In 65 pts, the aneurysm was located on the medial cerebral artery, in 11 pts it was located on the internal carotid artery, whereas in the other 22 pts the anterior communicans artery was involved. 9 pts presented with multiple aneurysms, in 7 pts multiple aneurysms were clipped in one surgical procedure.
Results and Discussion: In 95 of 98 pts, the cerebral aneurysm was successfully clipped and peri-operative course was uneventfull. In 2 pts, it seemed impossible to clip the aneurysm due to anatomical characteristics. One pt was ultimately treated by endovascular approach, in the other pt a second surgical approach (again by supra-orbital incision) did result in successfull clipping of the aneurysm thanks to the use of a differently positioned temporary clip. In 1 pt, intra-operative bleeding occurred during surgical manipulation of the aneurysm, with ensuing brain bulging and a large craniotomy had to be performed. We noted a significantly shorter mean surgical procedure time compared to standard procedure times for cerebral aneurysm clipping before 2004 (m195min vs m329min). Related to this reduced surgical time, we observed a significantly shorter time to awakening (m135min vs m285min after ICU admission). 92 of 98 pts were discharged from ICU within 24hrs of admission,

and 32 pts were even discharged within the first 12hrs of ICU admission. Mean hospital stay was 6 days, with 5 pts leaving the hospital within 3 days after surgical intervention. Mean hospital stay for elective cerebral aneurysm surgery performed before 2004 was 9.8 days, with no pt leaving hospital within 3 days of surgery.
Conclusion(s): In conclusion, our data confirm all advantages of minimal invasive neurosurgical approach for cerebral aneurysm clipping. This less invasive approach guarantees as well optimal surgical conditions as significantly shortened procedure time and ICU–hospital stay.

7AP5-8

Monitoring of brain oxygenation during complex cerebral aneurysm surgery by absolute cerebral oxygen saturation (Fore-Sight technology)

I. Bertrand, C. De Deyne, J. Wuyts, F. Jans, R. Heylen

Department of Anaesthesia & Neurosurgery, Ziekenhuis Oost-Limburg, Genk, Belgium

Background and Goal of Study: Complex cerebral aneurysm surgery carries a high risk for intra-operative ischemic insults, especially if multiple periods of temporary clipping seem necessary to allow final aneurysm clipping. Optimal intra-operative cerebral protection remains an open and controversial question. The use of non-invasive neuromonitoring, applied during aneurysm surgery, could guide an optimal (and maximal) intra-operative neuroprotective strategy.
Materials and Methods: In 12 pts, scheduled for elective complex cerebral aneurysm surgery by supra-orbital incision, non-invasive cerebral oximetry was applied over the patient's forehead. The Fore-Sight monitor is a newly available, continuous wave, spatially resolved, near-infrared spectrometer that measures absolute cerebral tissue oxygen saturation (SctO2%). Validation studies proved a stable correlation between SctO2 and jugular bulb saturation (SjO2) with SctO2 10% higher than SjO2. As it is accepted that SjO2 has a normal safe limit of 45%, the absolute Fore-Sight SctO2 threshold is estimated to be approximately 55%.
Results and Discussion: In 3 of 12 pts, excessive ambient light interfered with SctO2 monitoring and no SctO2 data could be obtained. In 7 of 9 remaining pts, multiple periods of temporary clipping were applied. Before temporary clipping, barbiturates were administered in order to obtain a Burst Suppression Ratio of 20 to 40%. In all pts, a small, nonsignificant decrease in ipsilateral SctO2 was observed during temporary clipping, without any SctO2 value below 55%. After release of the temporary clip, an immediate, shortlasting (3–5min) and significant increase in ipsilateral SctO2 was observed in 3 pts. In one of these 3 pts, all 4 periods of temporary clipping resulted in the same phenomenon. After release of the temporary clip, ipsilateral SctO2 increased by a mean of 8.4% (range 7–11%) with return to baseline after a mean of 4min. These observations could point to a local hyperperfusion occurring after the release of the temporary clip and could indicate the presence of a time window not suitable for re-application of a temporary clip.
Conclusion(s): This first report reveals the feasibility of intra-operative non-invasive cerebral oxygenation monitoring, using absolute SctO2 monitoring, during complex cerebral aneurysm surgery. The surgical approach by minimal invasive supra-orbital incision plays a major role in enabling this forehead non-invasive monitoring technique. However, further studies will have to reveal the clinical implications of this new information.

Local and Regional Anaesthesia

8AP1-1

Comparison of the effects of preoperative bolus injection versus continuous infusion of epidural ropivacaine in laparoscopic colectomy. Preliminary results

M. Papadopoulou, P. Mavridou, K. Panteleou, K. Daflou, A. Manataki

Department of Anesthesiology, Hatzikosta General Hospital, Ioannina, Greece

Background and Goal of Study: It is known that sympathetic proganglionic fibres from level T_5 to L_1 impede gut activity, and that epidural blockade to the midthoracic levels eliminates this inhibition, yielding a conveniently contracted small intestine. The goal of our study was to assess the effect of bolus epidural injection versus continuous epidural infusion of ropivacaine preoperatively in scheduled laparoscopic colectomy.
Materials and Methods: 60 patients (26 women, 34 men ASA I–III), scheduled for laparoscopic colectomy, were randomized into three groups of 20 patients each. An epidural catheter was inserted at the $T_{12} – L_1$ space in all groups. • ***Group A***: the epidural catheter was inserted *the day before surgery* and a continuous infusion of 0.2% ropivacaine was started at a rate of 5 ml/h for 12 ± 2 hours before surgery. • ***Group B***: the epidural catheter was placed 2 hours *before surgery* and a bolus 15 ml of ropivacaine 7,5 mg/ml was injected into the epidural space. •• ***Group C***: No preoperative infusion was administered. The epidural catheters were also used for postoperative analgesia. General anesthesia was induced with propofol, remifentanil, rocuronium. Intraabdominal pressure in all groups was 12 mm Hg. Quality of surgical conditions, duration of pneumoperitoneum and intraoperative complications were recorded. *Unpaired t-test and x^2 analysis was used ($p < 0.05$* considered statistically significant).
Results and Discussion: Patients had similar demographic data. Preoperative epidural ropivacaine yielded a small and contracted intestine in groups A and B versus a non-contracted and large in volume intestine in group C. This fact created optimal surgical conditions in group A and B that led to better control of laparoscopic instruments with statistically significant reduction of surgical time and reduction of the duration of pneumoperitoneum ($p < 0.05$). No remarkable intraoperative complications occurred. Only 1 patient from group B developed intraoperative hypotension which was treated successfully with ettilefrine iv
Conclusion(s): Both preoperative epidural continuous infusion and bolus epidural injection of ropivacaine, proved to be valuable in laparoscopic colectomy, as it enhanced the quality of surgical conditions, reduced the duration of pneumoperitoneum and minimized its adverse pathophysiological effects during anesthesia, without complications regarding patients. Even though both A and B regimens were efficient we suggest the use of bolus injection due to lesser patient's discomfort.

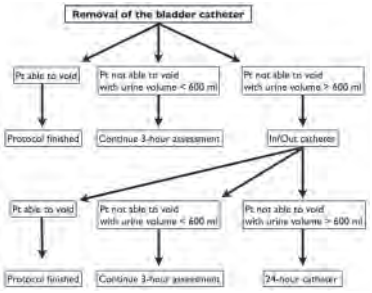
8AP1-2

Removing the bladder catheter the morning after surgery in surgical patients receiving epidural analgesia leads to less urinary tract infection

C. Zaouter, P. Kaneva, F. Carli

Department of Anesthesia, Montreal University Health Centre, Montreal, Quebec, Canada

Background and Goal of Study: It is common practice to catheterize the bladder in presence of epidural analgesia and leave the bladder catheter in situ in order to avoid postoperative urinary retention (POUR)(1). However, bladder catheterization carries the risk of urinary tract infection (UTI))(2). The present study was set up to assess the incidence of UTI if bladder catheterization was discontinued the morning after surgery with the epidural still functioning.
Materials and Methods: Patients at low risk for POUR, scheduled for thoracic and abdominal surgery and receiving continuous thoracic epidural analgesia were randomized the morning after surgery to two groups: in the Early Removal Group (ERG) (n = 105) the bladder catheter was removed the same morning after surgery, while in the Standard Group (SG) (n = 110) the bladder catheter was removed when epidural analgesia was discontinued (3–5 days). Urinary bladder volume was assessed by ultrasound every 3h from removal of the bladder catheter. Primary and secondary outcomes were the incidence of urinary tract infection (UTI) and rate of re-catheterization.



Results and Discussion: 215 patients were randomized. There were 17 UTI in total, with 15 (14%) in the SG and 2 (2%) in the ERG ($p = 0.004$). There was no difference in the incidence of in/out catheterizations between the two groups ($p = 0.09$). When matched for the types of surgery the hospital length of stay was longer in the patients who contracted UTI ($p = 0.0001$).

Outcome data

	Early Removal Group (n = 105)	Standard Group (n = 110)	p value	NNT
Patients who contract urinary tract infection (n)	2	15		
Patients who did not contract urinary tract infection (n)	103	95	0.004	
Risk calculate correctly (%)	2	15	13	8.5

NNT = Number needed to treat

Conclusion(s): Leaving the bladder catheter as long as the epidural analgesia is functioning results in higher incidence of UTI and prolonged hospital stay.

References:

1 Warren JW. Catheter-associated urinary tract infections. Int J Antimicrob Agents 2001; 17:299–303.

2 Stamm WE. Catheter-associated urinary tract infections: epidemiology, pathogenesis, and prevention. Am J Med 1991;91:65S–71S.

8AP1-3

Levosimendan for treatment of severe bupivacaine-induced cardiotoxicity in anaesthetized pigs

P. Rosenberg, J. Aittomäki, S. Liuhanen, M. Sallisalmi, M. Salmenperä

Department of Anaesthesiology and Intensive Care Medicine, Helsinki University Hospital, Helsinki, Finland

Background and Goal of Study: None of previously studied inotropic drugs is specifically recommended for the treatment of local anaesthetic-induced cardiotoxicity. The inodilator, levosimendan was shown to reverse ropivacaine-induced negative inotropy in isolated heart preparations (1). We investigated whether levosimendan reverses bupivacaine-induced cardiodepression in anaesthetized pigs.

Materials and Methods: The randomized and double-blind study comprised 20 pigs anaesthetized with isoflurane. Monitoring: ECG, mean arterial blood pressure (MAP), heart rate (HR), cardiac output (CO), ejection fraction (EF). Bupivacaine 2 mg/kg/min was infused into a central vein until MAP dropped to 55% of baseline. Thereafter a levosimendan bolus, 80 µg/kg or placebo was infused into the same vein in 10 min, followed by a 50-min infusion of levosimendan 0.7 µg/kg/min or a corresponding volume of placebo. Ringer's solution was simultaneously infused i.v. 20 ml/kg in 10 min, followed by 20 ml/kg in 50 min. Comparisons of the *combined group* x *time effect* between the two groups were performed using ANOVA for repeated measures.

Results and Discussion: Two pigs in each group had cardiac arrest after bupivacaine, and could not be resuscitated. The remaining 16 pigs recovered, including three who needed adrenaline and cardiac compression. In the levosimendan group, HR, CO and EF rose more ($p < 0.05$) compared to the placebo group. HR and CO stayed significantly higher ($p < 0.05$) and MAP and SVR lower ($p < 0.05$) during the 50-min levosimendan infusion supplemented with infusion of Ringer's solution. Also in the placebo group, which received similar vascular filling with Ringer's solution, the recovery was relatively quick and, eventually, all parameters reached baseline. Occasional extrasystolic beats, AV-conduction block, and tachycardia (in pigs who had received adrenaline) occurred during the therapeutic phase in both groups. Due to vasodilation caused by levosimendan (ATP-dependent K^+ channel activation) MAP and central blood pressures remained low, but normal.

Conclusion(s): The rise in HR, CO and EF after the levosimendan bolus was greater than that in the placebo group suggesting rapid improvement of myocardial function. The typical side-effect of levosimendan infusion, low MAP and high HR, remained relatively modest, probably, due to sufficient intravascular filling. Notably, a similarly successful recovery endpoint was reached (albeit slowly) in the placebo group by infusing Ringer's solution.

Reference:

1 Stehr SN, Christ T, Rasche B, et al. Anesth Analg 2007; 105: 641–7.

8AP1-4

Unilateral fixation does not decrease the incidence of urinary retention after low dose spinal anesthesia for knee surgery

L. Gasteiger, W. Voelckel, L. Kirchmair, I. Garoscio, T. Luger

Anesthesiology and Critical Care Medicine, Innsbruck Medical University, Innsbruck, Austria

Background and Goal of Study: We evaluated wheter unilateral fixation of low dose spinal anesthesia may reduce the likehood of postoperative urinary retention.

Materials and Methods: Forty patients scheduled for knee arthroscopy randomly received bilateral (n = 20) or unilateral (n = 20) spinal anesthesia with 6 mg hyperbaric bupivacaine 0.5%. A lateral decubitus position was maintained in the unilateral group for 20 minutes, thus minimizing sensory and motor block on contalateral side.

Results and Discussion: Incidence of urinary retention (>500ml) and subsequent temporary catherization was 7/20 in the bilateral vs. 6/20 uilateral group (N.S.).

Conclusion(s): In conclusion, seeking unilateral fixation of low dose spinal anesthesia does not further decrease the likehood of unrinary retention.

8AP1-6

A survey of knowledge of local anaesthetic toxicity and cardiac arrest – Room for improvement

S. Quasim

Department of Anaesthesia, Warwickshire School of Anaesthesia, Birmingham, United Kingdom

Background and Goal of Study: Local anaesthetics are used by many staff within the hospital environment. Intralipid 20% is recommended in the UK during the management of local anaesthetic-induced cardiac arrest. The aim of this survey was to establish whether those using local anaesthetics have knowledge of this agent, and to compare this knowledge with that of other drugs used in cardiac arrest situations.

Materials and Methods: An electronic survey clinical staff was performed. Questions regarding the maximum dose (in mg/kg) of bupivicaine, lidocaine and lidocaine + adrenaline were asked, together with questions about knowledge of drug doses of adrenaline, amiodarone and atropine in cardiac arrest situations. Finally, staff were asked to name a specific drug recommended for use in LA toxicity and also to calculate the dose in mg of 20 ml of 1% lidocaine. The grade and specialty of each responder was recorded as part of the questionnaire.

Results and Discussion: Two hundred questionnaires were sent to a variety of hospital clinicians in 3 different hospitals. Questions were completed using SurveyMonkey.com freeware. One hundred eighty questionnaires were completed, which represents a 90% response rate. Overall, 42% of respondents correctly identified Intralipid as a treatment for LA-induced cardiac arrest. Over 80% of respondents knew the correct doses of adrenaline, amiodarone and atropine in cardiac arrest. Anaesthetists and plastic surgeons had good knowledge of maximum doses of local anaesthetics. Midwives had good knowledge regarding maximum doses of the drugs they use, whereas some groups of surgeons had worryingly poor knowledge. The results are of concern as many of the groups surveyed use local anaesthetics without the presence of an anaesthetist and it is alarming that about one third could not calculate the dose of lidocaine in mg contained in 20 ml of 1% lidocaine.

Conclusion(s): LA toxicity is a potentially life-threatening condition which has a recommended treatment guideline. This guideline is widely published to UK anaesthetists, but some groups seem quite unaware of the possibility of using Intralipid as a treatment for LA-induced cardiac arrest. Although anaesthetists are usually called as part of a cardiac arrest team in the UK, the knowledge of safe dosing of LAs and specific treatment should be improved to achieve the same levels of knowledge about other Advanced Life Support (ALS) drugs.

Reference:

Guidelines for the management of severe local anaesthetic toxicity (2007). Association of Anaesthetists of Great Britain and Ireland.

8AP1-7

Incidence of subclinical femoral neuropathy after analgesia provided with femoral catheter

E. Albrecht, T. Kuntzer, A. Farron, C. Kern, F. Gronchi

Service of Anaesthesiology, Centre Hospitalier Universitaire Vaudois Lausanne, Lausanne, Switzerland

Background and Goal of Study: Patients with anterior cruciate ligament (ACL) reconstruction and femoral catheter analgesia may develop quadriceps amyotrophy. We aimed to determine if this amyotrophy might be related to a femoral neuropathy.

Materials and Methods: After Ethical Committee approval and patients' written informed consent, 17 patients ASA I and II scheduled to undergo ACL reconstruction were recruited. An electromyography (EMG) was performed before the operation in order to exclude a femoral neuropathy. A femoral nerve catheter was inserted before the surgery with the aid of a nerve stimulator, and 20 ml of 0.5% ropivacaine was injected. The operation was done under

spinal or general anaesthesia. Postoperative analgesia was provided with 0.2% ropivacaine for 72 hours, in association with oxycodone, paracetamol and ibuprofen. A second EMG was performed 4 weeks after the ACL repair. A femoral neuropathy was defined as a reduction of the surface of the motor response of more than 20%, compared to the first EMG. A third EMG was performed at 6 months if a neuropathy was present.

Results and Discussion: Mean age of this group of patients was 27 years old (range 18 – 38 y.). Among the 17 patients, 4 developed a transient femoral neuropathy (incidence of 24%) without clinical complain.

Conclusion(s): In this study, the incidence of subclinical femoral neuropathy after ACL reconstruction is high. This lesion may be caused by the femoral catheter (mechanical damage, toxicity of local anaesthesia). Further studies are needed to investigate the incidence of neuropathy, according to the type of analgesia (epidural analgesia, PCA).

8AP1-9

Risk factors for severe bradycardia during spinal anesthesia

A. Chatzimichali, A. Zoumprouli, A. Papaioannou, H. Askitopoulou

Anesthesiology, General University Hospital of Heraklion, Heraklion, Crete, Greece

Background and Goal of Study: Although spinal anaesthesia is considered a safe technique, it is not without risk or side effects. The incidence of severe bradycardia during spinal anaesthesia is reported to be as high as 6.4 to 13%. Six out of 26 cardiac arrests in France had a fatal outcome. The fact that many of these arrests occurred in healthy young patients during minor surgery raises the question, whether some of them were avoidable. Risk factors like baseline heart rate < 60 bpm, ASA physical status I, sensory level above T6 and age <50 years are frequently observed in case reports about bradycardia during spinal anesthesia. The present study investigated risk factors and the value of Heart Rate Variability (HRV) to identify patients prone to develop severe bradycardia during spinal anaesthesia.

Materials and Methods: Thirty two ASA I–II patients, 20–50 years of age, undergoing elective lower abdominal or limb surgery under spinal anaesthesia were studied. Patients with a history of cardiovascular disease or disorders of the autonomic nervous system were excluded. All patients received 10–15 mg of 0.5% plain bupivacaine through a 25 gauge spinal needle at L3–L4 level. The level of spinal block extended from T5 to T12 dermatome. The HRV was assessed with Holter monitoring for 25 min before the spinal block. Patients were grouped according to whether bradycardia did or did not occur during spinal anesthesia.

Results and Discussion: Patients were classified in two groups: bradycardic and non-bradycardic, according to their heart rate during spinal anesthesia. Nine out of the 32 patients developed severe bradycardia (<45 bpm) during spinal anesthesia. The cluster analysis revealed that the LF/HF ratio, in combination with the baseline heart rate, agree with the classification of patients in bradycardic and non bradycardic groups. Further more, the combination of patient's age, baseline blood pressure, baseline heart rate, the sensory level and the LF/HF ratio, also confirmed this classification. Finally, the Pearson correlation coefficient showed that the correlation between baseline heart rate and minimum heart rate during spinal anaesthesia was significant ($p < 0.01$).

Conclusion(s): This study shows that the heart rate variability in combination with clinical factors such as baseline heart rate could contribute to the identification of patients prone to develop severe bradycardia during spinal anaesthesia. However, more patients must be studied to provide better accuracy and therefore safer results.

8AP1-10

The effect of lipid pretreatment on ropivacaine induced cardiotoxicity in rats

S. Ayhan Özdemir, A. Karci, N. Hocaoglu, C. Olguner, Z. Elar

Anesthesiology and Reanimation, Dokuz Eylül University Medical School, Izmir, Turkey

Background and Goal of Study: In this randomized controlled experimental study, the effect of pretreatment with 10% and 20% lipid infusion, on cardiotoxicity of ropivacaine were investigated in anesthetized rats.

Materials and Methods: Twenty-four male adult Wistar-Albino rats were divided into three groups. The anesthetized rats were mechanically ventilated using a tracheotomy cannula and invasively monitorized. Baseline values for the heart rate, mean arterial pressure and width of QRS complexes were recorded. The control group (n = 8) received 3 $mL \cdot kg^{-1}$ of 0.9% saline for 5 min. Lipid 1 (n = 8) and Lipid 2 (n = 8) groups were administered 3 $mL \cdot kg^{-1}$ of 10% and 20% lipid solutions respectively for 5 min. After completion of the pretreatment drug infusion, drug infusion was begun with ropivacaine%1 at a rate of 3 $mg \cdot kg^{-1} \cdot dk^{-1}$ and was continued till development of asystole. Ropivacaine infusion was than stopped and resuscitation was started. Times before the first QRS complex change and first dysrhythmia; also times to 50% decrease in heart rate and mean arterial pressure compared to the baseline values and also time to asystole, defined as absence of a positive deflection on the arterial pressure trace were recorded.

Results and Discussion: An increase in the time to 50% decrease in heart rate, and mean arterial pressure values, an increase in the period before the development of cardiac arrest and an increase in total ropivacaine consumption were observed following administration of both 10% and 20% lipid solutions. There was a prolongation in the period before the first QRS complex change and first dysrhythmia following 20% lipid infusion.

Conclusion(s): These results, suggest that lipid solutions can be effective in prevention of ropivacaine cardiotoxicity.

8AP1-11

The effects of lipid treatment on levobupivacaine induced cardiotoxicity in rats

A. Karci, A. AykaÇ Ibisoglu, K. Oransay, G. Olguner, Z. Elar

Anesthesiology and Reanimation, Dokuz Eylül University Medical School, Izmir, Turkey

Background and Goal of Study: The effects of 20% lipid infusion on treatment of levobupivacaine induced cardiotoxicity and on the results of resuscitation were investigated in this randomized, controlled, experimental study in anesthetized rats.

Materials and Methods: Twenty eight, male Sprague-Dawley rats were divided into four groups. A tracheotomy was performed for controlled ventilation. The rats were cannulated for invasive monitorization. Baseline values for heart rate, systolic blood pressure, diastolic blood pressure, mean blood pressure and the duration of QRS complex were recorded. Rats in Group A (n = 7) received 1,5 $mL \cdot kg^{-1}$ 20% lipid emulsion for 30 minutes. Rats in Group B (n = 7) received 3 $mg \cdot kg^{-1} \cdot dk^{-1}$ levobupivacaine infusion and 1,5 $mL \cdot kg^{-1}$ 20% lipid emulsion upon a decrease of 50% in mean blood pressure. Levobupivacaine infusion was continued until development of asystole and resuscitation was started afterwards. In Group C (n = 7) levobupivacaine infusion was started at a dose of 3 $mg \cdot kg^{-1} \cdot dk^{-1}$ and continued until asystole. Standard resuscitation was begun immediately along with 1,5 $mL \cdot kg^{-1}$ 20% lipid emulsion. In Group D (n = 7). Levobupivacaine infusion was continued untill asystole and standard resuscitation was started while levobupivacaine infusion discontinued. Time to the first QRS modification, 50% reduction in heart rate and mean arterial pressure and asystole were recorded. Success in resuscitation was also recorded.

Results and Discussion: Baseline measurements were similar in all of the groups. No hemodynamic change was observed in rats receiving only lipid infusion. There were no statistical differences in the period before the decrease in mean arterial pressures and heart rates, QRS widening. It was observed that the time to development of asystole was longer in Group B compared to Groups C and D (426,4 ± 649,8 s; 54,7 ± 17,7 s; 53,0 ± 34,7 s; respectively). There were 4 successful resuscitations in Group B. Spontaneous cardiac activity was provided in all rats in Group C; but continued in only one rat for 20 minutes. Spontaneous cardiac activity could not be provided in rats in Group D.

Conclusion(s): These results suggest that administration of lipid emulsion may prevent cardiac arrest due to levobupivacaine cardiotoxicity and lipid infusion along with standard resuscitation in cardiac arrest due to levobupivacaine may improve survival.

8AP2-1

Ultrasound guided transversus abdominis plane block: Description of a new technique and comparison with conventional systemic analgesia during laparoscopic cholecystectomy

P. Marhofer, A. Turkistani, M. Delvi, S. Kettner, A. El-Dawlatly

Anaesthesia, Intensive Care and Pain Medicine, Medical University of Vienna, Vienna, Austria

Background and Goal of Study: The transversus abdominis plane (TAP) block is usually performed by landmark-based methods. This prospective, randomized and double-blinded study was designed to describe a method of ultrasonographic guided TAP blockade and to evaluate the intra- and postoperative analgesic efficacy in patients undergoing laparoscopic cholecystectomy of general anaesthesia with or without TAP blockade.

Materials and Methods: Forty-two patients received either standardized general anaesthesia with TAP blockade (group A, n = 21) or pure standardized general anaesthesia (group B, n = 21). Ultrasonographic guided bilateral TAP blockade was performed with a high frequent linear ultrasound probe and an in-plane needle guidance technique with 15 mL bupivacaine 0.5% on each side. Intraoperative demand of sufentanil and postoperative demand of morphine via a patient controlled analgesia device were recorded.
Results and Discussion: Ultrasonographic visualization of the relevant anatomy (Figure 1), detection of the body and tip of the needle and the spread of local anaesthetic between the internal oblique and transverse abdminal muscles was possible in all cases where a TAP block was performed. The arrow in figure 1 indicates the target of the tip of the needle. Intra- and postoperative analgesic demand is presented in Table 1.

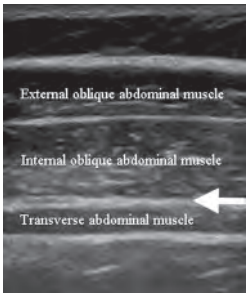


Table 1. Intra- and postoperative anagesia demand

	Group A	Group B	p-value
Intraoperative sufentanyl (µg)	8.6 ± 3.5	23.0 ± 4.8	< 0.01
2-h postoperative morphine (recovery room, mg)	0.9 ± 0.7	2.3 ± 1.0	< 0.05
24-h postoperative morphine (ward, mg)	10.5 ± 7.7	22.8 ± 4.3	< 0.05

Conclusion(s): Ultrasonographic guidance enables exact placement of the local anaesthetic for the TAP block. The perioperative analgesic demand for laparoscopic cholecystectomy is significantly decreased in patients who receive a TAP block in combination with general anaesthesia as compared to those with pure general anaesthesia.

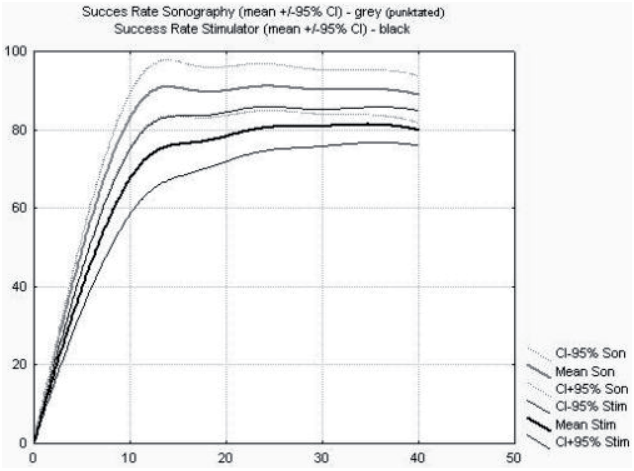
8AP2-2

Axillary brachial plexus blockade by real-time ultrasound guidance or by nerve stimulator: Which method is easier to learn?

C. Luyet, M. Wipfli, G. Schüpfer, R. Greif, U. Eichenberger

Department of Anaesthesiology and Pain Therapy, Inselspital, Bern University Hospital, Bern, Switzerland

Background and Goal of Study: The use of ultrasound improves the success rate of axillary brachial plexus block compared to nerve stimulation.[1, 2] Little is known about the learning process of the skill needed to perform ultrasound-guided block. The aim of this study was to compare the learning curves and success rates of axillary plexus block of residents trained in ultrasound-guidance (US) to residents trained in nerve stimulation (NS).
Materials and Methods: 10 residents were trained in US-guided block and systematically analysed. Four of them were already familiar with NS when starting with the US training. Therefore we divided this group in an US only (6 residents) and a mixed (4 residents) group. For the NS group we randomly picked and analysed 11 residents trained with NS in the years before the US technique was introduced at our institution. The novices' learning curves were generated by retrospective data analysis out of our electronic anaesthesia database. A chronological binary table of successful or failed blocks (need for block completion, deep sedation or conversion into general anaesthesia) for each resident was created. The individual success rates were pooled and the institutional learning curve was calculated using a bootstrapping technique combined with a Monte Carlo simulation procedure.[3]
Results and Discussion: Figure 1 graphically displays the institutional learning curves and success rates US versus NS with the corresponding 95% confindence intervals. The two confidence intervals do not overlap, indicating a statistically significant difference. The confidence interval is wider and therefore the difference is not significant if we compare NS to the mixed group (data not shown).
Conclusion(s): US-guided axillary plexus block seems to be easier to learn than NS guided axillary plexus block, especially for residents not trained in NS before. Moreover, in concordance to other studies[1, 2] the final success rate after learning the method (plane part of the learning curves) is higher in the US group compared to the NS group.



References:
1 Chan VW, Perlas A, McCartney, et al. *Can J Anaesth* 2007; 54: 176–82.
2 Lo N, Brull R, Perlas A, et al. *Can J Anaesth* 2008; 55: 408–13.
3 Schuepfer G, Johr M. *Paediatr Anaesth* 2005; 15: 465–9.

8AP2-3

Comparison between in plane and out of plane needle introduction in ultrasound guided axillary block

J. Vo Van, N. Nguyen, E. Georges, N. Nguyen, V. Shacoori

Dpt of Anesthesiology and Intensive Care and Group A.R.R.E, University of Rennes I, University Hospital Center, Rennes, France

Background and Goal of Study: The two ultrasound-guided approaches to the perivascular axillary artery are the in-plane (IP) and the out-of-plane (OOP) techniques. With the IP approach, the needle is introduced sidelong under the probe in the short axis of the axillary artery. In the OOP approach, the needle is introduced tangentially to the skin along the long axis of the axillary artery. In this study, we compared two series of axillary blocks performed under IP and OOP ultrasound guidance.
Materials and Methods: After informed consent, 40 ASA I and II patients scheduled for ambulatory hand surgery were randomly divided in two equal groups: IP and OOP. Every patient received oral alprazolam 0.5 mg 2h before, and sufentanil 10 µg IV at the beginning of the procedure. All blocks were completed by a senior staff physician. Each patient received a perivascular axillary injection of 8 ml mepivacaine 1.5% under direct ultrasound vision at each radial, ulnar, median, and musculocutaneous nerve location. We studied the quality of block obtained, the depth of needle entry from skin to the inferior axillary artery wall compared to the same distance estimated echographically, the procedure length and the pain at needle advancement using a standard visual analog scale (VAS) graduated from 0 to 10. We also performed injections with an ultrasound phantom. A silastic tube was inserted medially into an agarose gel (1%) while still liquid, mimicking an artery. 8 ml of mepivacaine colored with azorubine were injected in IP and OOP approaches at 6 o'clock tube position. The agarose blocks were then sectioned in the long axis to visualize the spread of the colored mepivacaine.
Results and Discussion: All the patients had satisfactory surgical anaesthesia. No rescue blocks or conversion to general anaesthesia were necessary in any patients. The median length of needle insertion was 3.7 cm in the IP group versus 2.6 cm in OOP. Estimated ultrasound distance from skin to inferior axillary artery wall was 1.7cm ± 0.2 in both groups. Axillary block was more rapidly performed in OOP group (5 ± 1 min versus 8 ± 1 min in IP). In the IP group, 8 patients complained of pain (VAS > 4) at needle introduction, versus 5 in OOP. The range of dispersion of the colored mepivacaine in the phantom model was greater in the OOP group: 3.2 cm versus 2.4 cm in IP.
Conclusion(s): The two techniques gave an equally adequate nerve blockade, but the OOP approach is more rapid (due to a wider diffusion of local anesthetic) and less painful.

8AP2-4

Efficacy of ultrasound-guidance in obturator nerve block: A comparative study with nerve stimulator-guided technique

Y. Fujiwara, H. Ito, S. Kurokawa, M. Harado, T. Komatsu

Department of Anesthesiology, Aichi Medical Unversity School of Medicine, Nagakute, Aichi, Japan

Background and Goal of Study: Obturator nerve block (ONB) is a useful technique in preventing adductor contraction of the hip during transurethral resection of the tumor on the lateral wall of the bladder. Recently, ultrasound-guided ONB has been introduced (1). Although many advocates of ultrasound theorize that ultrasound-guidance may improve the quality of peripheral nerve block, the clinical efficacy of ultrasound-guided ONB has not yet been determined. We hypothesized that ultrasound-guidance reduces the time and needle passes needed for ONB, enhances the motor block of adductor muscle and reduces the absorption of local anesthetics into systemic circulation.
Materials and Methods: After institutional approval and written informed consent, 30 patients (American Society of Anesthesiologists physical status I–II) undergoing transurethral resection of the bladder tumor under spinal anaesthesia supplemented with ONB were enrolled in this study. They were randomly allocated to receive either ONB assisted by electrical nerve stimulation (Group NS) or ultrasound-guided ONB (Group US). In Group NS, the insulated needle was inserted 2 cm caudal and 2 cm lateral to the pubic tubercle. The needle was advanced until the adductor muscles of the thigh twitched at < 0.6 mA. In Group US, ONB was performed following the method reported recently (1). As a result, 15 ml of 1% plain lidocaine was administered. Thereafter, 2 ml of venous blood sample was obtained 5, 15, 30 and 60 min after the block. Serum concentration of lidocaine was determined using fluorescence polarization immunoassay (COBAS INTEGRA 800, Roche Diagnostics, S.L., Barcelona, Spain). The motor function of adductor muscle was assessed 5 and 15 min after ONB. The time and the number of needle passes needed to find the obturator nerve was recorded.
Results and Discussion: Time needed to find the nerve were 16 ± 14 sec in Group NS, 7 ± 2 sec in Group US ($p < 0.05$). In all patients in Group US, only one needle pass was needed to find the nerve, whereas two or three needle passes were needed in 5 patients in Group NS ($p < 0.05$). However, there were no significant differences in motor function and serum concentration of lidocaine between the groups.
Conclusion(s): Ultrasound guidance significantly reduces the number of needle passes and time needed to find the nerve. Ultrasound-guidance neither enhances the motor block of adductor muscles nor prevents the absorption of local anesthetics into systemic circulation.
Reference:
1 Anesth Analg 2007;105:888.

8AP2-5

Comparison of two different techniques of ultrasound-guided lateral femoral cutaneous nerve block

K. Hara, S. Sakura, R. Ishida, F. Kono, Y. Saito

Anesthesiology, Shimane University, Izumo, Shimane, Japan

Background and Goal of Study: Ultrasound imaging has been shown to help perform various peripheral nerve blocks by visualizing the nerves and the adjacent anatomical structures. We previously described a technique of ultrasound-guided lateral femoral cutaneous nerve (LFCN) block, in which anaesthetic is injected immediately under the inguinal ligament without locating the nerve (1). A recent study(2) using cadavers and volunteers showed that ultrasound imaging can identify LFCN accurately. In the present study, we compare the two techniques of ultrasound-guided LFCN block with or without locating the nerve in terms of success rate and execution time.
Materials and Methods: With IRB approval and informed consent, 100 patients undergoing knee surgery with ultrasound-guided femoral, LFCN and sciatic nerve blocks were enrolled. All patients were randomly divided into two groups. In the subinguinal (S) group, we visualized the inguinal ligament and the anterior superior and inferior iliac supine and injected local anaesthetic immediately under the inguinal ligament. In the nerve (N) group, we scanned patients at the inguinal region to locate LFCN within 1 minute and injected local anaesthetic around the nerve. All patients received 5 ml of 1% mepivacaine for the block. Measurements included the time required to perform and onset of the sensory block. The success of the block was defined as obtaining loss of pinprick sensation within 10 min after the completion of the block.
Results and Discussion: The success rate was higher in group S than in group N (95.9% vs. 74.5%, $P < 0.01$). There were no differences between the groups in demographic data, the time required to perform (excluding the time for locating the nerve), or onset of the block.
Conclusion(s): The results of the present study demonstrate that ultrasound-guided LFCN block is more reliably and easily performed by using the technique in which anaesthetic is injected immediately under the inguinal ligament than the technique in which anaesthetic is injected around the nerve.
References:
1 Hara K, Sakura S, Nomura T, et al. Eur J Anaesthesiol 2008; 25 (Suppl 44): 8AP2–6.
2 Ng I, Vaghadia H, Choi PT, et al. Anesth Analg 2008; 107:1070–4.

8AP2-6

Ultrasound guided axillary plexus block. Comparision with quadruple and triple injection

M. Rial Munin, M. Amor Berdullas, P. Aguirre Puig, L. Pazos Otero, M. Taboada Muñiz

Anesthesiology, Hospital Clínico Universitario de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

Background and Goal of Study: The ultrasound guided axillary braquial plexus is usually described locating four nerves of the braquial plexus. The purpose of this study was to evaluate the efficacy of the axillary braquial plexus block locating four nerves (4n) in comparison with three nerves (3n), using neurostimulation and ultrasound.
Materials and Methods: 24 patients scheduled for trauma hand surgery were randomly assigned to two groups. A total of 25 mL Mepivacaine 1,5% was employed. In the 4n group (12 patients) four nerves were located: the musculocutaneus and median nerves received 5 mL of Mepivacaine and the ulnar and radial nerves received 7,5 mL. In the 3n group (12 patients), 5 mL were injected in musculocutaneus and median nerves and 15 mL surrounding the humeral artery looking for a motor response of the radial nerve. All neurostimulation responses were obtained between 0,4 – 0,5 mA with 0,1 msec. The time required to perform the block and onset times of anaesthesia were documented. The success of the blockade was defined as a complete sensory and motor block of the forearm and hand 30 min. after.
Results and Discussion: The time to perform the block was shorter in the 3n group (360 ± 105 vs 433 ± 122; $p > 0.05$). Onset time was shorter in the 3n group (8 ± 7,8 vs 16 ± 9,2; $p > 0.05$). Success rate was greater in the 3n group (83,3 vs 75; $p > 0.05$). No patient reported pain during the procedure.
Conclusion(s): No statistically differences were found between the two groups. However, the results demonstrated a shorter time to perform the block in group 3n than in group 4n.
References:
1 Casati A. y cols Anesthesiology. 2007 May; 106 (5):992–6.
2 Schwemmer U. y cols. Ultraschall Med. 2005 Apr;26(2):114–9.
3 P. Diéguez García y cols. Cirugía Mayor Ambulatoria 2007 Vol. 12, N º 1, pp. 13–14.
4 Ultrasound Guidance in Regional Anaesthesia: Techniques for Upper Extremity Nerve Block 2007, Brian D. Sites y cols. pp 22–23.

8AP2-7

Ultrasound guided popliteal lateral sciatic nerve block. A pilot study on cadavers comparing three injection techniques

A. Faust, M. Benkhadra, R. Fournier, G. Feigl

Anesthesiology, University Hospitals of Geneva, Geneva, Switzerland

Background and Goal of Study: Ultrasound imaging has been shown to be a valuable technique to localize the sciatic nerve (SN) in the popliteal fossa and to guide block needle placement. This study compares the distribution of a colored solution on nerves structures in the popliteal fossa, following three injection techniques.
Materials and Methods: 40 cadavers preserved according to Thiel's embalming method were available. Using lateral approach, 80 popliteal regions were randomly assigned to 3 groups. Under ultrasonic imaging control, 20 mL of a mixture of ropivacaine 0.2% and methylene blue was injected at a point immediately proximal to the bifurcation of the tibialis and peroneal components either on the anterior aspect of SN (group ANT) or on the posterior aspect of the SN (group POST) or 10 mL on the anterior and 10 mL on the posterior aspect of the SN (ANT/POST). Quality of images was subjectively defined as 1 for bad, 2 for acceptable and 3 for good visibility. Fine dissection of each injected popliteal region was then performed and colorations of the SN, the common peroneal nerve (CPN) and the tibialis nerve (TN) were noted. Was considered as a successful block: a complete coloration of both the CPN and the TN or a complete coloration of the sciatic nerve
Results and Discussion: Injection success rate was not different between the 3 groups (53% vs 55% vs 69%; NS, for groups ANT, POST and ANT/POST respectively). There was a trend for a better injection success rate when the visibility was better (45% vs 6o% vs 70% for visibility = 1, 2 and 3 respectively. All the three techniques were equivalent in terms of success with an apparent better rate for the group ANT/POST compared with ANT and POST groups but this study was not powered enough to detect such a difference. The mean success block rate for the three techniques is 60%. This rate seems to be dependent on the quality of the nervous structures visibility. It could be probably enhanced if we consider that in clinical practice local anesthetic distribution around the nerve can be influenced on real time by needle readjustments, which was not the case in this study. The impossibility to use neurostimulation to confirm the target was another disadvantage.
Conclusion(s): A double injection technique ANT/POST could be associated with a better success block rate. Thiel's embalming technique preserve

spectacular colors and flexibility like living conditions. We describe an original application of this method for teaching and practicing ultrasound guided nerve block.

8AP3-1

Comparison of epidurally infused hydromorphone with fentanyl combined with ropivacaine in patients receiving total knee arthroplasty

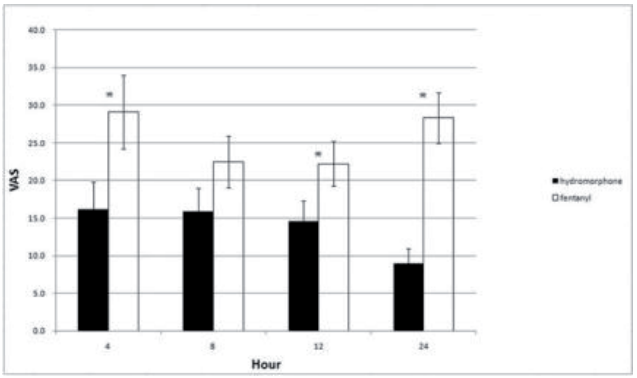
J. Lee, J. Kim, S. Chun, J. Park

Anesthesiology and Pain Medicine, National Health Insurance Corporation, Ilsan Hospital, Koyang-yang Si, Kyung-gi Do, Korea

Background and Goal of Study: Hydromorphone is semi-synthetic opioid with pharmacokinetic properties intermediate between morphine and fentanyl. Some reported that epidural infusion of hydromorphone provides rapid onset of analgesia and lower incidence of adverse effects than morphine. However comparative study with lipophilic opioid like fentanyl is rare. We compared the analgesic effects and side effects of epidurally infused hydromorphne with fentanyl in patients receiving total knee replacement.

Materials and Methods: Randomized, double-blinded method, 79 patients (ASA I–III, aged 25–75) with spinal/epidural-combined technique were participated. 39 patients received epidural PCA with hydromorphone (4 μg/ml) and 0.1% ropivacaine and 40 patients received fentanyl (2μg/ml) and 0.1% ropivacaine during 24 hours at a rate of 5ml/hr. We recorded VAS for pain and the incidence of adverse effects; nausea/vomiting, itching, hypotension, drowsiness and respiratory depression at 4, 8, 12, 24 hours after surgery. The VAS for pain was analyzed by unpaired t-test, and other categorical data was analyzed by chi-square and Fisher's exact test. The study was enrolled 79 patients to provide 80% power to detect 15 decrease for VAS in hydromorphone group during 24 hours after surgery (using our unpublished pilot study) with a α level 0.05.

Results and Discussion: The hydromorphone group showed lower VAS for pain at 4, 12, 24 hours after surgery than the fentanyl group (p = 0.03, 0.03, 0.006)but the incidence of nausea/vomiting and itching was higher in hydromorphone group at 8 hours after surgery (p = 0.001, 0.007). The incidence of others was not statistically different in both group and no patients in both groups showed delayed respiratory depression. (All data was mean and standard error)Epidural infusion of hydromorphone with ropivacaine provided effective analgesia than fentanyl with ropivacaine in patients receiving total knee replacement. But it also showed higher incidence of nausea and vomiting and itching in hydromorphone group.



Conclusion(s): Epidural use of hydromorphone show better effect for pain compared with fentanyl for total knee replacement but some adverse effects like nausea/vomiting and itching seem to occur more and it must be prevented.

8AP3-2

Postoperative nausea and vomiting after neuraxial anesthesia: A multicentre study of a surgical population

P. Vila, V. Mazo, S. Sabaté, C. Orrego, J. Canet

Anesthesiology, Hospital Germans Trias i Pujol, Badalona, Barcelona, Spain

Background and Goal of Study: Postoperative nausea and vomiting (PONV) are known side effects of general anesthesia, but their incidence and the risk factors of PONV after neuraxial anesthesia may be different.[1] We analyzed the main risk factors for PONV in patients who received neuraxial anesthesia.

Materials and Methods: Patients operated on under neuraxial anesthesia in a prospective multicenter study of 26 hospitals in Catalonia, Spain, were studied. Inclusion criteria were age older than 18 yr and elective non-cardiac surgery lasting more than 1 hour. Variables recorded were patient demographic data, type of anesthesia (epidural and/or intrathecal), intravenous fluid infusion (ml), intraoperative changes in blood pressure of more than 30% (yes/no), perioperative opioid consumption (yes/no), length of surgery (min), surgical procedure and incidence of PONV within 24 h after surgery. Bivariate and multivariate analyses were performed. Odds ratios and 95% confidence intervals (CI) were calculated.

Results and Discussion: We studied 744 subjects undergoing neuraxial anesthesia. The mean (SD) age was 58.9 (16.3) yr, weight 72.9 (14.4) kg, height 1.63 (0.1) m; 402 were female (54.1%). The overall incidence of PONV was 19% (6.7% in the post anesthetic care unit and 15.1% on the ward [24 h]). Mean intravenous fluid intake was 8.2 ml·kg·h^{-1}. Hypotension (> 30% under baseline) developed in 98 patients (14.9%). Risk factors for PONV after neuraxial anesthesia were related to surgical procedure: gynecological surgery (PONV in 27.7% vs. 18% after other types of surgery; OR 3.4 [1.6–7.1]); and orthopedic surgery (PONV in 23.8% vs. 13.2% after other types of surgery; OR 3.1 [1.9–5.2]). Anesthesia-related risk factors were anesthesia duration (> 3 hours), (PONV in 32.1% of patients under prolonged anesthesia vs. 18.3% in shorter procedures [<3 hours]; OR 2.7 [1.1–6.8]); and opioid consumption (PONV in 29.6% vs. 16.9% in those who did not receive opioids; OR 1.8 [1.1–2.9]).

Conclusion(s): Since the overall incidence of PONV after neuraxial anesthesia is not negligible, antiemetic prophylactic measures may be necessary in patients with increased risk. Consensus guidelines for prophylaxis of PONV in surgical patients under neuroaxial anesthesia should be reviewed.

Reference:

1 Borgeat A, Ekatodramis G, Schenker CA. Anesthesiology 2003;98:530–47.

8AP3-3

Analgesia prior to spinal block in the lateral position in elderly patients with a femoral neck fracture: A comparison of fascia iliaca compartment block and intravenous alfentanil

M. Yun, M. Han, S. Park, S. Do, Y. Kim

Anesthesiology and Pain Medicine, Seoul National University Bundang Hospital, Seongnam, Kyounggi, Korea

Background and Goal of Study: In this prospective randomized study, the authors compared the analgesic effect of a fascia iliaca compartment block with that of IV alfentanil when administered to facilitate positioning for spinal anesthesia in elderly patients undergoing surgery for a femoral neck fracture.

Materials and Methods: Group IVA patients (n = 20) received a bolus dose of IV alfentanil 10 μkg^{-1} followed by infusion rate of alfentanil 0.25 μ kg^{-1} min^{-1} two minutes before spinal block, and group FIC patients (n = 20) received a fascia iliaca compartment block with 0.375% ropivacaine (30 mL) 20 minutes before spinal block. VAS scores, time to achieve spinal anesthesia, quality of patient positioning, patient acceptance were compared.

Results and Discussion: VAS scores during positioning (mean and range) were lower in the FIC group than in the IVA group [2.1 (1–4) versus 4 (3–6), P = 0.001], and mean time to achieve spinal anesthesia was shorter in the FIC group [6.9 (SD 2.7) min versus 10.8 (5.6) min, P = 0.009]. Patient acceptance (yes/no) was better in the FIC group (17/1) than in the IVA group (12/8)(P = 0.021).

Table 1. VAS scores

	Group IVA	Group FIC
	(n = 20)	(n = 20)
Before FIC block or IV alfentanil	6.6 (0.6)	6.5 (0.7)
At 2 min after IV alfentanil or	2.1 (0.7)*	
20 min after FIC block		2.0 (0.6)*
At positioning for spinal anesthesia	4.0 (1.0)†	2.2 (0.8)‡

*P < 0.001 vs. Before FIC block or IV alfentanil. †P < 0.001 vs. At 2 min after IV alfentanil. ‡P < 0.001 vs. the IVA group.

Table 2. Correlation between VAS scores and thigh sensory blocks in the FIC group.

Sensory block	LFC + F	LFC + F + O
Patient no. (%)	11/20 (55%)	8/20 (40%)
Before FIC block	6.7 (0.8)	6.2 (0.4)
At 20 min after FIC block	2.2 (0.6)*	1.5 (0.5)*†
At positioning for spinal anesthesia	2.5 (0.9)	1.7 (0.4)‡

*P < 0.05 vs. Before FIC block. †,‡P < 0.05 vs. the LFC + F group.

Conclusion(s): A FIC block is more efficacious than IV alfentanil in terms of facilitating the lateral position for spinal anaesthesia in elderly patients undergoing surgery for a femoral neck fractures.

8AP3-4

Unilateral spinal anesthesia for knee arthroscopy: A comparison of hyperbaric bupivacaine 6 mg vs. hyperbaric bupivacaine 4 mg + fentanyl 20 µg

R. Krobot, I. Bacak Kocman, J. Premuzic, N. Vucelic, P. Grbcic

Department of Anesthesiology and Intensive Care, General Hospital Varazdin, Varazdin, Croatia

Background and Goal of Study: Unilateral spinal anesthesia restricts the distribution of spinal block preferentially to the operative side. Intrathecal coadministration of opioid enhances sensory block without increasing motor or sympathetic block. We compared clinical profile of unilateral spinal anesthesia produced with either hyperbaric bupivacaine 6 mg or hyperbaric bupivacaine 4 mg + fentanyl 20 µg in patients undergoing knee arthroscopy.
Materials and Methods: 40 ASA I–II adults randomly assigned to 2 groups (n = 20) received unilateral spinal anesthesia with hyperbaric bupivacaine 6 mg (Group B) or hyperbaric bupivacaine 4 mg + fentanyl 20 µg (Group BF). In both groups block was performed in lateral position with operative side down, local anesthetic solution injected slowly through 27-gauge Whitacre needle without barbotage and lateral position maintained for 15 min following spinal injection. Sensory (pin-prick test) and motor block (modified Bromage scale), hemodynamic data, side-effects and time to first analgesic and first micturition were recorded. Mann-Whitney U-test and Fisher's exact test were performed, $p < 0.05$ was considered significant.
Results and Discussion: Demographic data and start values of systolic arterial pressure (SAP) and heart rate (HR) were comparable between the groups. Anesthesia was adequate and motor block strictly unilateral in all 40 patients. Peak sensory level on operative leg was T_{11} (T_{12}–T_7) in Group B and T_{12} (T_{12}–T_8) in Group BF, P = 0.25. Complete motor block had 11 (55%) Group B and 3 (15%) Group BF patients, P = 0.02. Total regression of motor block required 103 ± 18 min in Group B and 70 ± 25 min in Group BF, $P < 0.001$. Time to first analgesic was 392 ± 152 min in Group B and 382 ± 154 min in Group BF, P = 0.96, and time to first micturition 352 ± 155 min and 339 ± 102 min, P = 0.85, respectively. Maximum decrease of SAP from baseline was 16 ± 8% in Group B and 14 ± 9% in Group BF, P = 0.44 and of HR 17 ± 9% and 15 ± 8%, P = 0.50, respectively. Pruritus had 6 (30%) Group BF patients, P = 0.02. No postdutal puncture headache, vomiting, respiratory depression or neurological complications were noted.
Conclusion(s): Unilateral hyperbaric bupivacaine 4 mg + fentanyl 20 µg spinal anesthesia provides adequate intraoperative sensory block in operated leg and results in similar cardiovascular stability and postoperative analgesia, but less intense motor block and faster motor recovery than unilateral hyperbaric bupivacaine 6 mg spinal anesthesia in patients undergoing knee arthroscopy.

8AP3-5

Cerebrospinal fluid backflow through the needle is not sufficient to predict spinal anaesthesia success

R. Fuzier, A. Richez, B. Bataille, O. Choquet, J. Magues

Department of Anaesthesia and Critical Care, CHU Purpan, Toulouse, France

Background and Goal of Study: Spinal anaesthesia (SA) is one of the most popular technique for abdominal or lower limb surgery. Success rate is considered very high upon condition that local anaesthetic (LA) is injected after obtaining a cerebrospinal fluid (CSF) backflow. The aim of this prospective, multicentre study was to assess success rate of spinal anaesthesia and to evaluate risk factors associated with failure.
Materials and Methods: We conducted a website survey of French-speaking anaesthetists over a 12-month period to assess more than 1000 consecutive SA performed in several centers. Each center had to include at least 50 consecutive SA. Technical failures (inability to obtain a CSF backflow through the needle) were excluded. Primary endpoint was the evaluation of failure rate (inadequate sensory level for surgery or no level at all). Risk factors leading to failure, such as patients' characteristics and position, type of needle, puncture (spine level, median or paramedian puncture), LA (type, concentration, baricity), adjuvants,… were analysed. Data, expressed as mean ± SD or percentage, were compared using U-Mann-Whitney or Chi-2 tests. Correlation was performed using odds ratio method. $P \leq 0.05$ was considered significant.
Results and Discussion: 1214 SA were performed by 21 centres. Failure rate was 3,2% [$CI_{95\%}$ = 2,2–4,2], reported by 17 of 21 centres (median 2 failures by centre). Total (no sensory block) and partial (inadequate level) were noted in 41% and 59%, respectively. In the failure group, patients were younger (46 ± 19 yr vs 56 ± 20 yr, $p < 0,01$) and the number of puncture attempts ≥ 3 was higher. Type of surgeries, needle, LA, and of adjuvants, baricity and concentration of LA, patient's position during the procedure were not statistically different between groups. Using logistic regression, independent risk factors for SA failure were number of puncture attempts ≥3 (relative risk [RR] 2,87) and no adjuvant injected with LA (RR 2,32). In contrast, patients age >70 yr was a factor decreasing the risk of failure (RR 0,3).
Conclusion(s): This study confirmed a significant incidence of failure rate of SA, even when technical failures are excluded. A CSF backflow through the needle is not sufficient to predict success of SA. Young people, multiple attempts of puncture and lack of adjuvants are independent factors of failure. Our results need to be confirmed by others studies.

8AP3-6

The minimum effective local anaesthetic dose of bupivacaine, levobupivacaine and ropivacaine after intrathecal injection in total knee arthroplasty

E. Guasch, A. Fernandez, D. Torres, N. De Brogly, F. Gilsanz

Anesthesia, Hospital Universitario La Paz, Madrid, Spain

Background and Goal of Study: Intrathecal anesthesia is commonly used for total knee arthroplasthy (TKA). Bupivacaine, levobupivacaine and ropivacaine have been used as intrathecal agents. The aim of this study was to determine the minimum effective local anesthetic dose (MLAD) of these local anesthetics for intrathecal anesthesia with epidural catheter in TKA surgery.
Materials and Methods: After local ethics committee approval, patients scheduled for TKA under combined spinal-epidural anaesthesia, were randomly allocated to one of three groups receiving intrathecal isobaric bupivacaine (group B), levobupivacaine (Group LB) or ropivacaine (Group R). All patients received 20 µg of intrathecal fentanyl added to local anaesthetic. The dose of local anaesthetic was varied using up-and-down sequential allocation technique. The dose for the first case was 15 mg in group B and LB and 17.5 in Group R and the testing interval was set at 0.5 mg. Subsequent doses in each group were determined by the outcome in the previous patient using success or failure of the spinal anaesthesia as primary end point. Success was if a bilateral T10 sensory block to cold was attained within 20 minutes after intrathecal injection and the surgery proceeded successfully after the intrathecal injection without supplementary epidural injection. The MLAD was calculated using the Dixon and Massey method. We collected too, motor block (Bromage scale evolution in time), anesthetic times (to perform the technique and from technique to start of surgery), and surgery times, hypotension incidence (30% fall in systolic blood pressure). These variables were compared among groups with one way ANOVA test.
Results and Discussion: We studied a total of 93 patients: Group B: n = 30, Group LB n = 26, Group R n = 37. Groups are homogeneous in age, sex, body mass index, ASA physical status, basal systolic blood pressure, and anesthetic and surgery times. The MLAD was 7.85 mg in group B, (IC95% 7.217–8.483 mg.), 7.65 mg in Group LB (IC95% 7.132–8.168 mg.) and 9.0625 mg in group R (IC95% 6.5545–11.5705 mg.). Motor block showed differences after 90 minutes in Group R patients (p = 0,003). Hypotension, nausea or emesis did not show differences among groups.
Conclusion(s): In intrathecal anaesthesia for TKA surgery, ropivacaine is less potent and provokes less motor block than levobupivacaine and bupivacaine, while the potency is similar between levobupivacaine and bupivacaine
References:
1 Dixon WJ, Massey FJ. In: Introduction to statistical analysis. 1983: 426–41.
2 Sell A et al. Acta Anaesthesiol Scand 2006;50:217–21.

8AP3-7

Levobupivacaine versus ropivacaine for epidural analgesia after total hip replacement

D. Ologoiu, I. Grecu, L. Tiganiuc, A. Constantinescu

Anesthesiology and Intensive Care, Clinical Emergency Hospital of Bucharest, Bucharest, Romania

Background and Goal of Study: The aim of this prospective, randomized, double blind trial was to evaluate the efficacy and safety of ropivacaine and levobupivacaine administered by continuous epidural infusion for postoperative analgesia in patients undergoing total hip replacement.
Materials and Methods: After IEB approval and patient informed consent, 42 patients ASA III–IV scheduled for total hip replacement under combined spinal-epidural anesthesia were enrolled over a 4 month period (May–Aug 2008). At end surgery, patients were randomly assigned to 2 groups: group R (n = 20) received ropivacaine 0,2% and group L (n = 22) received levobupivacaine 0,125%. Both groups received continuous lumbar epidural analgesia, at a rate of 6 ml/h, for 48 hours postoperatively. If pain on VAS at rest or mobilization was ≥4, a 5 ml bolus was given on epidural catheter and if this was insufficient, 100 mg tramadol iv bolus was supplemented, up to 300mg/d. Primary endpoints were VAS at rest and mobilization, number of epidural boluses, tramadol consumption, haemodynamic stability and incidence of motor block. For statistic analysis SPSS 13.0 was used and $p < 0.05$ was considered significant.

Results and Discussion: The two groups were similar regarding demographics, level of sensory block and minor side effects (nausea and vomiting). Postoperative hemodynamic parameters were stable in all patients. Motor block was not seen. No epidural boluses were needed in group L, while 4 patients in group R required 1 bolus each (p = 0.058). The L group had lower tramadol consumption 58.45 ± 23.25mg vs. 69.10 ± 32.44mg, but not statistical significant. VAS at rest and mobilization was similar in both groups.

VAS at mobilization

Group (n)	6h	12h	24h	36h	48h
Group R (20)	4.12 ± 1.26	3.56 ± 1.24	4.90 ± 1.25	4.02 ± 1.89	3.12 ± 1.16
Group L (22)	3.66 ± 1.58	3.68 ± 1.35	4.12 ± 1.50	3.98 ± 2.04	3.16 ± 1.48

Conclusion(s): Levobupivacaine 0.125% in continuous epidural infusion provides similar pain relief as 0.2% ropivacaine infusion within first 48h after total hip replacement, with no adverse effects.

References:

1 Perduto VA, Baroncini S, Montanini S et al. Eur J Anaesth 2003; 20:979–983.
2 Kehlet H. Br J Anaesth 1997; 78:606–617.

8AP3-8

Changes in epidural pressure according to E-QST and respiratory situations

A. Imoto, T. Yokoyama, T. Yatabe, K. Kido, K. Yamashita

Department of Anesthesiology and Critical Care Medicine, Kochi Medical School, Nankoku, Kochi, Japan

Background and Goal of Study: The loss-of-resistance test is the most popular method for identifying the epidural space, but this method recognize only the change of resistance and cannot confirm epidural puncture. Therefore, we developed a new method to confirm epidural puncture by assessing indirect changes in epidural pressure using the Queckenstedt-test[1)] procedure (E-QST[2)]), which increases subarachnoid pressure by compressing the internal jugular veins. In the current study, we investigated the effect of breathing and positive airway pressure on the change in epidural pressure in patients.

Materials and Methods: Patients (ASA PS I–II) undergoing elective surgery with epidural anesthesia were enrolled for this study. For 20 patients, epidural puncture using the loss-of-resistance test was performed in right lateral position after induction of anesthesia, and epidural puncture was confirmed by by E-QST. The epidural pressue was monitored through a Tuohy needle to confirm epidural puncture during E-QST. Then, airway pressure increased to 10, 15, 20 or 25 mm Hg and was kept for 5 seconds. The changes in the epidural pressure according to these positive airway pressures were recorded. In 10 patients, epidural puncture was performed before induction of anesthesia. The changes in the epidural pressure according to deep breathing were also recorded.

Results and Discussion: In 20 anesthetized patients (12 male and 8 female, 70 ± 8 year-old, 156 ± 9 cm in heigt and 57 ± 12 kg in weight), the baseline in the epidural pressure was 5.6 ± 5.6 mm Hg (range: 0–20 mm Hg) and the epidural pressure increased by 4.4 ± 2.1 mm Hg (range: 2–9 mm Hg) during E-QST. The epidural pressure increased 2.6 ± 0.5, 4.3 ± 0.7, 6.4 ± 1.4 and 8.5 ± 1.7 mm Hg according to the increase 10, 15, 20 or 25 mm Hg in the airway pressure. In 10 conscious patients (6 male and 4 female, 45 ± 15 year-old, 165 ± 9 cm in heigt and 62 ± 8 kg in weight), the baseline in the epidural pressure was 5.3 ± 3.5 mm Hg (range: 0–11 mm Hg) and the epidural pressure increased by 3.8 ± 2.0 mm Hg (range: 2–7 mm Hg) during E-QST. Decrease by 1–2 mm Hg in the epidural pressure was observed corresponding to the inspiratory phase. In the deep breathing, this decrease in the epidural pressure was 3–4 mm Hg.

Conclusion(s): In all 30 cases, epidural pressure increased during E-QST. Epidural pressure increased by positive pressure ventilation, and decreased by spontaneous breathing.

References:

1 Queckenstedt H. Deuche Zeitshaft fur Nervenheilkunde 1916;55:325–33.
2 Yokoyama T, et al. Acta Anaesthesiol Scand. 200;52:256–61.

8AP3-9

The anatomy of the thoracic spinal canal in different postures: An MRI investigation

T. van Zundert, R. Lee, C. Botha, A. van Zundert, P. Wieringa

Department of Biomechanical Engineering, 3ME, Delft University of Technology, Delft, Netherlands

Background and Goal of Study: The goal of this study was to investigate, with magnetic resonance imaging (MRI), the modal anatomical positions of the spinal canal (spinal cord, thecal tissue, etc.) in various postures.

Materials and Methods: Ten volunteers (4 female (age: 28 ± 6 years, weight: 57 ± 4kg, height: 165 ± 5cm), 6 male (age: 40 ± 17 years, weight: 84 ± 9kg, height: 182 ± 5cm) were imaged in an f-MRI scanner in supine, laterally recumbent, and sitting (head down) positions. Both axial and sagittal slices of the thoracic and lumbar spine were measured for the relative distances between anatomical structures, including dura and spinal cord.

Results and Discussion: The posterior dura – spinal cord distance is significantly greater in the middle thoracic region than at upper and lower thoracic levels for all postures of the volunteers ($p < 0.05$). Furthermore, there is variation in distances between the structures important for neuraxial anesthesia between the different volunteers postures ($p < 0.05$), specifically by placing the patient in a head-down sitting posture (as commonly done) the separation of not only the vertebral processes but also the dura and spinal cord is increased.

Conclusion(s): The spinal cord follows the straightest line through the imposed geometry of the spine; accordingly there is relatively more (than at upper thoracic and lumbar levels) posterior separation of cord and surrounding thecal tissue at mid-thoracic levels. Placing a patient in a position that accentuates the thoracic curvature of the spine (i.e., sitting head-down) increases the posterior separation of the spinal cord and dural sheath. This may have implications for neuraxial anesthesia techniques. (1)

Reference:

1 van Zundert AA, Stultiens G, Jakimowicz JJ et al. Laparoscopic cholecystectomy under segmental thoracic spinal anaesthesia: a feasibility study. Br J Anaesth 2007;98: 682–6.

8AP3-10

Heart rate variability may predict high risk of hypotension due to thoracic epidural anaesthesia

R. Owczuk, M. Steffek, M. Wujtewicz, T. Marjanski, M. Wujtewicz

Department of Anaesthesiology and Intensive Therapy, Medical University of Gdansk, Gdansk, Poland

Background and Goal of Study: Hypotension related to spinal and epidural anaesthesia is commonest side effect of these procedures, and is mainly consequence of preganglionic sympathetic fibers blockade. It is known that sympathetic tone, expressed as heart rate variability, predicts severe hypotension after spinal blockade (1). Thee aim of this study was to establish if similar prediction is observed for thoracic epidural anaesthesia (TEA).

Materials and Methods: 24 males (ASA physical status I or II; mean age 54 ± 7.6 years, mean body mass 74 ± 8 kg) scheduled for thoracic surgery were recruited to take part in the study. High thoracic epidural blockade was obtained with 0.5% isobaric bupivacaine solution (8–12 ml). ECG acquisition was performed with a sampling frequency of 10000 samples per second per channel. Analysed were HRV parameters obtained before TEA and mean arterial pressure (MAP) value observed at the moment of T1 level blockade occurrence. MAP decrease greater than 20% (when compared with initial value) was adopted as significant. Logistic regression method (quasi-Newton and Rosenbrock estimation) was used for the assessment of the risk of significant MAP fall. $P < 0.05$ was considered to be significant.

Results and Discussion: No total power, low frequencies (LF) and high frequencies (HF) were connected with significant risk of blood pressure drop (p values: 0.45, 0.48, 0.46, respectively). The only independent risk factor for significant MAP decrease was LF/HF ratio ≥ 2.5 (p = 0.04, odds ratio = 5.8 [95% CI: 1.2–37.8]). Interestingly, univariate analysis revealed that initial MAP value was not connected with significant blood pressure fall (p = 0.15), while it was determined but initial heart rate frequency (p = 0.02).

Conclusion(s): LF/HF ratio may be a tool to detect patients at high risk of hypotension due to TEA.

Reference:

1 Hanss R, Bein B, Weseloh H, et al. Anesthesiology, 2006; 104: 537–45.

8AP3-11

Clinical comparison between midline and paramedian epidural catheterizations at the lumber vertebral level

A. Ogura, T. Saito, Y. Oi, T. Inoue

Anesthesiology, Shizuoka Red Cross Hospital, Shizuoka, Japan

Background and Goal of Study: The aim of the study was to investigate the difference of the incidence of complications/problems between midline (MA) and paramedian (PA) approaches for lumbar epidural catheterization, and to predict the distance from the skin to the epidural space (SED).

Materials and Methods: After obtaining IRB approval and informed consent, 320 adult patients were enrolled in the study. Epidural catheterization was performed using both approaches in all patients. The first approach for epidural puncture was decided at randomly. The catheter introduced by the first approach was withdrawn, and that introduced by the second approach was used for anesthesia. Patients were placed in a moderate chest-knee position.

The epidural puncture was performed with an 18-G Tuohy needle in the L3-4 vertebral interspace. MA needle was inserted at the midpoint between adjacent spinous processes. In PA, the insertion point of the needle was 1.0 cm lateral to the cranial part of the L4 process. The epidural space was identified by the loss-of-resistance technique with saline. SED was measured in each approach. In PA, vertebral lamina distance (SLD) was recorded prior to identification of the epidural space. Number of attempts, technical difficulties and incidence of complications during catheterization were also recorded. Statistics: The data are expressed as mean ± SD. SED and number of attempts obtained from both approaches were analyzed by paired t-test. Chi-square analysis, when appropriate or Fisher's exact test was used to assess statistical significance. $P < 0.05$ was considered significant.

Results and Discussion: During epidural catheterization, there were no major complications noted in any patient. Statistically significant differences were observed between the two approaches for the following factors: resistance to insertion of the catheter (94 in MA, 3 in PA ($P < 0.01$)); blood in catheter initially (16 in MA, 3 in PA ($P < 0.01$)) and transient paresthesia (15 in MA, 1 in PA ($P < 0.01$)). In the study, SED of PA was longer than that of MA (MA: 4.4 ± 0.6 cm, PA: 4.7 ± 0.6 cm ($P < 0.001$)). Measured SLD was 4.0 ± 0.6 cm.

Conclusion(s): Because the needle orifice points straightforward the cephalad direction, complications during catheter introduction rarely occur using PA.

8AP4-1

IV sedation and sciatic nerve block: The choice of drug is decisive to improve block performance

A. Salces y Nedeo, B. Bataille, A. Richez, J. Magues, R. Fuzier

Department of Anaesthesia and Critical Care, CHU Purpan, Toulouse, France

Background and Goal of Study: Intravenous sedation just before realisation of a peripheral nerve block is a common and widespread practice despite the lack of evidence concerning its interest or efficacy. No clinical study focused on the effects of such a sedation on block performance, and, eventually, on the choice of the best drug.

Materials and Methods: In this prospective double-blinded study, we assessed the efficacy of sedation injected intravenously five minutes before starting a parasacral sciatic nerve block. 80 patients undergoing below knee surgery under parasacral sciatic nerve and femoral nerve blocks were randomly allocated to one of the four groups: 2 ml of saline + 2 ml of saline (group placebo), 2 ml of saline + 0,1 µg/kg of sufentanil (group sufentanil), 2 ml of saline + 0,02 mg/kg of midazolam (group midazolam), 0,1 µg/kg of sufentanil + 0,02 mg/kg of midazolam (group sufentanil + midazolam). All blocks were performed using a 100-mm short bevel needle connected to a nerve stimulator (2 Hz, 100 µsec). Location of the needle was judged adequate when current < 0.6 mA still elicited a distal tibial motor response. 25 ml of 1% mepivacaine was injected on sciatic nerve and, 15 ml on femoral nerve. Parameters assessment were time to perform the block (min), number of needle redirections, pain (VAS), sedation and memory scores. $P \leq 0.05$ was considered significant.

Results and Discussion: All groups were similar with respect to demographic and surgical data. As compared to control group (10.7 ± 7.6 min), time to perform the block was shorter in sufentanil and sufentanil + midazolam groups (6.6 ± 4.7 min, $p = 0.05$ and 5.6 ± 3.9 min, $p = 0.01$, respectively), with no difference in midazolam group (6.9 ± 4.5 min, $p = 0.11$). Number of needle redirections, pain and sedation scores, adverse events, and success rates were similar in all groups. Sufentanil alone or associated altered memory scores as compared to control (respectively $p = 0.02$ and $p = 0.007$).

Conclusion(s): This study confirms that iv sedation before sciatic nerve block improved block performance. Sufentanil, but not midazolam, halved the time to perform the block, with no sedative effect. Surprisingly, more memory disturbances were encountered with sufentanil.

8AP4-2

Glutamate release and neurological impairment following intrathecal administration of lidocaine and bupivacaine in rats

C. Cherng, C. Wong

Anesthesiology, Tri-Service General Hospital, Taipei, Taiwan

Background and Goal of Study: Local anaesthetics-induced direct neurotoxicity is a potential complication of spinal anaesthesia. Lidocaine is more neurotoxic than other local anaesthetics. High concentrations of glutamate are suggested to be neurotoxic. In this study, using in vivo microdialysis, we examined the changes of glutamate concentration in the cerebrospinal fluid (CSF) after lidocaine and bupivacaine intrathecal administration in the rat.

Materials and Methods: Three days before experiment, the animals were intrathecally implanted with a loop microdialysis probe and a catheter. The rats without neurological sequelae were used. Both in lidocaine and bupivacaine groups, twenty four male Wistar rats were divided into 4 groups (N/S, 2.5%, 5%, 10% of lidocaine and N/S, 0.25%, 0.5%, 1% of bupivacaine), 6 rats in each. After 30 min of equilibrium of the microdialysis system, 20 mL of the normal saline or study drugs was injected through the intrathecal catheter, and then the CSF dialysate samples were collected every 10 min for 2 hours. Glutamate was measured by HPLC. Postoperatively, tail-flick test was performed every day for 4 days.

Results and Discussion: Lidocaine, especially of high concentrations (5% and 10%), produced a significant increase of glutamate concentration in the CSF during the whole observation period and the increase was in a concentration-dependent manner. Bupivacaine has no change in all studied concentrations. The latency of tail-flick was significantly increased in the 5% and 10% of lidocaine groups for 4 days, but not in bupivacaine groups. According to the results of high concentration of lidocaine inducing increased glutamate release and decreased tail-flick latency, we suggest that glutamate may be involved in the mechanisms of lidociane-induced neurotoxicity.

Conclusion(s): Intrathecal lidocaine produces concentration-dependent glutamate release and neurologic impairment in rats, but not bupivacaine.

8AP4-3

Serum concentration of lidocaine after transversus abdominis plane block

T. Komatsu, N. Kato, Y. Shibata, S. Kurokawa, Y. Fujiwara

Department of Anesthesiology, Aichi Medical Unviersity School of Medicine, Nagakute, Aichi, Japan

Background and Goal of Study: Transversus abdominis plane (TAP) block has been reported to be effective for postoperateive analgesia for patients undergoing surgery involving midline abdominal wall incision [1]. As large doses of local anesthetics are needed in TAP block, the risk of systemic toxicity of local anesthetics, as a result of absorption into circulation, should always be considered. The objective of this study was to investigate the serum concentration of lidocaine after TAP block.

Materials and Methods: After institutional approval and written informed consent, 12 patients (American Society of Anesthesiologists physical status I–II) undergoing gynecological laparoscopic surgery under general anesthesia supplemented with TAP block were enrolled in this study. After induction of general anesthesia with propofol (target controlled infusion at 2.5–3.5mcg/ml), remifentanil (0.1–0.25mcg/kg/min) and vecuronium, ultrasound guided bilateral TAP block was performed with 20ml of 1% plain lidocaine on each side. Thereafter, 2 ml of venous blood sample was obtained at 1, 5, 15, 30, 60 and 120min after the block. Then the serum concentration of lidocaine was determined using fluorescence polarization immunoassay (COBAS INTEGRA 800, Roche Diagnostics, S.L., Barcelona, Spain).

Results and Discussion: Peak of mean serum concentration of lidocaine occurred 30min after the block (3.6 ± 0.7mcg/ml). The individual peak serum concentration (Cmax) in all patients ranged between 2.7 and 5.5mcg/ml. In all patients Cmax was achieved 15–60min after the block. The highest serum concentration of lidocaine (5.5mcg/ml) was recorded 15min after the block.

Conclusion(s): TAP block was associated with significant increase in serum concentration of local anesthetics. The highest concentration of lidocaine recorded in this study was 5.5mcg/ml, which was just above the therapeutic range for antiarrhythmic effect of lidocaine (2–5mcg/ml) and high enough to produce adverse effect of lidocaine [2]. Recently, 1.3–2.7mcg/ml of lidocaine has been reported to reduce the sevoflurane requirement, postoperative abdominal discomfort, pain on movement [3]. We suggest that considerable portion of analgesic effect of TAP block might depend on the rise in serum concentration of local anesthetics.

References:

1 Anesth Analg.2007;104:193–7.
2 Circulation 1974;50:1217–30.
3 Anesthesiology 2007;106:11–8.

8AP4-4

The effect of a new topical local anaesthetic delivery system on forearm skin blood flow reactivity

M. Wiles, S. Dobson, I. Moppett

Anaesthesia, University of Nottingham, Nottingham, Notts, United Kingdom

Background and Goal of Study: Different local anaesthetics have varying effects on vascular tone. A potential benefit of regional blockade is improved microvascular blood flow, but it is not clear whether this effect occurs with all topical anaesthetics. The transient hyperaemic response (THR) to brief compression of the brachial artery has been described as a way to assess the vascular reactivity of forearm skin (1). Rapydan® is a topical local anaesthetic delivery system containing 7% lidocaine and 7% tetracaine within a plaster that warms the underlying skin, theoretically enhancing skin vasodilation. We hypothesised that local vasodilatation and disturbance of vascular reactivity by Rapydan would be greater than that of other topical local anaesthetic agents.

Materials and Methods: 20 healthy male volunteers were recruited. Non-invasive probes were placed on the volar surface of the forearm and baseline blood flow-flux (arbitrary units, AU) and the transient hyperaemic response (THR) to 20 second occlusion of the axillary artery were measured using laser Doppler flowmetry. The THR ratio (THRR) is net hyperaemic flow divided by net baseline flow. One arm had EMLA (2.5% lidocaine 2.5% prilocaine) applied as an active control and the other had Ametop (4% tetracaine) and Rapydan. Rapydan was removed after 30 minutes and Ametop and EMLA after 60 minutes. Skin blood flow-flux and THRR were then remeasured. Data were analysed using paired t-tests, with $p < 0.05$ taken as significant.

Results and Discussion: The net increase in skin flow-flux was significantly greater for Ametop than Rapydan (119(66) vs. 39(42) AU ($p < 0.001$)). The application of Ametop and Rapydan caused significant increases in skin blood flow-flux (24(12) to 143(69) ($p < 0.001$) and 16(5) to 55(43) ($p = 0.001$) AU) and decreases in THRR (2.7(1.2) to 1.1(0.3) ($p < 0.05$) and 2.8(0.8) to 1.5(0.9) ($p = 0.001$)). As previously shown EMLA had no significant effect on flow-flux or THRR (12(4) to 13(8) and 6.3(15.4) to 3.2(1.3)). (Mean values (SD)).

Conclusion(s): Both Ametop and Rapydan alter skin vascular reactivity and blood flow, but EMLA does not, suggesting vasodilatation occurs independently of local anaesthesia. Despite the heating process in Rapydan delivery system, the topical application of Ametop for 60 minutes causes a greater change in skin blood flow-flux than that seen after the 30 minute application of Rapydan.

Reference:

Wiles MD, Dickson E, Moppett IK. Transient hyperaemic response to assess vascular reactivity of skin: effect of topical anaesthesia. Br J Anaesth 2008; 101: 320–3.

8AP4-5

Subclinical neurocognitive dysfunction after carotid surgery under general and loco-regional anaesthesia

B. Tomaševic, I. Hromatko, M. Tadinac, B. Mazul-Sunko, Z. Ivanec

Deparment of Anaesthesiology and Intensive Care, University Hospital Sestre Milosrdnice, Zagreb, Croatia

Background and Goal of Study: The incidence of severe neurological complications after carotid endarterectomy (CEA) is low, but the occurrence of subclinical neurocognitive dysfunction and its relation to the type of anesthesia remains unclear. Therefore, we made a comprehensive psychometric testing among patients who underwent CEA under general or regional anaesthesia.

Materials and Methods: 40 patients were randomly asigned to recieve either general anaesthesia or superficial cervical block. General anesthesia was induced in a standardized manner. Loco-regional anaesthesia was performed infiltrating superficial cervical block. Psychological testing included Raven's Progressive Matrices, Digit Span (forward and backward), Digit Symbol and a test of spatial percepton. Patients were tested 24–48 hours before and 24 hours after surgery. S 100B protein, which is known to be correlated with neurological damage, was also determined.

Results and Discussion: All patients had uncomplicated clinical course. The type of anaesthesia did not influence cognitive function in any test. S 100B protein level was not correlated with any psychological test, either. The duration of surgery and carotid clamping did not influence postoperative cognitive function. The only intraoperative variable relevant for neurocognitive function was shunt insertion. Analysis of variance for repeated measurements with anaesthesia and shunt as independent variables, and age and general intelligence as covariates, showed that patients with inserted shunt had significantly worse results in the test of spatial perception (meanbefore 42,7 ± 36,4, meanafter 113,2 ± 112,2). Age and general intelligence correlated with results on some of psychological tests. The Digit Symbol test was worse after surgery (meanbefore 34,2 ± 14,1, meanafter 31,5 ± 14,9), with a significant effect of general intelligence as a covariate ($F = 5,3$; $r = 0.42$, $p < 0,5$). Test of concentration of attention after surgery showed only a negative effect of age ($F = 7,2$; $r = – 0.45$, $p < 0,5$).

Conclusion(s): 1. The type of anaesthesia did not influence neurocognitive function 24 hours after carotid endarterectomy. 2. Shunt insertion is the only intraoperative variable related to subclinical neurocognitive dysfunction. Patients with shunt had worse results in tests of spatial perception. 3. Age and general intelligence were related to postoperative neurocognitive function: Digit Symbol test, although worse after surgery, was better in patients with higher general intelligence, and concentration of attention was worse in older patients.

8AP4-6

Respiratory function after lung surgery: Is an intercostal nerve block plus intravenous analgesia with morphine as effective as epidural anaesthesia with ropivacaine/sufentanil? A prospective randomized clinical study

D. Hock, G. Gorsewski, S. Kühn, E. Baltes, R. Meierhenrich

Klinik fuer Anaesthesiologie, Universitaetsklinikum Ulm, Ulm, Germany

Background and Goal of Study: Epidural anaesthesia (EDA) is considered to be the "golden standard" to maintain respiratory function after lung surgery and to reduce number of pulmonary complications. An intraoperatively performed intercostal nerve block (ICB) plus intravenous patient controlled analgesia (IV-PCA) with opioids could be an less time consuming and safer alternative to EDA, but data evaluating the postoperative respiratory function are scarce. The aim of the present study was to investigate if an ICB plus IV-PCA with morphine is as effective as an EDA with respect to respiratory function after lung surgery.

Materials and Methods: With approval of the local ethic committee 83 patients were randomly allocated to the EDA-Group (n = 40) or ICB-Group (n = 43). Patients in the ICB-Group received intraoperatively a 5 segment intercostal block with 30 ml ropivacaine 0.75% and postoperatively IV-PCA with morphine. Patients in the EDA Group received intraoperatively ropivacaine 1% through a thoracic epidural catheter (TH6-TH8) and postoperatively patient controlled EDA with ropivacaine 0.2% and sufentanil 2µg/ml. Forced vital capacity (FVC), forced expiratory volume in 1s (FEV1) and peak expiratory flow (PEF) were used to analyze respiratory function preoperatively (Pre-OP), at the evening of operation (post-OP) and at the first four postoperative days (POD 1–4).

Results and Discussion: The median values of FVC, FEV1 and PEF are given in the table. Overall postoperatively the EDA-Group demonstrated a better respiratory function compared to the ICB-Group. At the POD 2 all respiratory parameters measured were significantly higher in the EDA-Group (*; $p < 0,05$).

Table

	pre-OP	post-OP	POD 1	POD 2	POD 3	POD 4
FVC						
EDA-Group	2,78	1,63	1,67	1,62	1,71	2,04
ICB-Group	3,07	1,39	1,35	1,31	1,53	1,56
p-value	0,670	0,087	0,017*	0,045	0,292	0,084
FEV1						
EDA-Group	2,23	1,31	1,23	1,22	1,29	1,39
ICB-Group	2,30	1,00	0,98	0,97	1,17	1,12
p-value	0,954	0,065	0,126	0,027*	0,228	0,045*
PEF						
EDA-Group	5,07	2,43	2,51	3,04	2,88	3,10
ICB-Group	4,57	2,03	2,30	2,17	2,86	2,42
p-value	0,940	0,086	0,421	0,028*	0,495	0,044*

Conclusion(s): Regarding the respiratory function ICB with subsequent IV-PCA is not as effective as patient controlled EDA in patients undergoing lung surgery. This may have implications for postoperative pulmonary complications and morbidity.

8AP4-7

The QTc changes during continuous epidural anesthesia with ropivacaine or levobupivacaine for total knee arthroplasty

S. Kim, J. Choi, T. Rhyu, W. Baek, J. Hong

Anesthesiology and Pain Medicine, Kyungpook National University Hospital, Daegu, Republic of Korea

Background and Goal of Study: Of all the amide local anaesthetics, bupivacaine is said to be the most cardiotoxic. Recently, the isoform of bupivacaine, levobupivacaine, is replaced to lessen this toxicity. The aim of this study was to investigate the clinical efficacy and electrophysiologic differences of levobupivacaine compared with ropivacaine for epidural anesthesia. We also evaluated the effects of sedative dose propofol on QTc changes in both group.

Materials and Methods: After the approvement from the Institutional Ethics Committee, thirty-two patients (ASA Class I/II) scheduled for elective total knee arthroplasty were prospectively enrolled to receive, in a randomized and double-blind fashion, either 16 mL of ropivacaine 7.5 mg/mL or 16 mL of levobupivacaine 7.5 mg/mL for epidural anesthesia. And while surgery was proceeded, the patients were infused sedative dose of propofol (1.5 to 2.0 µg/ml). The changes in conductivity and myocardial contractility were monitored using an interpretive electrocardiograph (which measured PR interval, QRS duration, and QT interval corrected for heart rate).

Results and Discussion: QTc interval changes after epidural anesthesia with each local anesthetic was 427 ± 21.98 ms to 462 ± 28.31 ms in levobupivacaine group, 401.09 ± 20.25 ms to 396.23 ± 30.94 ms in ropivacaine group. The QTc interval during propofol infusion was 443.65 ± 27.55 ms in levobupivacaine group and 396.56 ± 12.87 ms in ropivacaine group. No significant hemodynamic changes were seen between groups.

Conclusion(s): Even clinical evidence was not seen, prolonging the QTc intervals was prominent in the levobupivacaine group. Propofol seemed not influence on QTc intervals in each group.

8AP5-1

Anaesthesia for total knee arthroplasty: Efficacy of single-injection or continuous lumbar plexus associated with sciatic nerve blocks

L. Frassanito, A. Vergari, A. Messina, C. Caputo, B. Gunnella

Anaesthesiology, Policlinico A. Gemelli – Università Cattolica del Sacro Cuore, Rome, Italy

Background and Goal of Study: Total knee arthroplasty (TKA) often results in marked postoperative pain[1]. Few report investigated the use of lumbar plexus block associated to sciatic nerve block as unique tool of anaesthesia for TKA[2]. Moreover it is not clear whether single injection nerve blocks would be as effective as continuous perineural infusion[3]. We compared Tramadol consumption, pain and satisfaction after primary TKA in patients who received single injection or continuous lumbar plexus and sciatic nerve blocks.

Materials and Methods: Forty-four patients scheduled for unilateral total knee arthroplasty were allocated to single shot group (group A) or to catheter group (group B) using a computer-generated randomization list. Lumbar plexus was performed as described by Chayen. In group B a catheter was left in situ. Sciatic nerve block was performed using Labat' s tecnique. A solution of 0.6% ropivacaine was used. Postoperatively, in group B the LA infusion solution (ropivacaine 0.2%) was started at 10 mL/h for 48 hours. All patients received Acetaminophen 1 gr i.v. four times daily, ketorolac i.m. 30 mg three times per day, and i.v. tramadol 100 mg in case of inadequate analgesia. Data were analyzed using Student t test ord. two-way analysis of variance (ANOVA) for repeated measures with time and treatment as the 2 factors. Post hoc comparisons were performed by Bonferroni test. Statistical significance for all test was a P value < 0.05.

Results and Discussion: All patients reported being satisfied with their anaesthetic management. Although pain scores appeared lower in the active infusion group, the differences did not reach statistical significance. Total tramadol consumption was higher in group A (mean value 236 ± 155) than group B (185 ± 101). No significant difference was found between these different therapeutic strategies (P = 0.06). On the contrary, ANOVA showed a significant effect of time ($P < 0.0001$) as well as a significant treatment-by-time interaction ($P = 0.0006$).

Table 1.

Time	Group A	Group B
6 h	0	0
12 h	1.7 ± 2	1.8 ± 2.5
24 h	5 ± 2.1	3.7 ± 2
48 h	3 ± 2.1	4.8 ± 1.2
72 h	1.8 ± 3.1	1.6 ± 0.6

VAS (mean value ± SD)

Conclusion(s): This study confirms that the combination of lumbar plexus with sciatic nerve blocks is safe and effective for TKA. Either single injection or continuous infusion of Ropivacaine in lumbar plexus provides reliable and long-acting anaesthesia and analgesia.

References:

1 Capdevila, Anesthesiology. '99;91(1).
2 Watson, Reg Anesth Pain Med. '05;30(6).
3 Greengrass, Can J Anaesth. '98;45(11).

8AP5-2

Bilateral greater occipital nerve block: A symptomatic treatment of the postdural puncture headache. A prospective, randomised trial

M. López-Vizcayno, B. SanPedro, A. Girones-Muriel, A. Moreno, E. Matute

Anaesthesiology, Hospital Sanitas La Moraleja, Madrid, Spain

Background and Goal of Study: Postdural puncture headache (PDPH) is a complication following unintentional dural puncture during attempted epidural anaesthesia. The rationale for using the Greater Occipital nerve (GON) block as a treatment for cervico-frontal headache comes from the proximity of sensory neurons from the upper cervical spinal cord to trigeminal nucleus caudalis (TNC) neurons and the convergence of sensory input to TCN neurons from both cervical and trigeminal sensory fibres. The aim of this study is to evaluate the utility of the bilateral GON block for the treatment of PDPH.

Materials and Methods: After obtaining Institutional Review Board approval, we included 10 obstetric patients, ASA I–II, with symptoms of PDPH after dural puncture during epidural anaesthesia, in a randomized, controlled trial, in two groups. In Group I (n = 5), we started the treatment of PDPH at the moment of dural puncture with conservative measures (hydratation, caffeine and conventional analgesia). In Group II (n = 5), we began the treatment when the first symptoms appeared, with a bilateral GON blockade (bupivacaine 0.25%, 4 cc, and 20 mg of triamcinolone). We maintained the epidural catheter for infusion of 15 cc of colloid solution bolus in both groups, if needed. We recorded the PDPH pain (visual analogical scale -VAS-) every 8 hours after dural puncture, tolerance to sitting position, the family subjective impression, the need for bolus of colloid solution, the length of hospital stay, and the difference (in days) from the planned hospital discharge. If VAS was equal or greater to 7 for two consecutive measurements, we proposed the execution of an epidural blood patch.

Results and Discussion: We did not find significant differences in any parameters analyzed. The medium VAS after 24 hours of treatment was 4.1 in Group I and 3.7 in Group II. The number of bolus of colloid was: 1.4 bolus per patient in Group I/0.5 in Group II. The hospital stay lasted 1.5 days more than the time schedule, in both groups. In 1 patient in each group we performed an epidural blood patch. The mechanism for the relief of the headache after the GON blockade could be due to a "winding down" of central sensitization when afferent input to the dorsal horn and TCN is temporally reduced.

Conclusion(s): GON block could be useful for the treatment of PDPH. We accept the limitations of our study due to small sample size, but GON block is easy to perform, with quick results and it does not involve any serious complications, so it could be used like other conservative therapies in PDPH.

8AP5-3

Comparison of infraclavicular brachial plexus block with 0.5% levobupivacaine and 0.5% ropivacaine for upper limb surgery

C. Yang, S. Jung, H. Kwon, C. Cho, Y. Lim

Anesthesiology and Pain Medicine, Konyang University Hospital, Daejeon, Korea

Background and Goal of Study: Levobupivacaine has longer duration of sensory and motor block than equipotent dose of ropivacaine for brachial plexus block. This prospective, randomized, double blind study was to compare the clinical effect of infraclavicular brachial plexus block produced by same dose of levobupivacaine and ropivacaine for upper limb surgery.

Materials and Methods: Sixty patients scheduled for upper limb surgery were performed vertical infraclavicular brachial plexus block with 30 ml of 0.5% levobupivacaine (group L) or 0.5% ropivacaine (group R) using nerve stimulator. We recorded degree and duration of sensory (cold) and motor (movements of muscles) block on nerve territories. The quality of block, side effects and complication were assessed.

Results and Discussion: There were no significant differences in frequencies of stimulated nerve type, evolution of sensory and motor block quality, or success rates of block between two group. There was no significant difference in the duration of sensory block, but the duration of motor block was prolonged in levobupivacaine group (P < 0.05). There was no complication in both groups.

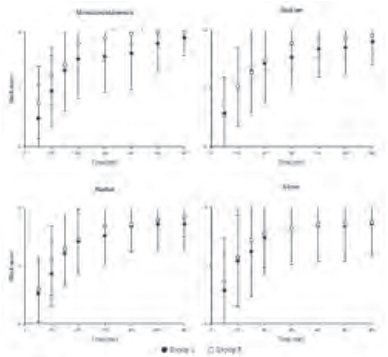


Fig. 1. Evolution of sensory block quality in the territories of the musculocutaneous, median, radial, and ulnar nerves over the 30-min evaluation period. Group L: 0.5% levobupivacaine, Group R: 0.5% ropivacaine. *: $P < 0.05$ between the groups.

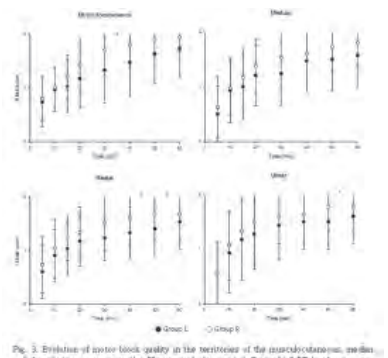


Fig. 2. Evolution of motor block quality in the territories of the musculocutaneous, median, radial, and ulnar nerves over the 30-min evaluation period. Group L: 0.5% levobupivacaine, Group R: 0.5% ropivacaine. *: $P < 0.05$ between the groups.

Quality of infraclavicular brachial plexus block

	Group L (n = 30)	Group R (n = 30)
complete failure	1 (3.3)	1 (3.3)
unsatisfactory block	11 (36.6)	6 (20)
satisfactory block	18 (60)	23 (76.6)

Values are number of patients (%). Group L: 0.5% levobupivacaine, Group R: 0.5% ropivacaine

Duration of sensory and motor block

	Group L (n = 30)	Group R (n = 30)
sensory block (min)	1021 ± 238	920 ± 265
motor block (min)	1023 ± 251	865 ± 199

Values are mean ± SD. Group L: 0.5% levobupivacaine, Group R: 0.5% ropivacaine

Conclusion(s): Levobupivacaine had similar in quality and the duration of sensory block and longer duration of motor block than same dose of ropivacaine.

Reference:

Piangatelli C, De Angelis C, Pecora L, et al. Minerva Anestesiol 2006; 72: 217–21.

8AP5-4

Levobupivacaine 0.5% provides longer analgesia after posterior sciatic nerve bloc than the same dose of ropivacaine in foot and ankle surgery

R. Fournier, A. Faust, Z. Gamulin

Anesthesiology, University Hospitals of Geneva, Geneva, Switzerland

Background and Goal of Study: Levobupivacaine and ropivacaine are 2 left enantiomeric molecules of the family of pipecoloxylidide group. They are frequently used for peripheral nerve blocks because of their safe clinical profile. Levobupivacaine is more lipophilic and theoretically more potent (1) than ropivacaine but clinical studies show controversial results with similar duration of action (2) or slightly longer analgesia (3) with levobupivacaine. We perform this study in order to confirm our clinical impression of higher efficiency of the pure S-enantiomer of bupivacaine. We compare the analgesic characteristics of 20 ml levobupivacaine with 20 ml ropivacaine 0.5% in a posterior sciatic nerve block for foot and ankle surgery.

Materials and Methods: Eighty patients scheduled for foot or ankle surgery, under posterior sciatic and femoral nerve block only, were included in this double blinded study. We performed the posterior sciatic nerve block following Labat landmarks. A plantar flexion of the foot or toes between 0.2 and 0.4 mA was considered appropriate. At this time, either 20 ml ropivacaine 0.5% or 20 ml levobupivacaine 0.5% according to the double-blind allocation were injected through the needle. The delay to obtain a sensory and motor block in both territories of sciatic nerve as well as the duration of action were assessed with the two different solutions. Complete or partial failure of the block were also recorded. The complications such as technical or neurologic problems were noted.

Results and Discussion: Data were compared using the test of Mann-Whitney or Chi square as required and presented as median and ranges or% of patients. The analgesic and anesthetic characteristics of the 2 groups are depicted in table 1. No complications were noted.

Table 1.

	ROPIVACAINE (n = 40)	LEVOBUPIVACAINE (n = 40)	P value
DELAY OF ACTION (min)	17 (3–40)	16 (2–40)	NS
DURATION OF ACTION (min)	1035 (590–1500)	1605 (575–2400)	p < 0.0001
NO RESCUE ANALGESIA (%)	3/40 (7.5)	10/40 (25)	p < 0.034

Conclusion(s): Twenty ml of LEVOBUPIVACAINE 0.5% in posterior sciatic nerve block provides more than 9 hours (570 min) of extra analgesia in foot and ankle surgery than the same dose of ROPIVACAINE. The number of patients needing rescue analgesia at 24h is also significantly higher in the group Ropivacaine.

References:

1 Brau ME et al. Anest Analg 2000; 91 : 1499–505.
2 Casati A et al. Anesth Analg 2002; 94 : 987–90.
3 Casati A et al. EJA 2005; 22 : 452–6.

8AP5-5

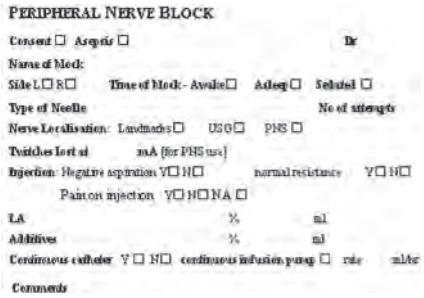
Improvement in the quality of documentation of peripheral nerve blocks

R. Ananthmanohar, R. King

Department of Anaesthetics, ABM University Hospital NHS Trust, Swansea, United Kingdom

Background and Goal of Study: Peripheral nerve blocks (PNB) are widely used for anaesthesia and pain relief. We decided to design a standard format for documentation of PNBs since no uniform template exists, despite their extensive use.

Materials and Methods: 16 Parameters were identified from the available evidence to meet the clinical and legal requirements of PNB documentation[1,2,3,4]. We analysed the quality of documentation of the PNBs performed in our Hospital against this. We developed a standard label for documentation of PNBs after the audit. A re-audit a year later was done to look at the compliance of the label usage and the quality of the documentation.


PERIPHERAL NERVE BLOCK

Consent ☐ Asepsis ☐ Dr

Name of block:

Side L☐ R☐ Time of block:- Awake☐ Asleep☐ Sedated ☐

Type of Needle No of attempts

Nerve Localisation: Landmarks☐ USG☐ PNS ☐

Twitches lost at mA (for PNS use)

Injection: Negative aspiration Y☐ N☐ normal resistance Y☐ N☐

Pain on injection Y☐ N☐ NA ☐

LA % ml

Additives % ml

Continuous catheter Y ☐ N☐ continuous infusion pump ☐ rate ml/hr

Comments

Results and Discussion: Analysis of 52 anaesthetic charts in the first audit revealed the quality of documentation of PNB's was poor and inconsistent. Only 63% of the parameters were documented. The second audit was done a year later after the introduction of the label. We analysed 50 anaesthetic charts. Labels were used in 80% of cases. Quality of documentation had improved to 100% with the use of the label. In the 20% of the charts where labels were not used the quality of documentation was still poor. Only 66% of the parameters were documented. Discussion: Clear and uniform record keeping is an indication of high quality patient care. It also helps to meet the clinical and legal requirements and provide uniformity in teaching and training standards. We believe the label proposed by us is simple and convenient to use reducing the possibility of missing relevant information.

Conclusion(s): We have shown that there is a definite improvement in the quality of documentation of PNB's with the use of standard sticky labels. We are in the process of incorporating this label as a printed addition to our anaesthetic chart.

References:

1 AP Adams; A revised Anaesthesia Record Set; Newsletter RCOA; March 1996; p8–9.
2 JC Gerancher et al; Development of a standardized PNB procedure note form; Regional Anaesthesia and Pain Medicine; Vo1 30; Feb 2006; p67–71.
3 Mayfield JB; Diagnosis and management of PNB complications; International Anesthesiology Clinics; Vo143; Summer 2005; p119–126.
4 Documentation of Peripheral Nerve Blocks- www.nysora.com.

8AP5-6

Comparison between continuous femoral nerve block and posterior lumbar plexus block in patients undergoing arthroscopic anterior cruciate ligament reconstruction using a hamstring autograft

K. Hara, S. Sakura, K. Doi, S. Tadenuma, Y. Saito

Anesthesiology, Shimane University, Izumo, Shimane, Japan

Background and Goal of Study: Arthroscopic anterior cruciate ligament (ACL) reconstruction using a hamstring autograft requires blockade of obturator nerve which provides sensory innervation to the hamstring and the knee joint. It has been shown that, in addition to the sciatic nerve block, blockade of the entire lumbar plexus or the combination of femoral and obturator nerve blocks can provide good quality of analgesia during surgery (1,2). In the present study, we sought to compare the efficacy of two methods, i.e., a postoperative continuous femoral nerve block and posterior lumbar plexus (PLP) block in patients undergoing ACL reconstruction using a hamstring autograft.

Materials and Methods: With IRB approval and informed consent, we studied two groups of patients undergoing ACL reconstruction using an ipsilateral hamstring autograft: group F (n = 19) received combined femoral, lateral femoral cutaneous, obturator, and sciatic nerve blocks; group L (n = 20) combined PLP and sciatic nerve blocks. All the blocks were conducted using a linear (6–13 MHz) or convex (2–5 MHz) ultrasound transducer and M-turbo ultrasound system (Sonosite Inc.). Patients were sedated with propofol or midazolam during surgery. After surgery, continuous infusion of 0.2–0.25% ropivacaine via the femoral nerve (group F) or PLP cathetre (group L) was started at 4 – 6 ml/hr with PCA. Measurements included pain at rest and during movement at 24 and 48 h, and the usage of PCA and rescue analgesic during postoperative 48 h, and side effects. Mann-Whitney rank-sum test, Student's t-test and chi-square test were used for statistical analysis.

Results and Discussion: There were no differences between the groups in the number of patients who required fentanyl during surgery, or the number of PCA or rescue analgesic postoperatively, or side effects. VAS pain scores were similar between the two groups except for the score at 48 h during movement which was lower in group F that in group L (median 2.0 vs. 4.0, $P < 0.05$).

Conclusion(s): A continuous femoral nerve block produced slightly superior postoperative analgesia to a continuous PLP in patients undergoing arthroscopic ACL reconstruction using a hamstring autograft. The present results suggest that the blockade of obturator nerve is not so important for postoperative pain relief as it is for intraoperative analgesia.

References:

1 Hara K, Sakura S, Ota J, et al. Eur J Anaesthesiol 2008; 25 (Suppl 44): A117
2 Hara K, Sakura S, Ishida R, et al. Anesthesiology 2008; 109: A336.

8AP5-7

Incidence of atypical musculo-cutaneous nerve location (accolated or fused with the median nerve) in 315 axillary blocks under ultrasound

F. Remerand, C. Couvret, J. Laulan, M. Laffon, J. Fusciardi

Groupement d'Anesthésie Réanimation Chirurgicale, Hôpital Trousseau, Université F. Rabelais, CHU Tours, Tours Cedex, France

Background and Goal of Study: Axillary block is one of the most common block for locoregional anaesthesia. In reference textbooks, ulnar, radial and median nerves (MN) are located in a common sheath, surrounding the axillary artery. The musculocutaneous nerve (MCN) is classically located outside this sheath, in the coracobrachialis. In one recent case report, an atypical MCN (at the vicinity of the MN) was described during an axillary block under ultrasound (*J Clin Anesth* 2006; 18: 541–544). Published data concerning the incidence and characteristics of such anatomic pattern come from autopsic studies (*Clin Anat* 2002; 15: 11–17). The goal of our study was to evaluate the bedside incidence of this atypical location of MCN in patients planned for upper limb surgery under axillary block, by using ultrasound and neurostimulation.

Materials and Methods: After local ethical committee approval and patient consent, all patients scheduled for upper limb surgery under axillary block performed under ultrasound by the same anaesthesiologist were included. After identification of MCN, MN, ulnar and radial nerves using a Logiq Book™ (General Electric, France), a picture was stored before injection. A short neurostimulation (0,5 à 1 mA) was used to confirl atypical nerve location. The following parameters were collected : MCN accolated to the MN before and after injection of local anaesthetics, neurostimulation, age, weight, heigth, sex, side, quality of the block. Statistical analysis was performed using Fisher or Student tests.

Results and Discussion: During the study, 315 axillary blocks were analyzed. The MCN and the MN appeared as a common trunk in 48 cases (15%). In 32 cases of 48 (67%), this trunk separated into MCN and MN after injection of 9 to 15 mL of local anesthetics. A common trunk was still visible after injection in 12 cases of 48 (25%). It was difficult to distinguish if one or two nerves were present after injection in 4 cases. Anesthesia was successful in all these 48 cases. Characteristics of the 48 patients with a common trunk did not differ from the ones with a classical location of MCN.

Conclusion(s): During axillary block, the MCN is accolated or fused with the MN in one case of six. This pattern has to be known by anaesthesiologists, mainly the ones performing blocks under neurostimulation without ultrasound, because it could favour unsuccessful and repeated punctions, looking for the MN or the MCN.

8AP6-1

Lidocaine concentration in cerebrospinal fluid after epidural administration: A comparison between epidural and combined spinal-epidural anesthesia

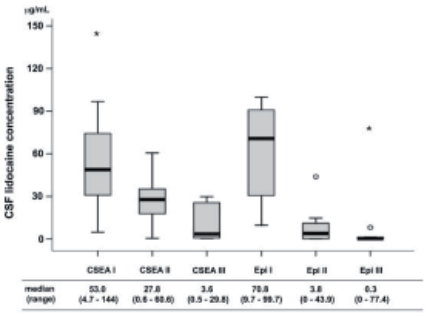
Y. Kamiya, T. Kikuchi, G. Inagawa, H. Miyazaki, T. Goto

Anesthesiology and Intensive Care Medicine, Yokohama City University Graduate School of Medicine, Yokohama, Kanagawa, Japan

Background and Goal of Study: Combined spinal-epidural anesthesia (CSEA) is now a popular technique in obstetric and gynecological surgery. However, there is concern about epidurally administered drugs spreading into the subarachnoid space through the meningeal hole made by the spinal needle. In this study, lidocaine concentrations in cerebrospinal fluid (CSF) at different interspaces were measured with or without preceding spinal anesthesia, 10 min after epidural injection of lidocaine, to investigate the effects of preceding meningeal puncture on CSF concentrations of epidurally administered local anesthetic.

Materials and Methods: Sixty patients scheduled to receive combined spinal-epidural anesthesia were randomly allocated to receive either spinal anesthesia first (Group CSEA) or epidural lidocaine first (Group Epi). Each group was divided into three subgroups in which site of epidural cannulation and spinal tap were separated by one, three, or five interspaces (Sets I, II, and III, respectively). CSF was collected from L4-5 interspace 10 min after 10 mL of 1% lidocaine was administered epidurally. In Group Epi, CSF was collected after epidural administration of lidocaine and before spinal anesthesia. In Group CSEA, spinal anesthesia was performed at L3-4 interspace after epidural cannulation and epidural lidocaine was administered postoperatively, following which CSF was sampled.

Results and Discussion: Lidocaine concentrations in CSF were significantly higher with increasing proximity of epidural injection site to CSF collection site in both groups. There were no significant differences in CSF lidocaine concentrations between Group CSEA and Group Epi in Set I, although lidocaine concentrations were significantly higher in Group CSEA Set II and III patients (see Figure 1).



Conclusion(s): Lidocaine concentration in CSF was similar with or without preceding meningeal puncture beneath the epidural administration site, in spite of probable local anesthetic spread into the subarachnoid space through the meningeal puncture made by the spinal needle.

8AP6-2

Total hip replacement: Are we using the correct dose of Intrathecal morphine?

A. Biswas, M. Walsh, C. Canavan

Department of Anaesthesia, Mayo General Hospital, Castlebar, Mayo, Ireland

Background and Goal of Study: Despite the extensive research demonstrating that Intrathecal morphine provides excellent postoperative analgesia much disparity remains in the amount of the drug being used. Currently in Mayo General Hospital a policy exists within the anaesthetic department recommending that all total hip replacement patients receive Spinal Anaesthesia with Intrathecal morphine. However the amount used varies between each consultant. It is the aim of this audit to compare the analgesic efficacy and side effects of 100mcgs,125mcgs,150mcgs and 200mcgs of Intrathecal morphine used. After receiving ethical approval an audit was carried out using questionnaire on patients undergoing total hip replacement between January 1st 2008 and 30th September 2008.

Materials and Methods: Ninety seven patients (ASA I–III), undergoing total hip replacement were included in this audit. Patients, divided in 4 groups, received 2–3 mls of 0.5% plain bupivacaine intrathecally with 100 mcgs (n = 35) morphine; 125 mcgs (n = 5) morphine;150 mcgs (n = 51) morphine and 200 mcgs (n = 6) morphine hydrochloride respectively. Intraoperatively- All patients received 1 gm paracetamol, 31 patients received Diclofenac Sodium 75 mg in addition. All of them received Dexamethasone 8 mg and Ondansetron 4 mg. Postoperatively each received (n-97) Paracetamol 1 gms qds ± Diclofenac Sodium 75mgs bd. Tramadol 100mgs was administered on a prn basis for moderate pain and oxyocodone 5 mg prn for severe pain. Ondansetron ± Pro chlorperazine, and Chlorpheniramine (for Pruritis) were also prescribed on prn basis. Patients were monitored in the PACU and in the ward for pain relief and side effects like nausea and vomiting, urinary retention, sedation, hypotension, pruritis and respiratory depression.

Results and Discussion: Due to the small number of patients receiving 125 mcgs (n = 5) and 200mcgs (n = 6) of morphine, comparison was only possible between patients receiving 100mcgs and 150mcgs of morphine. The results demonstrated that there were no clinically significant differences in the side effects, however the patients receiving 150mcgs had significantly superior pain relief in comparison to the patients receiving 100mcgs of morphine.

Conclusion(s): Although the side effects were similar, patients receiving 150mgs of morphine experienced superior pain relief than the other group. It

is highly recommended to use 150mcgs of morphine for all the patients and re audit after 4 months to evaluate the effectiveness.

Reference:

1 Optimizing the dose of intrathecal morphine. Anaesth Analg,2003Dec;97(6):1709–15.

8AP6-4

A prospective, randomized comparison of continuous epidural and paravertebral analgesia in thoracic surgery

P. Primieri, A. Galla, R. Petrucci, E. Adducci, E. Gualtieri

Anesthesiology and Intensive Care, Catholic University, Rome, Italy

Background and Goal of Study: The aim of this study was to compare analgesic efficacy and side effects of continuous thoracic paravertebral (TPVB) and epidural blocks (TEA) after thoracotomy. There after the addition of sufentanil to levobupivacaine was evaluated in the TPVB groups.

Materials and Methods: Following the Ethics Committee approval and patients informed consents, 60 patients undergoing lateral thoracotomy were randomly divided into 3 groups: group A received a TPVB with levobupivacaine 0.5% (20 ml) in bolus and 0.25% in continuous infusion (5ml/h); group B received a TPVB with sufentanil 30 µg (1ml) and levobupivacaine 0.375% (19ml) in bolus and sufentanil 1 µg/ml plus levobupivacaine 0.125% in continuous infusion (5ml/h); group C received a TEA with sufentanil 30 µg (1ml) and levobupivacaine 0.375% (19 ml) in bolus and sufentanil 1 µg/ml plus levobupivacaine 0.125% in continuous infusion (5ml/h). TPVB was performed after induction of general anaesthesia, in lateral decubitus, at the T5-T6-T7 levels. At T7 level a like-epidural catheter was placed. In C group epidural catheter was placed before anaesthesia at the T5-T7 levels. Pain was assessed within 72 h by visual analogue score at rest (VASr) and on coughing (VASm). Supplemental analgesic requirement, complications, hemodynamic and respiratory parameters were registered. Statistical analysis was performed by variance and chi-square test.

Results and Discussion: The distribution of pain scores was significantly different between the three groups. Group C had significantly lower VAS pain scores both at rest and on coughing (mean values under 1 and under 2 respectively) than group A and B ($p < 0.01$). The VASr score for the group A ranged from 0 to 2, whereas for the group B from 0 to 1.2; the VASm score for the group A ranged from 0.6 to 2.8, whereas for the group B from 0 to 2.5. Analgesic rescue was significantly higher in the TPVB groups ($p < 0.05$). No hemodynamic or respiratory complications occurred in the three groups. Our results showed a lower pain scores with TEA than TPVB, however TPVB represents a valid alternative to thoracic epidural block and may offer a better side-effect profile. The addition of sufentanil was very efficacious but the mechanism of action is debated.

Conclusion(s): We concluded that TPVB can provide a complete analgesia, comparable to the one obtained by TEA. TPVB is technically easy, safe and very comfortable when performed in general anaesthesia. The addition of sufentanil allows a reduction in local anaesthetic dosages and provides a better analgesia.

8AP6-5

Intrathecal low dose hyperbaric levobupivacaine-sufentanil spinal anesthesia for surgical hip fracture repair in elderly – Hemodynamic stability and quality of anesthesia

K. Oremus, Z. Safaric Oremus, I. Tudoric Deno

Anesthesiology, Akromion – Special Hospital for Orthopaedic Surgery, Krapinske Toplice, Croatia

Background and Goal of Study: Hypotension and bradycardia are most common adverse effects of spinal anesthesia in elderly patients. Intrathecal opioid addition facilitates local anesthetic dose reduction without losing analgesic efficacy of the block. We compared hemodynamic effects and block quality of intrathecal levobupivacaine with sufentanil and glucose to plain isobaric levobupivacaine for hip fracture surgery in elderly patients.

Materials and Methods: Forty ASA II–IV patients aged >70yrs (71–91) scheduled for surgical hip fracture repair were randomized to receive either 10mg isobaric levobupivacaine (Chirocaine® 5mg/ml, Abbott) (group IL) or 5mg levobupivacaine +5µg sufentanil (Sufentanil 5µg/ml, Torrex Chiesi, Austria) + 1ml 10% glucose (group HLS) intrathecally using a 25G pencil point needle and a midline approach in the sitting position at L2/3 interspace. Positioning for puncture was facilitated by premedication with 5µ sufentanil i.v. After spinal puncture patients were retained in a lateral position, fractured side down, for 15min and thereafter positioned supine for surgery. Vital signs (BP, HR, SpO_2) were monitored continuously. Hypotension was defined as reduction of systolic BP by 25% and treated with 5mg i.v. ephedrine while for a HR < 45/min 0,5mg atropine was administered. Block quality was assessed using a modified Bromage scale (0–3) and pin-prick as well as need for intraoperative rescue analgesia provided by 5µg sufentanyl i.v. boluses. Groups and results were analyzed using Student's t, Mann-Whitney and Fischer's exact test with $p < 0.05$ considered significant.

Results and Discussion: There were no differences in group characteristics considering age, gender, body weight and comorbidities, as well as surgery duration. Patients in the HLS group experienced significantly less hypotensive episodes while maintaining satisfactory intraoperative analgesia.

	Hypotension	Bradycardia	Unilateral block	Sensory level	Rescue analgesia
IL (n = 20)	14/20 (70%)	2/20 (10%)	3/20 (15%)	Th6 (4–10)	1 (5µg)
HLS (n = 20)	3/20 (15%)	0/20	20/20	Th7 (5–10)	1 (10µg)
P	< 0.01	NS	< 0.05	NS	NS

Conclusion(s): In an elderly patient population with significant comorbidities the addition of glucose and 5µg sufentanyl to 5mg intrathecal isobaric levobupivacaine rendered the anesthetic solution hyperbaric and provided eqivalent intraoperative spinal analgesia with greater hemodynamic stability compared to 10mg plain levobupivacaine.

8AP6-6

The influence of levobupivacaine temperature on the spread of spinal anesthesia

E. Horasanli, B. Nazli, M. Gamli, N. Gogus, B. Dikmen

Anesthesiology and Reanimation, Ankara Numune Training and Research Hospital, Ankara, Turkey

Background and Goal of Study: The physical characteristics of spinal anesthetic solutions are major determinants of their distribution within the subarachnoid space. One of the most important physical properties affecting the level of analgesia achieved after intrathecal administration of a local anesthetic is its dencity. Both CSF and local anesthetics exhibit a curvilinear decrease in density with increasing temperature (1,2). The present study was undertaken to investigate the influence of the temperature of the local anaesthetic solution on the spread of spinal anesthesia using 0.5% plain levobupivacaine.

Materials and Methods: After local ethical committee approval and informed patient consent, 60 patients (ASA I–III, aged 18–65 years) scheduled for TUR-P under spinal anesthesia. The patients were randomly allocated to one of two groups to receive plain levobupivacaine 0.5% had been previously adjusted to either, 23°C (room temperature) at group I, or 37°C at group II for at least 24 hr. Lumbar puncture was performed in the sitting position in the midline at the L_3–L_4 interspace using a 25-G spinal needle. Then, three ml of the plain levobupivacaine were injected at a rate of 0,2 mL/sec. Sensory and motor block was assessed using pinprick stimuli and a modified Bromage scale, respectively. Heart rate and blood pressure were recorded simultaneously. The two groups were compared using Student's t-test. Non-parametric and categorical data were analyzed using the Mann–Whitney U-test and the chi-squared test, respectively. $P < 0.05$ was considered to be statistically significant.

Results and Discussion: There were no statistical significant differences between the two groups regarding demographic data and hemodynamic changes ($p > 0.05$). The onset time of sensory and motor block was significantly longer in group I than in group II ($p < 0.001$). The maximum level of sensory blockade was significantly higher in group II [T_4 (T_3–T_6)] than group I [T_8 (T_5–T_9)] ($p < 0.001$). The different densities of levobupivacaine 0,5% at 23 °C, and 37°C and hence the correspondingly different states of baricity seems the most reasonable explanation of these findings.

Conclusion(s): The use of 3 ml 0,5% plain levobupivacaine for spinal anaesthesia in the sitting patient led to a higher and longer sensory block when a 37°C solution was compared to 23 °C solutions.

References:

1 Horlocker TT. Anesth Analg 1993;76: 1015–1018.
2 Greene NM. Anesth Analg. 1985; 64: 715–30.

8AP6-7

Neuroaxial blocks & tattoos: What are we doing?

A. Gaspar, N. Serrano

Anaesthesiology, Instituto Português de Oncologia de Lisboa, Francisco Gentil – E.P.E., Lisboa, Portugal

Background and Goal of Study: With tattoos becoming popular, especially in younger people, anaesthetists are often confronted with the need to perform neuroaxial blocks (NB), namely in parturients with lumbar tattoos. There are no guidelines for these situation. Also, there are no reports of major complications derived from NB through tattoos. Consequently, the actions of anaesthetists are diverse. We therefore conducted a survey of a sample of anaesthetists, to find out about their approach when facing NB on parturients with lumbar tattoos, and how their actions have been based.

Materials and Methods: We surveyed 537 anaesthetists in 30 hospitals. The questionnaire was structured in two groups of multiple choice questions: one related to the option of performing or not the NB over a tattoo and how the choice was argued. The other group of questions pointed towards the anaesthetists who had never faced that situation, inquiring them what would their approach be and the reasons for doing so. The obtained data was subjected to a descriptive analysis.
Results and Discussion: A total of 162 replies (30.2%) were received. 92 anaesthetists (56.8%) had already been asked to carry out a NB through a tattoo. 55 of them (59.8%) executed the NB on all occasions, always on pigment free skin, while 6 (6.5%) always refused to do so. 31 anaesthetists (33.7%) did not always choose to do the NB, but in the cases they did, it was over pigment free skin. Both of these approaches were, essentially, based in the literature. This is according to the fact that literature is not unanimous, which explains opposite actions having similar backgrounds. Of the 70 anaesthetists (43.2%) who had never been asked to perform NB through a tattoo, 74.3% would carry it out when faced with that situation, being that 67.2% would do it over an ink free area, while 7.1% would choose the pigmented one. It is mostly (57.1%) based on personal opinion rather than on literature that these respondents act.
Conclusion(s): Although there are clear limitations in a questionnaire survey, a 30.2% response rate seems to show a tendency towards performing NB on pigmented free skin when faced with a lumbar tattoo. Literature has been the backup for anaesthetists confronted with the above scenario, while personal opinion seems to be the basis for the ones that still did not faced this situation. The non existence of guidelines within the scientific community, as well as the controversy regarding the risks involved in performing NB over tattoo, probably explain the diverse actions taken by the anaesthetists.

8AP6-8

Is thoracic epidural more dangerous than lumbar epidural? The end of a myth

P. Eusébio, N. Lages, C. Correia

Anaesthesiology, CHAA, Guimarães, Portugal

Background and Goal of Study: Thoracic epidural anaesthesia/analgesia offers advantages over lumbar epidural anaesthesia/analgesia in thoracic and high abdominal surgery. Anaesthesiologists are more reluctant in performance thoracic epidurals because of the possible damage of the spinal cord in thoracic levels if there is an inadvertent puncture of the dura. The aim of this study was to investigate the anatomical configuration of the spinal canal in 20 patients without spinal or medullary disease.
Materials and Methods: We have examinated T2-weighted sagittal midline magnetic resonance images of the spinal column in 20 patients in the supine position. We measured the distance from the dura to the spinal cord in the interspaces T7–T8 and T12–L1 with a calculated angle for a entry needle of 60º.
Results and Discussion: The posterior distance between the dura and spinal cord in T7–T8 were greater than T12–L1. The median distance in T7–T8 was 7.3 mm (min 4.9; max 16.5) and in T12–L1 was 3.9mm (min 2.3; max 7.9). Appling the Wilcoxon Test with the SPSS, the difference in the distance between the dura and spinal cord in the 2 interspaces were statistically significant ($P < 0.01$).
Conclusion(s): We choose to study the interspace T7–T8 because of the easy anatomical external references (scapulae tip) during the performance of epidural anesthesia and because is the interspace where is the lowest ligamentum flavum midline gap (2.1%). Our measures were made with an angle of 60º because is the normal angle used during the performance of an epidural anesthesia. Our results confirm the Lee study (T1, T6; T12) and associated with Lirk study proves that T7–T8 epidural approach is a secure space to spinal, combined spinal-epidural and epidural anesthesia. With this study may be there is no place to perform T12–L1 epidural or to be reluctant in teaching middle thoracic epidural anesthesia in order to make safer procedures.

References:

LIRK, P.; et al. Cervical and High Thoracic Ligamentum Flavum Frequently Fails to Fuse in the Midline; *Anesthesiology* 2003; 99(6): 1387–90.

LEE, RA.; et al. The Anatomy of the Thoracic Spinal Canal Investigated with Magnetic Resonance Imaging (MRI); *Acta anaesthesiol Belg* 2007; 58 (3): 163–7.

LIRK, P.; et al. The Incidence of Lumbar Ligamentum Flavum Midline Gaps. *Anesth Analg* 2004; 98: 1178–80.

LIRK, P.; et al. The Incidence of Lower Thoracic Ligamentum Flavum Midline Gaps. *Br J Anaesth* 2005: 94: 852–5

8AP6-9

Comparision of hemodynamic effects of single dose spinal block and spinal catheter techniques

G. Karaaslan, B. Baltaci, N. Ozcan, H. Basar, B. Dikmen

Anaesthesiology and Reanimation, Ministry of Health, Ankara Training and Research Hospital, Ankara, Turkey

Background and Goal of Study: Although spinal anaesthesia is a commonly used anaesthesia technique, acute hemodynamic changes during the procedure increases the risk of this technique especially for critically ill patients. In this study, we aimed to compare the hemodynamic effects and total anaesthetic dose used in single dose spinal anaesthesia and spinal anaesthesia provided by spinal catheter.
Materials and Methods: After approval of ethics comittee and informed patient contents, 40 patients, aged between 18–70 years which will undergo transurethral resection under spinal anaesthesia technique were enrolled in this study. All patients were monitorized with ECG, peripheric oxygen saturation and non-invasive blood pressure monitors. In 5 minute intervals, heart rate, systolic and diastolic blood pressures and value of peripheric oxygen saturations were registered. All patients received 500 ml of colloid solution (6% gelatin) in 20 minutes before the block. Fluids were maintained with 10 ml kg^{-1} h^{-1} Ringers solution. Patients were randomized into two groups. All patients were positioned in sitting position. In single dose spinal group, subarachnoid access supplied using 24 G Quincke tip neddle and 3 ml of 0.5% Bupivacaine was injected into subarachnoid space. In spinal catheter group, 22 G spinal catheter (Spinocath, Braun) placed in subarachnoid space through 18 G Tuohy neddle placed in epidural space. All patients were taken to supine position immediately after procedures. Volume of spinal catheter was measured and found to be 1 ml. 1.5 ml of 0.5% Bupivacaine was injected from spinal catheter as initial dose. Spread of analgesic block was determined using pin-prick in each 5 minutes. Until the analgesic block levels reach T10 level 0.25 ml of same solution were added. After T10 analgesia level is reached, surgery was started in each group.
Results and Discussion: Maximum block levels were comparable in both groups. Median local anaesthetic dose in single dose and spinal catheter groups were 3 ml and 1,25 ml respectively. Mean systolic and diastolic blood pressure values were significantly lower in single dose spinal group. Hypotension, bradycardia incidence were significantly higher in single dose spinal group.
Conclusion(s): Continous spinal anaesthesia managed using spinal catheter provides a stable hemodynamic state and safer anaesthesia technique esspecially for critically ill patients.

8AP6-10

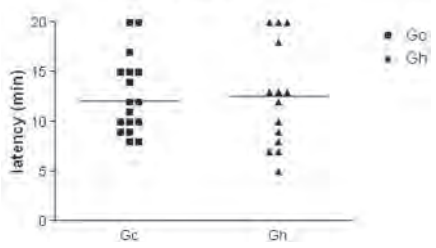
Influence of hyaluronidase in the quality of epidural blockade

J. Abrao, L. Garcia, C. Rizzo, P. Pereira Leite de Moura, L. Italo da Silva

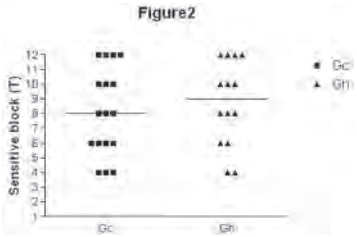
Department of Biomechanics, Medicine and Rehabilitation of the Locomotor Apparatus, Ribeirao Preto School of Medicine, University of Sao Paulo, Ribeirao Preto, SP, Brazil

Background and Goal of Study: The diffusion of local anaesthetic from the epidural space through the dura mater into the cerebrospinal fluid is one of the mechanisms of the epidural anesthesia. The gel of intracellular cement imposes a barrier to this diffusion; as the hyaluronic acid is an important constituent of this gel, you can expect that the use of hyaluronidase can reduce the effectiveness of this tissue barrier. The objective of this study was to evaluate the use of hyaluronidade in epidural anaesthesia.
Materials and Methods: After approved by local IRB and the consent signed, fifty subjects were assigned to one of the two groups: Gh (epidural with bupivacaine 0.5% + hyaluronidase 1000UI)or Gc (the same without hyaluronidase). Punction at L_3/L_4. Inclusion criteria: (1) age:18–65 y; (2) patients from the vascular ambulatory. Exclusion criteria: (1) skin infection in the puntion local; (2) pregnant patient; (3)use of anticoagulant drugs; (4) history of bad experience with epidural anesthesia. Six patients were withdraw for technical difficulties
Results and Discussion: The groups were homogenous in relation to age and gender. The latency was: Group Gc = 12.65 ± 3.87; Gh = 12.50 ± 5.23 (ns). There were no diference in sensitive and motor block between the groups.

Figure1



Conclusion(s): The use of hyaluronidase as a supplement to local anesthetic in epidural anaesthesia didn't make any difference regarding to latency and spread of sensitive and motor blocks.



References:
1 Scott DB. Hyaluronidase in epidural analgesia. Br J Anaesth. 1956; 28:187–193.
2 Bromage PR, Burfoot MF. Quality of epidural Blockade: influence of physico-chemical factors; hyaluronidase and potassium. Br J Anaesth. 1966;38:857–865.
3 Devulder J. Transforaminal nerve root sleeve injection with corticosteroids, hyaluronidase, and local anesthetic in the failed back surgery syndrome. J Spinal Disord. 1998 Apr;11(2):151–4.

8AP6-11

The effects of epidural clonidine on lymphocyte subpopulations and blood cortisol level

M. Gubina, A. Ihan, J. Bovill, V. Novak-Jankovic

Department of Anaesthesiology and Perioperative Intensive Therapy, University Clinical Centre Ljubljana, Ljubljana, Slovenia

Background and Goal of Study: Surgical trauma initiates stress response in human body through nevroendocrine and immune pathways, with consecutive immune suppression. Alpha2 adrenoceptor agonist clonidine is known to inhibit secretion of stress hormones. The goal of this study was to investigate the potentially beneficial immunomodullatory effects of epidural clonidine on lymphocyte subpopulations and cortisol concentration in perioperative period.

Materials and Methods: In a prospective double blinded study 24 patients with lung carcinoma, undergoing thoracotomy were randomly divided into two groups, clonidine (CLO; n = 12) and control (CON; n = 12). All patients received a bolus of 40 µg/kg of morphine by epidural catheter inserted at Th 6–7. The CLO group additionally received 4 µg/kg of clonidine epidurally. General anesthesia was than induced with propofol, vecuronium and fentanyl and the operation proceeded. We used continuous epidural infusion of 4 µg/kg/h of morphine and 10 µg/kg/h of bupivacain in saline for postoperative analgesia in both groups. In CLO group we added 0.2 µg/kg/h of clonidine. We took four blood samples (before inserting epidural catheter–T1, at the end of operation–T2, the next morning–T3 and the second morning–T4) and measured lymphocyte subpopulations using flow cytometry and the blood cortisol concentration. We compared the percentage of lymphocyte subpopulations (whole lymphocyte count, NK cells, Thelper1, Thelper2) and the blood cortisol concentration between the groups. We used analysis of variance for repeated measurements to evaluate overall changes.

Results and Discussion: There were no significant differences in percentage of lymphocytes and their subpopulations between both groups. There was also no significant difference in blood cortisol concentration between both groups. The changes were similar in CLO and CON group.

Conclusion(s): Epidural clonidine did not affect the percentage of lymphocyte subpopulations in perioperative period in patients undergoing lung surgery. It also did not affect blood cortisol concentration in the same group of patients. With these methods we could not demonstrate any measurable effect of clonidine on immune system during operation.

8AP7-2

Equivalent analgesic potency of intravenous remifentanil to epidural lidocaine in patients undergoing gynecological surgery

Y. Inagaki, N. Moriyama, A. Noritake, M. Nakasone, S. Takahashi

Anesthesiology and Critical Care Medicine, Tottori University Faculty of Medicine, Yonago, Tottori, Japan

Background and Goal of Study: Remifentanil is used in patients receiving anticoagulants who cannot undergo epidural catheterization. However, it has not been clarified how much infusion rate of remifentanil is necessary for providing equivalent analgesic potency to epidural lidocaine. We conducted this study to find out an infusion rate of remifentanil equivalent to epidural lidocaine in patients undergoing gynecological surgeries.

Materials and Methods: After obtaining approval of our institutional review board, thirty-five consenting patients were randomly assigned to two study groups; epidural anaesthesia group (Group E) and remifentanil (Rf) infusion group (Group R). All patients received epidural catheterization at either T10/11 or T 11/12 level before anesthesia induction. Anesthesia was induced with fentanyl 2 µg/kg and 4 µg/ml of propofol with target-controlled infusion. After tracheal intubation, anesthesia was maintained with propofol to maintain Bispectral index (BIS) value between 40 and 55. If BIS value was below 40 and above 55, effect-site concentration (C_E) was decreased and increased by 0.5 µg/ml, respectively. Group E was received 6 ml of 1.5% lidocaine as a bolus followed by a rate of 3 ml/h. If mean arterial pressure (MAP) and/or heart rate (HR) were >15% of the baseline, patients received 3 ml of 1.5% lidocaine and an epidural infusion rate was increased by 1 ml/h. Group R first received 0.25 µg/kg/min of Rf. If MAP and/or HR were >15% of the baseline, Rf dose was increased by 0.05 µg/kg/min. If MAP and/or HR were < 15%, lidocaine infusion rate and Rf dose were decreased by 1 ml/h and 0.05 µg/kg/min, respectively. We evaluated median C_E of propofol, required infusion doses of 1.5% lidocaine and remifentanil, time to awakening and propofol $C_E$at awakening. Data was analyzed by unpaired-t test. A P value less than 0.05 was considered statistical significant.

Results and Discussion: Patients' profiles were similar in the two study groups. C_Es of propofol to maintain anesthesia were 3.1 (2.5–4.0) µg/ml [Median (range)] and 3.3 (2.5–4.0) µg/ml, respectively, in Groups E and R. Requirements of 1.5% lidocaine and Rf were 5.6 ml/h and 0.24 µg/kg/min. Times to awakening were 10 (4–25) min and 11 (5–35) min, propofol C_E^s at awakening were 1.60 µg/ml and 1.56 µg/ml, respectively, in Groups E and R. This study clarified equipotency of analgesia between Rf and epidural anesthesia.

Conclusion(s): Analgesic potency created by 5.6 ml/h of 1.5% lidocaine administered epidurally was equivalent to 0.24 µg/kg/min of Rf in gynecological surgery.

8AP7-3

Intravenous lidocaine versus continuous femoral nerve block for postoperative analgesia and rehabilitation after total hip arthroplasty

H. Thomas, B. Brui, T. Ferrant, P. Lavand'homme

Anesthesiology Department, St Luc Hospital, Brussel, Belgium

Background and Goal of Study: The perioperative administration of intravenous lidocaine has been associated to improvement of postoperative pain and mobilization after abdominal surgery. (1) After total hip arthroplasty (THA), anesthesia by continuous femoral nerve block is associated with less side effects than IV PCA with morphine or continuous epidural analgesia. (2). During a continuous peripheral nerve block, a significant systemic absorption of local anesthetic may participate to the analgesic effect. (3) The study compares the benefit of 24 hours lidocaine infusion (similar doses) either by continuous femoral nerve block (CFNB lido) or by intravenous route (IV lido) in patients undergoing THA.

Materials and Methods: Placement of femoral nerve catheter was performed in all the patients before anesthesia. Patients were then randomly assigned to receive: IV lidocaine (1.5 mg/kg followed by intraoperative continuous infusion of 2 mg/kg/h and postoperatively 1mg/kg/h for 24 hours) and saline CFNB (group IV lido) or CFNB with lidocaine (lidocaine 1% bolus followed by intraoperative infusion of lidocaine 1% 10 ml/h and lidocaine 0.5% 10ml/h during 24 hours postoperatively) and IV saline (group CFNB). All patients received paracetamol 4g/24h and IV PCA with morphine. PCA morphine consumption, pain scores at 2h, 24h, 48h, day 8, 1 month and 3 months were recorded. Pain intensity (knee flexion) was assessed at rest and at movement (knee flexion) according to a visual analog scale (VAS 0–10). Statistical analysis was performed by unpaired t-Test. A $p < 0.05$ was considered significant. (*)

Results and Discussion: Demographic data (age 71 ± 8 years), preoperative pain (VAS 4.4 ± 2.5), length of surgery (140 ± 44min), intaoperative sufentanil (20.5 ± 3.7µ) were comparable between the groups. Postoperative mobility (degrees of flexion 6.25 ± 3 at day 3) was also comparable. There were no adverse effects of IV lidocaine.

Table 1.

	IV lido (n = 10)	CFNB lido (n = 10)
PCA morphine24h (mg)	23 ± 15	21 ± 21
PCA morphine 24–48h (mg)	6 ± 4	17 ± 15
VAS movement 24h	5.6 ± 1.8	5.2 ± 2.1
VAS movement 48h	4.1 ± 2.8	4.3 ± 2.5
VAS max 3 months	1 ± 1.2	0.7 ± 0.4

Conclusion(s): These preliminary results do not show significant difference in terms of pain relief and rehabilitation between IV lidocaine and local (CFNB) lidocaine administration.

References:
1 Kaba and al Anesthesiology 2007;106:11–8.
2 Singelyn and al Reg Anesth Pain Med 2005;30:452–457.
3 Malburny and al, ASA 2001: A965.

8AP7-4

Comparison of dexmedetomidine and ketamine infusions in patients undergoing lower extremity surgery with regional anesthesia

O. Koyuncu, A. Alagol, A. Turan

Department of Anaesthesiology and Reanimation, Trakya University, Edirne, Turkey

Background and Goal of Study: Monitored anesthesia care is the combination of local anesthetics and intravenous anesthetics drugs for sedation and analgesia. The aim of this prospective, randomised double blinded study was to compare intraoperative and postoperative effects of dexmedetomidine and ketamine infusion in patients scheduled for lower extremity surgery under epidural anesthesia.
Materials and Methods: After ethical approval and patient consent, 60 ASA I-II status, aged between 18–80 patients scheduled for lower extremity surgeries were included. After standart premedication patients were monitored for heart rate, mean arterial pressure, SpO_2. All patients received 14 mL% 0.5 bupivacaine from the epidural catheter. At the same time intravenous infusions were started as:% 0.9 NaCl to Group I, 0.5 mg/kg/h dexmedetomidine to Group II, 0,5 mg/kg/h ketamine to Group III. When the patients felt pain, 50 mg fentanyl and 6 mL bupivacaine were added. At the end of the operation (0), 30. and 60. minutes, 2, 4, 8, 12, 24, 48 hours hemodynamic measurements, respiratory rate, oxygen saturation, sedation and pain scores were recorded. Postoperatively, patient controlled epidural analgesia containing of%2 lidocaine and morphine were given. Epidural consumption and side effects were recorded at 24 and 48. hours postoperatively.
Results and Discussion: The surgical block initiation time, peripheral oxygen saturation, respiratory rate, skin temperature, u rine and bleeding volume, infection rates and side effects were similar. Intraoperatively 4 5 to150. min systolic; and 45 to 105. min diastolic pressures were lower in dexmedetomidine group when compared with ketamine group. Postoperatively, first analgesic duration (218.95 ± 12.52, 267.75 ± 14.66, 248.65 ± 57.42 min; $p = 0.041$), epidural morphine at 48hrs (11.67 ± 1.55, 6.65 ± 0.79, 4.85 ± 0.54; $p < 0.001$), postoperative resque analgesic (n) (12, 4, 4; $p = 0.008$) and number of antiemetic consumption (n) (5, 0, 1; $p < 0.05$), pain scores were lower in dexmedetomidine groups in first 4hrs when compared with control group. Pain scores were lower in ketamine group at 48 hrs compared to other groups.
Conclusion(s): As a result, although there were moderate hemodynamic changes in dexmedetomidine group, dexmedetomidine group provided better pain control and decreased postoperative analgesic consumptions when compared to control and ketamine groups.

8AP7-6

The influence of hyaluronidase on the retrobulbar distribution of local anaesthetic solution following sub-tenon's block

M. Kendrisic, N. Tomanovic, M. Kendrisic

Anaesthetic Department, General Hospital, Sremska Mitrovica, Vojvodina, Serbia

Background and Goal of Study: The aim of this study is to investigate the distribution of the anaesthetic solution with different amounts of hyaluronidase in the retrobulbar space, following an injection into sub-Tenon's space.
Materials and Methods: After approval of the local ethics committee, 40 pig cadaver heads were used (80 eyeballs) in this experimental study. The material was divided into 4 groups (of 20 eyeballs). Each group was administered, in sub-Tenon's space, 4.5ml of a mixture of 2% Lignocaine, 0.5% Bupivacaine, 0.5ml of India Ink, with different amount of hyaluronidase- 0 $IUmL^{-1}$ (i.e. control),15 $IUmL^{-1}$, 75 $IUmL^{-1}$, 150 $IUmL^{-1}$. Samples of retrobulbar tissue were analysed using the standard histopathological procedure. After that, they were also analysed by computer using Adobe Photoshop® (Windows, USA). The retrobulbar space was divided into 8 zones by 4 perpendicular lines, which cross in the centre of the optic nerve. The presence of ink in connective and muscle tissues and in the neural sheath of the optic nerve was observed. Statistics were analysed by Chi-squared and Fisher's test.
Results and Discussion: The distribution of local anesthetic in each zone of the muscle tissue (I–VIII) is strongly influenced by amount of hyaluronidase, especially in the groups with 75 $IUmL^{-1}$ and 150 $IUmL^{-1}$ hyaluronidase ($p < 0,05$). In connective tissue, the distribution of local anesthetic is significantly higher ($p < 0,05$), under the influence of hyaluronidase (75 $IUmL^{-1}$ and 150 $IUmL^{-1}$), in areas which are distant from the place of injection (I–IV). Distribution in the optic nerve sheath is also significantly higher ($p < 0.01$) only the group with the highest amount of hyaluronidase – 150 $IUmL^{-1}$.
Conclusion(s): The presence of local anaesthetic solution in the retrobulbar space depends on the amount of hyaluronidase which was previously added to the local anaesthetic. The optimal dose of hyluronidase is 75 $IUmL^{-1}$. It provides significantly better spread of the local anaesthetic solution in connective and muscle tissues but has a minimal influence on the optic nerve.

References:

1 Eke T & Thomson JR. Serious complications of local anaesthesia for cataract surgery: a one year national survey in the United Kingdom *Brit J Ophthalmol* 2007; 91: 470–475.
2 Tan CSH, Au Eong KG, Kumar CM. Visual expiriences during cataract surgery: what anaesthesia providers should know. *EJA* 2005; 22: 413–419.

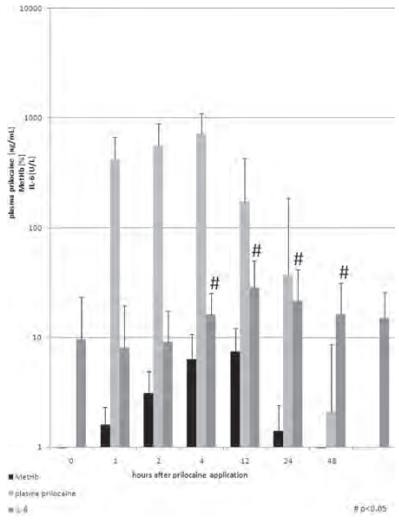
8AP7-7

Influence of methemoglobin after high dosage tumescent local anaesthesia (TLA) with prilocaine on TNF-α, IL-6 and IL-8.

M. Schmittner, B. Kemler, J. Faulhaber, M. Neumaier, G. Beck

Clinic of Anaesthesiology and Critical Care Medicine, University Hospital Mannheim, Mannheim, Germany

Background and Goal of Study: Tumescent local anaesthesia (TLA) with high prilocaine dosages leads to formation of methemoglobin (Met-Hb). Met-Hb is a potent activator of endothelium cells by stimulation of key inflammatory cytokines [1]. This study examines in vivo the influence of Met-Hb on TNF-α, IL-6 and IL-8 after application of TLA with high prilocaine dosages.
Materials and Methods: 30 patients (m/f, 18–80 years) received a TLA with >600 mg prilocaine (2000 mg prilocaine/500 mL ringer solution with 0.5 mg epinephrine) for dermatologic operations. 0, 1, 2, 4, 12, 24, 48 and 72 hours after the application of TLA, Met-Hb, prilocaine plasma levels, TNF-α, IL-6 and IL-8 were analyzed from plasma samples. Statistic was performed with the SAS system. Differences between the groups were calculated with the t-test.
Results and Discussion: 16 male/14 female patients (54.9 ± 18.1 years, 85.0 ± 20.0 kg, 171 ± 9 cm) received a TLA in a dosage of 1658.7 ± 580.6 mg (min: 880 mg, max: 4160 mg). The maximum average prilocaine plasma level occurred 4 hours after TLA application and totalled 718.7 ± 378.2 ng/mL. With 7.43 ± 4.75% (min: 1.7%, max: 20.7%) the blood methemoglobin level had its peak 12 hours after TLA. No clinical signs of methemoglobinemia were observed. IL-6 plasma levels started from 9.5 ± 13.6 U/L at baseline to 16.1 ± 9.0 U/L ($p < 0.05$) after 4 hours and had a peak of 28.4 ± 21.8 U/L after 12 hours ($p < 0.0001$). 72 hours after TLA the IL-6 plasma level was again comparable to baseline. TNF-α and IL-8 showed no significant difference in the chronological sequence. There was no correlation between the applied dosage of prilocaine and the Met-Hb plasma level, the prilocaine serum level, IL-6, IL-8 or TNF-α.



Conclusion(s): Even high dosages of prilocaine do not necessarily lead to a clinically significant methemoglobinemia. During TLA, methemoglobin is a stimulator for IL-6 but not for IL-8 or TNF-αα. However, TLA with high dose prilocaine is considered to be safe in case of clinical inflammatory response.
Reference:

1 Liu X., Spolarics Z.: Methemoglobin is a potent activator of endothelial cells by stimulating IL-6 and IL-8 production and E-selectin membrane expression. Am J Physiol Cell Physiol 2003; 285: C1036–C1046.

8AP7-8

Combined lumbar and sciatic plexus block compared with unilateral bupivacaine spinal anesthesia for hip fractures in the elderly: Preliminary results

K. Messaoudi, W. Azaiez, A. Ammous, K. Raddaoui, A. Cherif

Anesthesia and Intensive Care, Rabta Hospital, Tunis, Tunisia

Background and Goal of Study: Hip fracture is usually performed under general or spinal anaesthesia. Lumbar Plexus and Sciatic nerve block have been increasingly applied for intraoperative and postoperative analgesia. The aim of this study is to compare the time requirement for the anesthesia technique, hemodynamic effect, patient and surgeon satisfaction and the quality of postoperative analgesia.
Materials and Methods: After the approval of local ethical committee, twenty-two elderly patients were randomly assigned to 2 groups: a unilateral bupivacaine spinal anesthesia (UBSA) group with single-shot of 6mg hypobaric bupivacaine 0.5%, and a combined lumbar sciatic block (CLSB) group with 20 ml lidocaine 1.5% for the sciatic block and 20 ml of bupivacaine 0,5% for the posterior lumbar plexus block. All blocks had been performed with a 15cm needle and nerves were identified by a peripheral electric nerve stimulator. Time to perform blockade, sensory and complete motor block, hemodynamic parameters, postoperative analgesic requirements and satisfaction score were recorded
Results and Discussion: Demographic data, ASA score and duration of operation were similar in both groups. No need for general anesthesia was encountered in either group. There were no differences between both groups in comfort of surgery and in patient and surgeon satisfaction. The initial decrease of mean arterial pressure was 18% in the spinal group and 12% in the block group and was not significantly different. A more prolonged hemodynamic effect was found in the UBSA group, indicated by the more frequent use of ephedrine to stabilize blood pressure (*P* 0.05). Maximum VAS scores until 24 first post-surgery hours were lower in CLSB group with significantly different. The times requirement for the anesthesia technique were higher in the CLSB group than UBSA group (30 ± 15 minutes vs 8 ± 7 minutes) with a significantly difference (P < 0,03).
Conclusion(s): UBSA and CLSB provided adequate anesthesia for repair of hip fracture in the elderly. It seems that CLSB is a more effective method in the first 24 hours in regards to postoperative pain and that UBSA give more prolonged hemodynamic effect.

8AP7-9

Multimodal regional and systemic approach for postoperative analgesia in total knee arthroplasty

K. Rais, A. Ben Said, M. Soussi, S. Chahed, O. Kaabachi

Anesthesiology and Intensive Care Medicine, Kassab Orthopedic Institute, Tunis, Tunisia

Background and Goal of Study: Continuous femoral nerve block (CFNB) provides an adequate analgesia after total knee arthoplasty (TKA) (1). Adjunction of sciatic nerve block remains controversial (2, 3). Sciatic motor nerve block could be considered as a limiting factor. The objective of the study was to evaluate the effect of multimodal regional and systemic analgesic regimen associated to CFNB on postoperative morphine consumption.
Materials and Methods: After local Ethics Committee approval and written informed consent, 38 patients scheduled to receive spinal anaesthesia for TKA were randomised in 2 groups: Group M (n = 18) received 2 hours before surgery 400 mg celecoxib and group B (n = 20) received placebo. A femoral nerve catheter (FNC) was inserted in all patients and induced with 20ml, 0.25% bupivacane. Spinal anesthesia was performed with 12.5mg of 0.5% isobaric bupivacaine associated to 100g of morphine in group M and 1ml of saline in group B. An additional sciatic nerve catheter was inserted postoperatively in the group B and induced with 20 ml of bupivacaine 0.25%. Postoperative analgesia was assumed with paracetamol and PCA morphine in both groups (for 48 hours), plus 400mg celecoxib in group M for 5 days. Continuous infusion of 0.1ml/kg of bupivacane 0.25% was maintained for 48 hours on the FNC in group M and on both catheters in group B. We assessed: sensory and motor blocks using a simplified scale; postoperative pain with numeric rating scale (NRS) at rest and in movement and morphine consumption on day 1 and 2. Data were expressed in mean SD or in percentage and analysed with non parametric tests. P < 0.05 was significant.
Results and Discussion: Morphine consumption was comparable in both groups (8 mg and 21 mg at H24 and H48 in group B vs. 11 mg and 24 mg in group M). Median of NRS at rest was equivalent in both groups. Whereas, NRS in movement were lower in group B but not significantly; 2 vs. 4 at H24 respectively in group B and group M (p = 0.6) and 2 vs. 3 at H48 respectively in group B and group M (p = 0.3). No differences were noted in sensory and motor blocks in both groups. There was no difference regarding incidence of side effects.
Conclusion(s): Multimodal analgesia associated to a 48H CFNB provides the same patient comfort than the association of femoral and sciatic nerves block catheters and may be more appropriated in this type of procedure.
References:
1 Capdevilla X, Anesthesiol 1999;91:8–15.
2 Allen HW, Anesth Analg 1998;87:93–97.
3 Dang CP, Reg Anesth Pain Med 2005;30:128–33.

8AP7-10

Gasless laparoscopic surgery: General vs regional anesthesia

A. Wolfler, G. Sortino, G. Paindelli, F. Izzo, I. Salvo

Anesthesia and Intensive Care, Women and Children Hospital V. Buzzi, Milan, MI, Italy

Background and Goal of Study: Isobaric gasless laparoscopy for uterine myomectomy is proven to be advantageous compared to minilaparotomy (1) while compared to conventional laparoscopy risks associated with CO_2 insufflation are avoided. Aim of this study is to evaluate regional anesthesia during gasless laparoscopy.
Materials and Methods: After local Ethic Committee approval all the women undergone to gasless laparoscopic myomectomy were randomized to receive either general or regional anesthesia. Exclusion criteria were absolute contraindications for RA. General anesthesia was performed with total intravenous technique with propofol and remyfentanil. RA was obtained with combined spinal-epidural technique with intrathecally hyperbaric bupivacaine followed by ropivacaine through the epidural catheter. Data recorded were: failure of anesthesia, intraoperative complications (nausea and vomiting, hypotension, bradycardia), duration of surgery, number and total volume of myomas removed, PONV.
Results and Discussion: 64 women ASA I/II were enrolled in the study, 32 in the GA and 32 in the RA group. The two groups were homogenous for age and BMI. There were no intraoperative complications. All the patients in the RA group completed the surgical procedure with CSE anesthesia. Table 1 shows the comparison for surgical variables: statistical significance was observed for the mean time of intervention and the number of myomas removed. Only two patients had PONV, one for each group.

Characteristics of the two groups. Data are expressed as mean (± DS)

	GA (n = 32)	RA (n = 32)	
Duration of surgery (min)	137 ± 49.2	112 ± 41.1	p < 0.05
N of myomas	2.1 ± 1.54	2.6 ± 3.05	p < 0.05
Total volume of myomas (ml)	184.3 ± 42	166.3 ± 48	ns
Time of mobilization (min)	125 ± 57	98 ± 62	p < 0.05
PONV (n)	1	1	ns

GA = general anesthesia; RA = regional anesthesia

Conclusion(s): Regional anesthesia seems to be a valid alternative to general anesthesia for gasless laparoscopy. Advantages of regional anesthesia seems to be both anesthetic and surgical. Together with a better postoperative pain control and a faster time of mobilization, surgeons reported a better exposition of the surgical field in the RA than GA group with a significative reduction of the time of intervention.
Reference:
1 F. Sesti, F. Capobianco, T. Capezzolo et al Isobaric gasless laparoscopy versus minilaparotomy in uterine myomectomy: a randomized trial. Surg Endosc (2008) 22:917–923

Pharmacology

9AP1-2

The antioxidative effect of propofol on angiotensin II-induced cell proliferation and endothelin-1 gene expression in rat cardiac fibroblasts

K. Wong, Y. Leung, E. So, R. Wu, T. Cheng

Department of Anesthesiology & Institute of Medical Sciences, China Medical University & Hospital, Taichung, Taiwan

Background and Goal of Study: The fibroblasts play a pivotal role in the development of cardiac fibrosis, progression of left ventricular remodeling and results in diastolic dysfunction and heart failure in clinical practice. Propofol possesses an antioxidative effect that related to nitric oxide (NO) involvement. However the intracellular mechanism of propofol remains unclear. The aims of this study were to test whether propofol may alter angiotensin-II (Ang-II)-induced endothelin-1 (ET-1), nitric oxide synthase (NOS) and protein kinase B (Akt) expression, and to identify the antioxidative and mechanistic pathways of propofol in rat cardiac fibroblasts.

Materials and Methods: Cultured cardiac fibroblasts exposed to Ang-II (100 nM) in the presence of propofol (10–30 μM). Activation of ET-1 gene expression, endothelial-NOS (eNOS), NOS activity, phospho-eNOS, phospho-Akt (serine 473 and threonine 308 isoforms) and the involvement of extracellular signal-regulated kinase (ERK) pathway were also examined. $p < 0.05$ were considered significant (ANOVA).

Results and Discussion: The anti-proliferative effects of the pretreatment of cardiac fibroblasts with propofol for 30 min followed by exposure to Ang II for 24 h resulted in a significant decrease in Ang-II-increased cell number. Exposure of cells to propofol shown time- and dose-dependently enhanced the NO generation. Propofol enhanced the Ang-II-increased NOS activity at 30 min after stimulation. Propofol also significantly enhanced phospho-eNOS and phospho-Akt. These findings reveal that propofol increases NO production and Akt/eNOS phosphorylation in cardiac fibroblasts. Cells pretreated with propofol significantly decreased levels of Ang-II-induced ERK phosphorylation and attenuated Ang-II-induced activator protein-1(AP-1)-mediated reporter activation. These findings demonstrate that propofol inhibits the Ang-II-activated ERK signaling pathway and AP-1 activation in cardiac fibroblasts.

Conclusion(s): We demonstrate for the first time that propofol could up-regulates NO synthesis, NOS activity, phospho-eNOS and phospho-Akt in cardiac fibroblasts under Ang-II-stimulation, and involve of ERK pathway in their anti-oxidative activity. This study delivers important new insight in the molecular pathways that may contribute to the anti-oxidative effects of propofol in the cardiovascular system.

Acknowledgements: Supported by grant-NSC-96-2320-B-039-009-MY3 from National Science Council, Taiwan to Dr. Wong.

References:

1 Cheng TH *J Am Cell Cardiol* 2001; 33: 1805.
2 Wong KL *Pharmacology* 2006; 76:163–169.

9AP1-3

Do Ca^{2+} channel blockers improve malignant hyperthermia crisis?

T. Migita, K. Mukaida, H. Hamada, M. Kawamoto

Anesthesiology and Critical Care, Hiroshima University Hospital, Hiroshima, Japan

Background and Goal of Study: Malignant hyperthermia (MH) is lethal complication during general anesthesia. Before diagnosing MH, anesthesiologists usually administer Ca^{2+} blockers to control unexpected tachycardia and unstable circulation. However, it is not recommended in case of MH crisis. The goal of this study was to evaluate the effect of Ca^{2+} blockers on Ca^{2+} homeostasis and its impact of Ca^{2+} blockers in the presence of dantrolene.

Materials and Methods: This study was approved by the ethics committee of Hiroshima University. Human myotubes were obtained from muscle biopsy. And according to the results of the calcium-induced calcium release rate test, myotubes were divided into the accelerated group and the non-accelerated group. Using the calcium-sensitive probe Fura 2, we utilized the 340/380 nm ratio to analyze alterations in calcium homeostasis inducing Ca^{2+} blockers, such as nifedipine, diltiazem and verapamil, on Ca^{2+} homeostasis of primary myotubes. We investigated the effects of Ca^{2+} blockers on Ca^{2+} homeostasis with dantrolene. Human embryonic kidney (HEK)-293 cells were transfected R2508C, A4894T mutant, or wild-type ryanodine receptor type1 (*RYR1)*, and similarly we investigated the effects of Ca^{2+} blockers on Ca^{2+} homeostasis.

Results and Discussion: Nifedipine increased transient intracellular calcium concentration ($[Ca^{2+}]i$) of myotubes in concentration dependence, and the EC_{50} in the accelerated group and the non-accelerated group were 0.718 ± 0.329 μM and 1.389 ± 0.482 μM, respectively ($P = 0.009$). Nifedipine was the most potent, followed by diltiazem and verapamil in both groups. In the presence of 50 μM dantrolene, 5 μM nifedipine-induced Ca^{2+} increase was attenuated by 61.5% of the response in the absence of dantrolene. Nifedipine did not increase $[Ca^{2+}]_i$ of HEK-293 cells expressing R2508C, A4894T or wild-type *RYR1,* respectively. The increase of $[Ca^{2+}]_i$ of myotubes suggested that Ca^{2+} blockers may affect *RYR1*. The different response between myotubes and HEK cells suggested that Ca^{2+} blockers may affect *RYR1* not directly but through dihydropyridine receptors. The dantrolene-induced decline effect of $[Ca^{2+}]_i$ of skeletal muscle was not disappeared in the presence of Ca^{2+} blockers.

Conclusion(s): In MH crisis, we do not recommend to administer Ca^{2+} blockers because of its potent effect to increase $[Ca^{2+}]_i$.

Acknowledgements: This study was supported in part by Grant-in-Aid No. 17390428 for Scientific Research from the Japan Society for the Promotion of Science, Tokyo, Japan.

Reference:

1 Weigl LG, Hohenegger M, Kress HG. J. Physiol. 2000; 525.2:461–469.

9AP1-4

Comparison between the effect of propofol and pentobarbital on hydrogen peroxide-stimulated human hepatocyte

Y. Seo, E. Lee, J. Kim

Department of Anesthesiology and Pain Medicine, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Republic of Korea

Background and Goal of Study: Propofol and barbiturate are known as protective agents against ischemia/reperfusion injury in several organs, but there are few reports of their protective effect on human hepatocytes. We investigated the effect of both agents on human hepatocytes under hydrogen peroxide (H_2O_2)-induced oxidative stress.

Materials and Methods: Human hepatocellular carcinoma cell line, SNU761 cells were pretreated with different concentration of propofol (1, 10, 50 mM) and pentobarbital (1, 10, 50, 100, 400 μM) 30 minutes before H_2O_2 application. Lactate dehydrogenase (LDH) was measured for assessing and quantifying cell death, and terminal deoxynucleotidyl transferase (TdT)-mediated deoxyuridine triphosphate (dUTP)-biotin nick end-labeling (TUNEL) assay was executed for assessing apoptosis. To assess the nature of cell death, treated hepatocytes were double stained with fluorescein isothiocyanite (FITC)-labeled Annexin V and propidium Iodide (PI) and analyzed by flow cytometry.

Results and Discussion: Treatment of SNU-761 HCC cell with H_2O_2 increased the percentage of LDH release in a dose and time dependent manner. Pretreatment with propofol in 1, 10 and 50 mM gradually suppressed H_2O_2 induced LDH release, but pretreatment with pentobarbital 10, 50, 100 mM did not suppress and moreover pentobarbital 400 mM significantly ($P < 0.05$) increased H_2O_2 induced LDH release. When hepatocytes were treated with propofol 50 mM at 30 min before exposure of 125 mM of H_2O_2, the percentage of TUNEL positive cells was significantly decreased. However, pentobarbital 400 mM did not prevent H_2O_2-induced TUNEL staining. In Annexin V-FITC binding analysis, propofol decreased the number of necrotic and late apoptotic cells, whereas there were no significant decreases the number of necrotic and apoptotic cells when pentobarbital was treated.

Conclusion(s): Compared with pentobarbital, propofol showed protective effect on hepatoctyes against oxidative stress in clinical concentrations. Propofol may be considered as the better anesthetic agent than pentobarbital during oxidative injuries of hepatocytes.

9AP1-5

Effect of low-dose human atrial natriuretic peptide on urine volume

R. Hosoi, T. Yokoyama, K. Yoshida, K. Kido, K. Yamashita

Department of Anesthesiology and Critical Care Med, Kochi Medical School, Nankoku, Kochi, Japan

Background and Goal of Study: Oligulia is a major problem during anesthesia. Exogenous administration of human recombinant atrial natriuretic peptide (hANP) may increase urine volume and prevent acute renal failure after surgery[1]. However, recommended dose of hANP (0.1 micro-g/kg/min) may induce hypotension and anesthetic management may be difficult[2]. In the current study, therefore, we investigated the effects of low-dose hANP (0.01 micro-g/kg/min) on perioperative urine volume, blood pressure and renal function for orthopedic surgery.

Materials and Methods: Thirty patients (ASA-PS: I–II, 50–80 year-old) undergoing orthopedic surgery were enrolled in this study. Anesthesia was induced with fentanyl, midazolam, vecuronium and inhalation of 2% sevoflurane, and maintained with 1%sevoflurane and fentanyl. Continuous intravenous infusion of hANP at 0.01 micro-gram/kg/min was started after induction of anesthesia, and was continued for 24 hours. Blood samples were collected before induction of anesthesia, after surgery, one day and three days after surgery and were measured for creatinine, (CER), blood urea nitrogen (BUN), cystatin-C, liver fatty acid binding protein (LFABP) and electrolytes was checked every hours. Infusion volume, urine volume and blood loss were also recorded.

Results and Discussion: There were no significant differences in patient's background (age, gender, height and weight) between the hANP group ($n = 15$) and the control group ($n = 15$). Operation time, total infusion volume, blood loss and fentanyl dose also showed no significant differences; 315 ± 105 vs 362 ± 129 minutes, 5049 ± 1488 vs 4816 ± 1215 ml, 615 ± 657 vs 644 ± 526 ml and 0.82 ± 0.27 vs 1.01 ± 0.41 mg, respectively. No hypotension was observed during surgery in either group. CER, BUN, cystatin-C, and LFABP showed no significant differences between groups. In the hANP group, however, urine volume was significantly more than that of the control group; 1707 ± 893 vs 868 ± 616 ml ($p = 0.006$). Electrolytes, Na^+, K^+, Ca^{2+} and Cl^-, did not change significantly during surgery. In the hANP group, hemoglobin

concentration was also maintained, while it significantly decreased in the control group compared to the hANP group ($p = 0.026$).

Conclusion(s): Continuous infusion of low-dose hANP (0.01 micro-g/kg/min) effectively increased urine volume and maintained hemoglobin concentration during surgery without causing hypotension and hypokalemia.

References:

1 Akamatsu N, et al. Transplantation 2005;80:1093–8
2 Shirakami G, et al. Anesth Analg 1197;85:907–12

9AP1-6

Is resting $[Ca^{2+}]_i$ elevated in cultured myotubes from malignant hyperthermia susceptible individuals?

K. Mukaida, T. Migita, M. Kawamoto, Y. Ichihara, H. Kikuchi

Anesthesia, Hiroshima Prefecture Rehabilitation Center, Higashi-Hiroshima, Japan

Background and Goal of Study: Malignant hyperthermia (MH) is a pharmacogenetic disorder in skeletal muscle caused by an increased Ca^{2+} release from the sarcoplasmic reticulum (SR) through the ryanodine receptor 1 (*RYR1*). Some reports indicate elevated resting intercellular Ca^{2+} ($[Ca^{2+}]_i$) in MH myotubes[1)2)], whereas other reports show no increase in resting $[Ca^{2+}]_i$ [1)3)]. We assessed the resting $[Ca^{2+}]_i$ in myotubes from MH susceptible individuals with accelerated Ca-induced Ca release (CICR).

Materials and Methods: According to Endo's method, we measured the CICR rate in 28 individuals and classified them into accelerated CICR group (aCICR) and normal CICR group (nCICR). Using the fluorescent calcium indicator fura-2, resting $[Ca^{2+}]_i$ was measured in each myotube. The max. response and EC_{50} to caffeine were determined in myotubes. The effects of Ca^{2+} free external buffer (free Ca^{2+}),10mM procaine and 1.5mM Ni^{2+} were assessed on $[Ca^{2+}]_i$. Values are expressed as mean ± SE. An analysis of variance were used, followed by Scheffé test.

Results and Discussion: The measured $[Ca^{2+}]_i$ are shown in Table 1. After treatment with free Ca^{2+}, the $[Ca^{2+}]_i$ in myotubes with high resting $[Ca^{2+}]_i$ was significantly reduced and% max. response was significantly lowered (Table 1). Neither procaine nor Ni^{2+} had statistical significant effects. These results suggested high resting $[Ca^{2+}]_i$ was associated with enhanced Ca^{2+} entry through the plasma membrane and the enhanced Ca^{2+} entry supported the Ca^{2+} content in the SR.

Table 1. Parameters for $[Ca^{2+}]_i$

CICR rate/resting $[Ca^{2+}]_i$ n	aCICR/High 7	aCICR/Normal 8	nCICR/Normal 13	p value
Resting $[Ca^{2+}]_i$ (nM)	108.7 ± 5.5	64.6 ± 3.3	59.6 ± 3.7	<0.0001
EC_{50} for caffeine (mM)	2.48 ± 0.29	2.85 ± 0.25	5.27 ± 0.28	<0.0001
Decreased $[Ca^{2+}]_i$ (nM) *	70.1 ± 6.5	24.9 ± 4.3	30.2 ± 4.7	<0.0001
%max. respose to10 mM caffeine*#	8.1 ± 2.4	24.6 ± 6.5	40.0 ± 4.7	0.0007

* Effects of free Ca^{2+}, # Control was considered as 100%.

Conclusion(s): We show resting $[Ca^{2+}]_i$ of MH susceptible myotubes varies from normal to high depending on increased Ca^{2+} entry.

Acknowledgements: This study was supported in part by Grant-in-Aid No.17390428 for Scientific Research from the Japan Society for the Promotion of Science, Tokyo, Japan.

References:

1 Wehner M, Rueffert H, Koenig F, et al. Neuromuscul Disord. 2004;14: 429–37.
2 Ducreux S, Zorzato F, Müller C, et al. J Biol Chem. 2004; 279:43838–46.
3 Kaufmann A, Kraft B, Michalek-Sauberer A, et al. Anesthesiology. 2008; 109: 457–64.

9AP2-1

Time course and spontaneous recovery of cisatracurium-induced neuromuscular block in the elderly

J. Barrio, G. SanMiguel, J. Carrión, I. Bataller, F. Pelegrín

Department of Anaesthesiology, Hospital Arnau de Vilanova, Valencia, Spain

Background and Goal of Study: The aim of this study was to compare the duration and spontaneous recovery of a single dose of cisatracarium in young adults (18–55 yr) and elderly (> 70 yr) patients during intravenous propofol-remifentanil anaesthesia

Materials and Methods: 15 young adults and 14 elderly ASA 1–2 patients without any disease or treatment affecting neuromuscular block (NMB) were enrolled. Patients received 0,1mg/Kg of cisatracurium during propofol/remifentanil anaesthesia and spontaneous recovery of the NMB was allowed. NMB was assessed by acceleromyography after train-of-four (TOF) stimulation of the ulnar nerve. We measured the duration from cisatracurium administration to T1 recovery of 25% and to TOFratio recovery of 80%, and the recovery times T1 25%–T1 75% and T1 25%–TOFratio 80%. Student's t-test was used for statistical analysis

Results and Discussion: Data in minutes (mean ± SD) are shown in the table

	Young adults (40,5 ± 14,2 yr)	Elderly (77,1 ± 4,5 yr)	p values
Time to T1 25%	45,2 ± 6,7	60,3 ± 13,7	0,001
Time to TOFratio 80%	64,8 ± 9,5	86,2 ± 15,3	0,0003
T1 25%–T1 75%	13,0 ± 3,7	20,6 ± 6,9	0,005
T1 25%–TOFratio 80%	19,6 ± 3,6	27,3 ± 4,7	0,0001

Conclusion(s): We found that the duration of action and spontaneous recovery of cisatracurium-induced NMB was prolonged in elderly patients compared with young adults during propofol-remifentanil anaesthesia, despite of cisatracurium lack of organ-dependent elimination.

9AP2-2

Pyridostigmine attenuates immobilization-induced resistance to atracurium

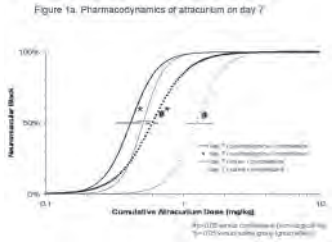
C. Frick, M. Helming, J. Martyn, M. Blobner, H. Fink

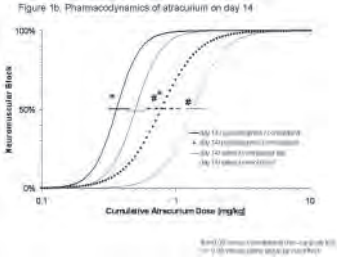
Klinik für Anaesthesiologie, Technische Universität München, Munich, Bavaria, Germany

Background and Goal of Study: Muscle weakness associated with critical illness leads to up-regulation of nicotinic acetylcholine receptors (nAChRs) and thus, complicating the use of muscle relaxants. Pyridostigmine reversibly blocks acetylcholinesterase and has the potential to decrease nAChR number. We investigated the effects of continuous pyridostigmine infusion on pharmacodynamics of atracurium and expression of nAChRs following immobilization.

Materials and Methods: After approval, 40 rats were immobilized in one hindlimb by pinning knee and ankle joints and received either continuous pyridostigmine (15mg/kg/day) or normal saline via implanted subcutaneous osmotic pumps. The contralateral leg served as control. Osmotic pumps were removed 24 h before measurements to exclude direct effects of pyridostigmine on muscle. After 7 and 14 days of immobilization, pharmacodynamics of atracurium and expression of nAChRs were examined.

Results and Discussion: Immobilization together with infusion of saline for 7 and 14 days significantly increased ED values of atracurium. This was associated with a profound up-regulation of nAChRs. Pyridostigmine infusion for 7 days, however, significantly reduced ED values on the immobilized tibialis muscle, while immoblization-induced up-regulation of nAChRs was significantly attenuated. Although the beneficial effects of pyridostigmine infusion on nAChR expression are no longer significant after 14 days of immobilization, resistance to atracurium was still diminished.





Conclusion(s): Continuous pyridostigmine infusion counteracts the immobilization-induced up-regulation of nAChRs after 7 days of immobilization. Up-regulation of nAChR concomitant with resistance to atracurium is attenuated in animals treated with pyridostigmine. After 14 days, however, the beneficial effects of pyridostigmine on nAChR expression are no longer significant.

9AP2-3

Variability in the duration of action of cis atracurium, under sevoflurane, desflurane and TIVA anaesthesia

E. Amaniti, P. Maidatsi, A. Philosoglou, E. Kwurdzieva, D. Vasilakos

Anaesthesia and Intensive Care Medicine, AHEPA University Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece

Background and Goal of Study: Variability in the duration of action of NMBA's is considered as a significant factor for residual paralysis in the PACU. Goal of the present study was the evaluation of possible cis atracurium variability, under three different regimens for maintenance of anaesthesia.

Materials and Methods: Forty-five ASA I–II patients, scheduled for abdominal or vascular surgery under general anaesthesia, participated in the study after informed consent. Exclusion criteria were the presence of renal, hepatic or neuromuscular disease, obesity, pregnancy or breast-feeding. After induction of anaesthesia and before cis-atracurium administration, ulnar nerve was stimulated via TOF WATCH SX® nerve stimulator and adductor pollicis response was monitored. After automatic calibration and baseline responces were achieved, repeated TOF stimulations were started. Afterwards, all patients received cis atracurium 0.1 mgkg $^{-1}$ and were randomly assigned to receive either 1 MAC of sevoflurane (group S, n = 15), desflurane (group D, n = 15) or Propofol, 100–120 μg kg $^{-1}$ min $^{-1}$ (group P, n = 15) as maintenance agent. Patients were evaluated during spontaneous recovery of neuromuscular junction. Endpoint variables were variability of 25% T1 and 25%–75% T1, which were defined as the current values of T1 and 25%–75% T1, subtracted to mean values of T1 and 25%–75% T1 of groups S, D and P respectively. Statistical analysis was conducted using Kruskal Wallis, Mann-Whitney U and x^2 tests. Level of significance was set at $p < 0.05$.

Results and Discussion: Demographics were comparable among groups ($p > 0.05$). Regarding variabilities of 25% T1 among groups (table 1), analysis revealed significantly higher variability in group P, compared to groups S and D ($p = 0.03$ P vs. D and $p = 0.035$ P vs. S). Variability of 25%–75% T1 of group P was also greater, compared to variabilities of groups D and S, respectively ($p = 0.014$ P vs. S and $p = 0.018$ P vs D). Comparisons between groups D and S didn't show any difference, regarding either variability of 25% T1 or 25%–75% T1 ($p > 0.05$).

Table 1.

	25% T1 variability Mean ± SD (min)	25%–75% T1 variability Mean ± SD (min)
Group S (n = 15)	6.26 ± 4.35	4.85 ± 3.3
Group D (n = 15)	6.41 ± 5.36	5.63 ± 5.74
Group P (n = 15)	9.64 ± 4.16	7.47 ± 3.1

Conclusion(s): Maintenance of anaesthesia with both sevoflurane and desflurane seemed to lead to more stable conditions and more predictable duration of action, compared to TIVA. This might be attributed to volatile anaesthetic-muscle tissue interaction.

9AP2-4

Is variability in the duration of action of rocuronium influenced by maintenance of anaesthesia agent?

E. Amaniti, P. Maidatsi, A. Zaralidou, Z. Aidoni, D. Vasilakos

Anaesthesia and Intensive Care Medicine, AHEPA University Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece

Background and Goal of Study: Variability in the duration of action of NMBA's often leads to significant residual curarization after the end of the procedure, which has been implicated in increased morbidity and mortality. Goal of the present study was the comparison of the variability in the duration of action of rocuronium, under sevoflurane or desflurane of anaesthesia.

Materials and Methods: The study was conducted in 40 ASA I–III patients, scheduled for abdominal or neurosurgical surgery under general anaesthesia, after informed consent. Exclusion criteria were the presence of renal, hepatic or neuromuscular disease, obesity, pregnancy or breast-feeding. After anaesthesia induction with diazepam 2 mg, propofol 2 mg kg^{-1} and fentanyl 5 μg kg^{-1}, ulnar nerve was stimulated with TOF WATCH SX® nerve stimulator and adductor pollicis response was monitored via accelerographic method. After automatic calibration was achieved, repeated TOF stimulations were delivered to obtain baseline responses. Afterwards, all patients received rocuronium 0.6 mg·kg^{-1} i.v. and volatile anaesthetic administration was commenced. Patients were randomly assigned into two groups to receive 1 MAC of either sevoflurane (group S, n = 20) or desflurane (group D, n = 20) as maintenance of anaesthesia agent. Patients were evaluated during spontaneous recovery of neuromuscular junction. Endpoint variables were variability of 25% T1 and 25%–75% T1, which were defined as the current values of T1 and 25%–75% T1, subtracted to mean values of T1 and 25%–75% T1 of groups S and D respectively. Statistical analysis was conducted using Mann-Whitney U and x^2 tests. Level of significance was set at $p < 0.05$.

Results and Discussion: Groups were comparable regarding age, weight and men/women ratio ($p > 0.05$). Mean and Standard deviations of 25%T1 and 25%–75% T1 variability values between groups are shown in table 1. Statistical analysis revealed significantly greater variability in D group, for both the variables measured, compared to S group.

Table 1.

	Variability 25% T1 Mean ± SD (min)	Variability 25%–75% T1 Mean ± SD (min)
Group S (n = 20)	5.66 ± 4.07	2.25 ± 1.65
Group D (n = 20)	8.89 ± 4.16 *	5.74 ± 2.94 §

* $p = 0.014$ D vs. S, § $p = 0.002$ D vs. S

Conclusion(s): Besides any known differences in rocuronium-sevoflurane or rocuronium-desflurane interaction, the use of desflurane, as maintenance of anaesthesia agent, lead to significantly higher variability in the duration of action of rocuronium, compared to sevoflurane, making recovery from neuromuscular block less predictable.

9AP2-5

Comparison of recovery time from PTC to reappearance of single twitch between single bolus and continuous infusion of rocuronium

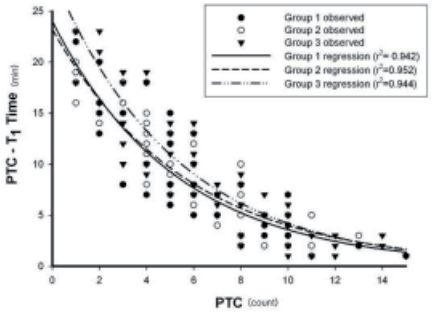
Y. Kim, M. Bang, H. Park, K. Lee

Department of Anesthesia and Pain Medicine, Gachon University College of Medicine, Incheon, Republic of Korea

Background and Goal of Study: During the Robot assisted or plain laparoscopic surgery or microscopic surgery, absolute patient immobility is requested. Deep neuromuscular block with intermittent bolus or continuous infusion of neuromuscular blocking agent is one of methods that accomplish this purpose. Rocuronium is known that it has no cummulative effect. Because of these properties of rocuronium, it may be considered that the recovery time from deep neuromuscular block with the single boluse dose of rocuronium would be the same as that with continuous infusion. The purpose of this study is to compare the recovery time from deep neuromuscular block which is in less than 5 post tetanic count to reappearance of 0.1Hz single twitch stimulation.

Materials and Methods: After IRB permission, 75 patients was enrolled to this study. Patients were randomly assigned to one of 3 groups. group 1 was administered single bolus only, group 2 was 1 hour infusion, and group 3 was 2 hour infusion of rocuronium during surgery. Anesthesia was induced with 2mg/kg of propofol, 10μg/kg of alfentanil, and 0.6mg/kg of rocuronium and maintained with 2L/min of O_2 and air and 1–2vol% of isoflurane. Group 2 and 3 were administered rocuronium by manner of continuous infusion during designated time. Neuromuscular blockade was monitored with TOF-watch® not to exceed more than 5 PTC during infusion. After infusion was end, PTC was counted every 5minute until reappearance of single twitch was detected and the each time was calculated. At the end of surgery, neuromuscular block was reversed with glycopyrrolate 0.4mg and pyridostigmine 15mg after TOF ratio 0.7 was confirmed.

Results and Discussion: Total amount of rocuronium was 2xED_{95} in group 1, 3.8xED_{95} in grouop 2, and 5.6xED_{95} in group 3. There was no statistical differences of the recovery time from PTC to reappearance of single twitch between groups.



Conclusion(s): There are no significant differences in recovery from deep neuromuscular blockade to reappearance of single twitch even if up to 2 hour of continuous infusion and 6xED_{95} of rocuronium was infused. When PTC was obtained during deep neuromuscular blockade, it may be predictable the time when the single twitch is reappeared.

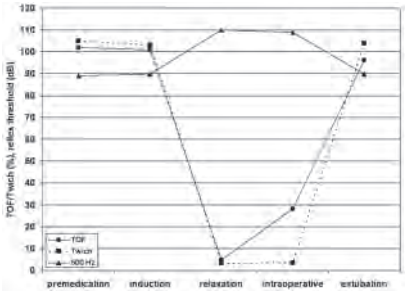
9AP2-6

Effects of neuromuscular blocking drugs on the threshold of the acoustically evoked stapedius reflex

P. Sárkány, M. Berhés, Z. Fülep, E. Tassonyi, B. Fülesdi

Anesthesiology and Intensive Care, Health and Medical Science Centre, University of Debrecen, Debrecen, Hungary

Background and Goal of Study: The authors tested an alternative method for monitoring the level of the neuromuscular block (NMB) and especially that of residual curarisation. The stapedius reflex threshold is a middle ear measurement of stapedius muscle response to sounds at individual frequencies. This striped muscle, because of its small size has ideal structure to record the level of the muscle relaxation and to identify the time of complete recovery of NMB. Our hypothesis was that the stapedius reflex is dependent on the activity of this small muscle, and therefore it may reflect the level of NMB.
Materials and Methods: We analysed 26 adult patients during anesthesias for lumbar disc herniotomy. The effect of muscle relaxant wasn't reversed at the end of surgery. The acoustically evoked stapedius reflex threshold was determined at different phases of anaesthesia using four different frequencies (500, 1000, 2000 and 4000Hz) by Interacoustics MT10 Handheld Impedance Tympanometer. We applied TOF Watch acceleromyography to define the TOF-ratio and single-twitch height continuously. The intraoperatively evaluated reflex data were compared with datas obtained from acceleromyography and the results were analysed statistically.
Results and Discussion: There were no differences in the magnitude of the stapedius reflex during anesthesia when administering sounds at different frequencies, therefore the lowest frequency was used in the further analysis. The reflex was totally blocked during profound neuromuscular block, which was indicated by elevation of stapedius reflex threshold. When the TOF ratio was 0.9 or above this limit, the reflex recovered.



Conclusion(s): A good correlation was found between TOF watch acceleromyography and stapedius reflex treshold results. This suggest an alternative, potential role of acoustic reflex monitoring in special intraoperative circumstances when routine neuromuscular testing is not possible (palsy, burn, operation on the upper extremities). Further studies with larger population are recommended for determining the specificity and sensitivity of this method for monitoring the neuromuscular function during anaesthesia.

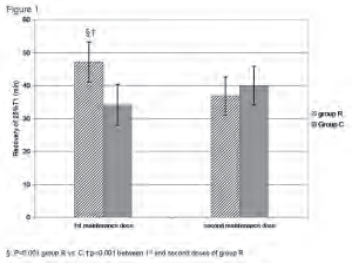
9AP2-7

Comparison of the duration of maintenance doses of cis atracurium, when equipotent doses of cis atracurium or rocuronium have been used for tracheal intubation

E. Amaniti, P. Maidatsi, B. Fyntanidou, I. Zaharas, D. Vasilakos

Anaesthesia and Intensive Care, AHEPA University Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece

Background and Goal of Study: Rocuronium is widely used, due to its fast onset of action. However, renal or hepatic impairment may induce prolongation of its action. On the other hand, cis atracurium does not rely on hepatic or renal clearance for its elimination, thus being suitable for long-lasting procedures, but it is characterized by delayed onset of action. Goal of the study was the comparison of the duration of repetitive doses of cis atracurium, when rocuronium or cis atracurium have been administered for intubation.
Materials and Methods: The study was conducted in 40 ASA I–II patients, underwent general anaesthesia, after obtaining informed consent. Exclusion criteria were the presence of renal, hepatic or neuromuscular disease. Anaesthesia was induced with propofol 2 mg kg $^{-1}$ and fentanyl 5 μg kg $^{-1}$, while maintenance was achived with desflurane 1 MAC. After loss of consciousness, ulnar nerve was stimulated via TOF WATCH SX® and adductor pollicis response was monitored using the accelerography. After automatic calibration, repetitive TOF stimulations were started. Patients were randomly assigned into two groups to receive either rocuronium 0.9 mg kg $^{-1}$ (group R) or cis atracurium 0.15 mg kg $^{-1}$ (group C). After spontaneous recovery to 25% T1, patients were administered 0.0375 mg kg $^{-1}$ cis atracurium (1/4 3ED95), as a maintenance dose. Patients were evaluated regarding the time to recovery to 25%T1, after administration of the first and second maintenance doses of cis atracurium. Statistical analysis was conducted using Kruskal Wallis, Mann Whitney U test chi-Square tests. Level of significance was se at $p < 0.05$.
Results and Discussion: Demographics were comparable between group ($p > 0.05$). Regarding first maintenance dose between groups, analysis revealed significantly faster recovery in group C, compared to group R ($p < 0.01$). Comparison of recovery after second maintenance dose between groups didn't show any difference. Intergroup comparisons of T1 recovery between first and second doses revealed significant differences only for group R ($p < 0.01$).



Conclusion(s): Maintenance doses of cis atracurium seemed to be influenced by the muscle relaxant used for tracheal intubation, probably due to pharmacodynamic interaction.

9AP2-8

Study of the EMG parameters

M. De Bel, M. Jaumain, F. Cantraine, N. Van Cutsem, T. Tuna

Bio Electrical and Mechanical Systems, Université Libre de Bruxelles, Brussels, Belgium

Background and Goal of Study: The aim of this work is to study shaping features of evoked EMG (eEMG) collected on the hand, foot and orbicular muscles and to evaluate the stability of the peak to peak amplitude **T**, the rectified area **S**, and the usual ratios $\mathbf{T_1/T_0}$, $\mathbf{S_1/S_0}$, $\mathbf{T_4/T_1}$, $\mathbf{S_4/S_1}$. Results of this study will lead us in the selection of the best parameters to follow the EMG evolution during myorelaxation.
Materials and Methods: For both studies, MUSTIMEG device was used to stimulate and to collect eEMG on each site of one set of normal voluntary subject. To analyse the parameters stability of eEMG, Train-Of-Four stimulation (TOF) is used every 15 seconds and data are collected during 5 minutes. To check the opportunity of polytopic monitoring during myorelaxation, TOF are applied to study the relationship between the amplitude of eEMG and the intensity of the stimulation current.
Results and Discussion: Without muscle relaxant, our system is supposed to measure continuously the same response; eEMG features (T, S, ratios …) are expected to remain constant. To assess the quality of our measurements we defined in Fig1 a Stability Index (SI). Tab1 presents two typical stability indexes for one patient: first, the variation of T_1 and S_1 from the mean (SI_mean) and second from the initial value (SI_initial). Having demonstrated the system to behave satisfactorily stable, we collected systematically eEMG. Tab2 presents the distribution of eEMG amplitude for each site on our set of subject. Fig2 shows the relationship between stimulation current and amplitude of eEMG.

Tab1. Characteristics values of T_1 and S_1 upon time of and Stability Index.

	initial value	mean value	SI_mean	SI_initial	SID	max	min
T_1	13,78 mV	13,78 mV	2,37%	1,37%	0,19 mV	14,02 mV	13,2 mV
S_1	35,08 mVs	36,65 mVs	0,88%	3,80%	0,62 mVs	36,18 mVs	32,08 mVs

Fig1. Stability Index.

$$SI\_rel\,(A) = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\frac{A_i - A_{ref}}{A_{ref}}\right)^2}$$

Tab2. Peak to peak EMG amplitude on each site

n = 19	T (Hand)	T (Foot)	T (Orb.)
mean	15.2 mV	14.6 mV	3.4 mV
median	15.7 mV	15.9 mV	3.3 mV
SID	2.2 mV	3.4 mV	1.3 mV
maximum	18.3 mV	24.3 mV	6.6 mV
minimum	9.9 mV	4.3 mV	1.6 mV

Fig2. Hand EMG amplitude VS Current intensity

Conclusion(s): MUSTIMEG provides reliable and accurate measurements of the muscular activity of orbicular, hand and foot muscles. Its availability will enable us to compare the pharmacodynamic of many surface muscles under the existing muscle relaxant.
Acknowledgements: We wish to thank "la region wallonne" for its contribution to this project under convention n°516150.

9AP2-9

Repeated induction of rocuronium-induced neuromuscular blockade and subsequent reversal with sugammadex in anaesthetised guinea pigs

A. Bom, F. Hope

Department of Pharmacology, Schering-Plough, Newhouse, United Kingdom

Background and Goal of Study: After reversal with sugammadex there is a period when the onset time of rocuronium and vecuronium are delayed. If neuromuscular blockade (NMB) is required before the recommended waiting time has passed, a nonsteroidal neuromuscular blocking agent (NMBA) should be used. This study aimed to determine whether an infusion of rocuronium in guinea pigs can be used to form complexes with sugammadex until the first signs of neuromuscular blockade are observed, allowing fast onset of NMB with a single dose of rocuronium.

Materials and Methods: Male guinea pigs were anaesthetised with urethane and artificially ventilated. Carotid artery and jugular vein catheters allowed administration of drugs, blood sampling and blood pressure measurements. Train-of-four stimulation of the sciatic nerve resulted in M. gastrocnemius contractions. After steady-state muscle contractions were obtained, animals were paralysed with a 3xED90 i.v. bolus dose of rocuronium (492 nmol/kg). One minute after maximum blockade, a more than effective i.v. bolus dose of sugammadex was administered (735 nmol/kg). Five minutes after complete recovery, rocuronium was infused until height of T4 was reduced to ~80% of baseline values. Then another 3xED90 i.v. bolus dose of rocuronium was administered again. This procedure was repeated three times. All values are expressed as Mean ± SEM.

Results and Discussion: After injection of the first 3xED90 dose of rocuronium, complete block of T4 and T1 was achieved in 1.3 ± 0.3 and 1.4 ± 0.3 min, respectively. Sugammadex caused complete reversal within 2.4 min. Subsequent infusion of rocuronium (32.8 nmol/kg/min) for ~ 4 min reduced height of T1 and T4 by 5.1 ± 3.5 and 23.1 ± 2.6, respectively. A second 3xED90 dose of rocuronium caused complete blockade of T4 and T1 with a similar onset time: 1.2 ± 0.2 and 1.3 ± 0.3 min. This procedure was repeated twice without any change in onset time.

Conclusion(s): In guinea pigs it was possible to titrate the excess of sugammadex with a slow infusion of rocuronium. Only when a sufficient amount of rocuronium has been infused to form complexes with the excess of sugammadex, will the first signs of NMB become evident. This experiment illustrates the principle of complex formation between sugammadex and rocuronium.

9AP3-1

Aprepitant for preventing postoperative nausea and vomiting: A dose finding study

T. Gin, L. Lai, Y. Tang, B. Cheng, M. Chan

Anaesthesia and Intensive Care, The Chinese University of Hong Kong, Shatin, Hong Kong Special Administrative Region, China

Background and Goal of Study: The aprepitant (a neurokinin$_1$ antagonist) dose suggested for prevention of postoperative nausea and vomiting (PONV) is 40 mg, but dose response data are limited. We conducted a dose finding study of aprepitant for the prevention of PONV after gynecologic laparotomy.

Materials and Methods: The study was approved by the ethics committee and 395 women scheduled for abdominal hysterectomy and/or ovarian cystectomy gave written informed consent. One hour before surgery, patients were randomized to receive one of five doses of aprepitant: 40 mg, 80 mg, 125 mg, 160 mg or 250 mg. We used a standardized anesthetic technique and postoperative analgesic regimen with patient controlled iv morphine. Patients were reviewed regularly for 48 hours after surgery. We recorded the incidence of vomiting, severity of nausea (visual analog scale, VAS 0–10), use of rescue antiemetics (prochlorperazine 12.5 imi), analgesic requirement and side effects. Data were compared among groups using χ^2 tests and ANOVA. $P < 0.05$ was considered significant.

Results and Discussion: Patient characteristics and operative details were similar among groups. Postoperative pain score and morphine consumption did not differ among groups. At 48 hours after surgery, more patients in the 40 mg group, 23% (95% confidence intervals, CI 14–34%) reported vomiting compared with 10% (95%CI 4.9–19%), 11% (95%CI 5.8–11.2%), 10.1% (95%CI 5–19%) and 8.9% (95%CI 4.2–17.7%) who received aprepitant at 80 mg, 125 mg, 160 mg and 250 mg, respectively ($P = 0.03$). The incidence of significant nausea (VAS > 4/10), range 23–42%, was however similar among groups ($P = 0.54$). Consequently, the proportion of patients requesting rescue antiemetics, range 20–26%, was not different among groups ($P = 0.48$). The incidence of side effects (mainly headache and dizziness) was similar among groups ($P = 0.71$).

Rates of postoperative nausea, vomiting and use of rescue antiemetics

	Aprepitant 40 mg	Aprepitant 80 mg	Aprepitant 125 mg	Aprepitant 160 mg	Aprepitant 250 mg
No. of patients	78	80	80	79	78
Vomiting%	23.1	10	11.3	10.1	8.9
Nausea (VAS > 4/10)	42.3	31.3	32.5	29.1	33.3
Any nausea	57.7	52.5	48.8	50.6	55.1
Use of rescue antiemetics	25.6	22.5	21.3	20.3	19.2
Side effects	14.1	11.3	12.5	13.9	11.5

Conclusion(s): Aprepitant 80 mg appears to be an appropriate dose for preventing vomiting after gynecologic laparotomy, with higher efficacy than aprepitant 40 mg. Dose dependent relief for postoperative nausea was not detected.

9AP3-2

Dexamethasone for postoperative nausea and vomiting prophylaxis: Effect on glycaemia in patients with type II diabetes undergoing laparoscopic surgery

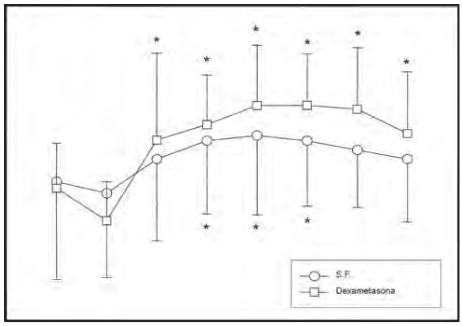
C. Nazar, R. Flores, H. Lacassie, H. Muñoz

Anestesiología, Pontificia Universidad Católica de Chile, Santiago, Santiago, Chile

Background and Goal of Study: Dexamethasone given to prevent postoperative nausea and vomiting (PONV) may produce significant hyperglycaemia in the postoperative period. The effect of dexamethasone on patients with diabetes is unknown. Goal of Study: We hypothesized that the use of dexamethasone for PONV prophylaxis in patients with diabetes potentiates hyperglycaemia in the postoperative period.

Materials and Methods: After approval by the Ethics Committee and written informed consent, thirty patients with tipe II diabetes, ASA II–III, BMI between 20–30 kg*m^{-2}, undergoing Laparoscopic Cholecistectomy (LC) were studied in a prospective, double-blind and randomized trial. Patients were randomly distributed into two groups: dexamethasone group (n = 15) received dexamethasone 8 mg intravenously after induction of anaesthesia; control group (n = 15) received isotonic saline. Anaesthesia technic was standard. Fingerprick capillary blood glucose concentrations were measured at baseline and even 2 hours during the first 12 hours since the start of surgery.

Results and Discussion: There were no significant differences in patients characteristics data, duration of anaesthesia and surgery or fentanyl consumption. Intragroup analysis showed that all measurements after the beginning of surgery were significantly higher than baseline in the dexamethasone group. In the control group, only at 4, 6 and 8 hours the glycaemia levels were significantly higher than baseline. Intergroup analysis did not find significant differences in the postoperative glycaemias between groups during all the study. Maximum blood glucose value in the dexamethasone group was 8.47 ± 1.15 mmol*l^{1} and in the control group 7.67 ± 1.95 mmol*l^{-1} (p = ns).



Conclusion(s): Patients with tipe II diabetes undergoing LC develop postoperative hyperglycaemia. To compare both groups, we did not find significant differences in postoperative blood glucose concentrations. Probably, the used of dexamethasone for PONV prophylaxis did not potentiates hyperglycaemia in the perioperative period in this patients.

9AP3-3

The clinical analysis about factors related to postoperative nausea and vomiting on gynecology surgery

J. Hou, K. Zheng, N. Hui

Anestheiology, Changhai Hospital, Shanghai, China

Background and Goal of Study: PONV is a common postoperative complication and the most common reason of patient's discomfortable. Severe

PONVcan lead to many clinical compications, increase the days that patients stay in hospital and aggravate their economic burden. The incidence is high in abdominal surgery and especially gynecology surgery. So this article analyzes the incidence and risk factors of postoperative nausea and vomiting (PONV) on gynecology surgery and tries to find a way to treat it.

Materials and Methods: 254 gynecology surgery cases were divided into groups according to age, preoperative fasting and drink deprivation time, operation types, postoperative analgesia types, postoperative analgesia's effect. Interview patients after operation at 6,12,24,48 hours respctively, and record their information of drug consumed, vital sign, pain, times, degree of PONV and other complications.

Results and Discussion: The total incidence of PONV on gynecology surgery is 59.06%. PONV often happened within the fist 24 hours after operation, especially in the first 6 hours; Patient's age, operation type, fasting and drink deprivation time have no effect on the incidence of PONV ($p > 0.05$); The incidence of PONV is higher in PCA group than in no-PCA group ($p < 0.05$), PONV is more frequent in the groups continuous analgesia ($p < 0.01$). Patients' age, operation type, fasting and drink deprivation time have no effect on PONV. Postoperative analgesia type, the analgesia's effect, route of administration and analgesics have effect on PONV's incidence. It is found PONV's incidence is obviously higher in two PCA groups than in NO-PCA group. Although the incidence of PONV's between PCIA and PCEA was considered statistically significant, it doesn't affect the choice of analgesia's types in clinical. Typical PONV's duration is less than 24 hours, and is most serious in the first 2 hours. It also found that in this study : frequent PONV was in the first day (23.23%) and it is related to postoperative analgesia's type, mainly happened in big surgery, long time of operation, and in weak patients.

Conclusion(s): In conclusions, our study suggest that postoperative analgesia type, route of administration, analgesics used have effect on PONV. Understand the risk factors of PONV on gynecology surgery can guide clinicians to use some of the controllable factors such as select the appropriate anesthetics, improve postoperative analgesia program, use preventive antiemetic, choose the appropriate type of postoperative analgesia to reduce the incidence of PONV.

9AP3-4

Incidence of nausea and vomiting after laparoscopic gynecological surgery is decreased in luteal phase of the menstrual cycle

B. Mraovic, T. Simurina, Z. Sonicki, J. Seric, Z. Markulin

Department of Anesthesiology, Thomas Jefferson University, Philadelphia, Pennsylvania, USA

Background and Goal of Study: Female sex is a well recognized risk factor for postoperative nausea and vomiting (PONV)(1). The data about influence of the phase of menstrual cycle on PONV after gynecological laparoscopy are sparse and controversial (2,3). We investigated whether the phase of menstrual cycle has influence on the incidence of PONV in women undergoing general anesthesia for gynecological laparoscopy in a prospective, double-blind, observation study.

Materials and Methods: After obtaining IRB approval and informed consents, 111 fertile women, ASA PS I/II, scheduled for laparoscopic gynecological surgery were assigned into three groups according to the phase of menstrual cycle at the time of anesthesia: F1–follicular phase (days 1–8), O2–ovulatory phase (9–15) and L3–luteal phase (16 to the end). Standardized general anesthesia technique was used (sevoflurane in air/oxygen) and no PONV prophylaxis. Diclofenac and pethidine was used for pain and metoclopramide for PONV. Data were analyzed using χ^2 and Kruskal Wallis test. $P < 0.05$ was considered significant.

Results and Discussion: There were no significant differences among groups for age, weight, height, BMI, h/o smoking, h/o motion sickness and h/o PONV. The incidence of PONV was significantly lower in L3 for PONV at 0–24h, for early PONV and early nausea. Rescue antiemetic usage, nausea and pain VAS scores, and perioperative opioid consumption were not different among groups.

Table1.

	F1 (n = 34)	O2 (n = 40)	L3 (n = 37)	p
PONV (24h)	12 (35)	15 (38)	5 (14)	0.041*
PONV (0–2h)	7 (21)	10 (25)	1 (3)	0.021*
PONV (2–24h)	5 (15)	8 (20)	5 (14)	0.713
Nausea (24h)	11 (32)	13 (33)	5 (14)	0.102
Nausea (0–2h)	7 (21)	9 (23)	1 (3)	0.032*
Nausea (2–24h)	4 (12)	6 (15)	5 (14)	0.921
POV (24h)	9 (27)	11 (28)	5 (14)	0.274
POV (0–2h)	5 (15)	7 (18)	1 (3)	0.106
POV (2–24h)	4 (12)	5 (13)	5 (14)	0.975

*$p < 0.05$, F1 = follicular, O2 = ovulatory, L3 = luteal phase. Data presented as n (%).

Conclusion(s): The incidence of PONV was lower in women in luteal phase of menstrual cycle at 24h, as well as the incidence of early PONV and early nausea. Further studies with larger groups and hormonal measurements are needed to confirm this finding. Scheduling patients in luteal phase of menstrual cycle could decrease the risk for PONV in gynecologic laparoscopic surgery.

References:

1 Gan TJ, et al. Anesth Analg 2007;105:1615–28.
2 Gratz I, et al. Anesth Analg 1996;83:565–9.
3 Sener EB, et al. Gynecol Obstet Invest 2005;59:49–53.

9AP3-5

Prophylactic P6 acupressure, ondansetron, metoclopramide and placebo for prevention of vomiting and nausea after strabismus surgery

A. Ebrahim Soltani, H. Mohammadinasab, S. Arbabi, M. Godarzi, R. Mohtaram

Anesthesiology, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran

Background and Goal of Study: To compare the efficacy of acupressure wrist bands, ondansetron, metoclopramide and placebo in the prevention of vomiting and nausea after strabismus surgery.

Materials and Methods: Two hundred patients, ASA physical status I or II, aged between 1 and 60 yr, undergoing strabismus surgery in Farabi Hospital in 2007–2008 years, were included in this randomized, prospective, double-blind and placebo-controlled study. Group I was the Control, group II received metoclopramide 0.2 mg/kg, group III received ondansetron 2 mg iv for patients less than 10 aged yr. and 4 mg iv for patients more than 10 aged-yr. just before induction, in Group IV acupressure wristbands were applied at the P6 points. Acupressure wrist bands were placed inappropriately in Groups I, II and III. The acupressure wrist bands were applied 30 min prior to induction of anesthesia and removed six hours following surgery. Anesthesia was standardized. PONV were evaluated within six hours and at 24 hr after surgery by a blinded observer. Results were analyzed by X^2 test. A *P* value of < 0.05 was taken as significant.

Results and Discussion: The incidence of PONV was not significantly difference in acupressure, metoclopramide and ondansetron during the 24 hours. The metoclopramide, ondansetron and acupressure groups had a significant decrease in the incidence of vomiting during the recovery (6%, 0% and 0%, $p = 0.001$).

Conclusion(s): Acupressure at P6 causes a significant reduction in the incidence of PONV in the 24 hours following strabismus surgery, similar to that of etoclopramide 0.2 mg/kg and ondansetron 2 mg iv for patients less than 10 aged yr. and 4 mg iv for patients more than 10 aged-yr.

9AP3-6

Does the addition of food flavourings decrease the incidence of nausea and vomiting following ingestion of sodium citrate– A healthy volunteer study

L. Alexander, B. Heidemann, A. Paul

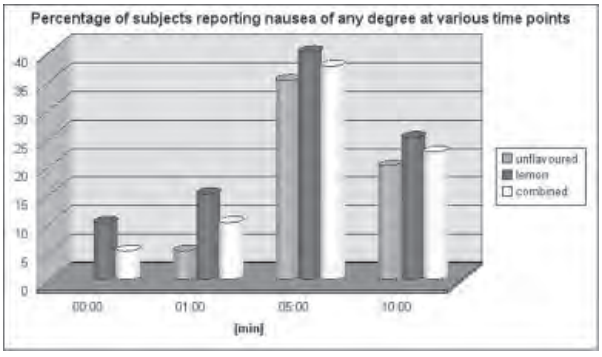
Department of Anaesthesia, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom

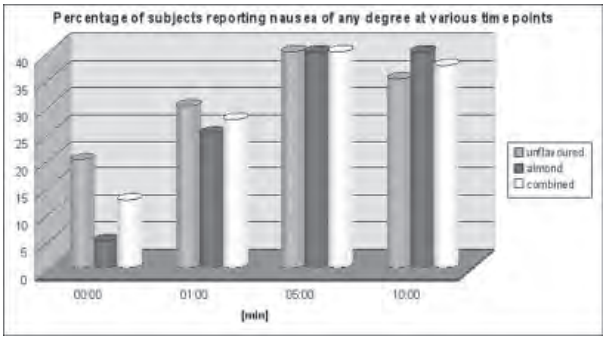
Background and Goal of Study: Sodium citrate is used to prevent acid aspiration syndrome. Its use causes nausea and vomiting (Abramovitz, 2006). Anecdotal reports suggest that added flavourings may reduce the incidence of nausea and vomiting. This study examines if this claim can be substantiated.

Materials and Methods: This is a double-blind randomised controlled trial which obtained formal ethics approval. Forty healthy female volunteers were randomised to receive unflavoured sodium citrate and either lemon or almond flavoured sodium citrate at random order at least 24 hours apart. Volunteers rated smell, taste, aftertaste and degree of nausea after ingestion of the solution. An investigator, blinded to the solution presented, observed the incidence of retching and vomiting. ANOVA was used for visual analogue data for smell, taste and aftertaste. Chi-squared test was used for frequency data for nausea and overall acceptability.

Results and Discussion: There was no significant difference in the incidence of nausea between the unflavoured and flavoured groups. Lemon flavoured solution had a significantly more pleasant smell ($p = 0.002$) and acceptable taste ($p = 0.027$) compared to unflavoured solution. It is possible that anecdotal reports of a reduction in nausea were caused by patients finding the flavoured solutions more pleasant to smell and of a more acceptable taste.

Conclusion(s): The addition of flavourings to sodium citrate does not reduce the incidence of nausea. A qualitative study in patients having received sodium citrate looking at subjective data for smell and taste and experimenting with different flavours may in due course improve patient experience with sodium citrate.





Reference:

1 Abramovitz, S., et al. 2006, 'Oral sodium citrate increases nausea amongst elec. tive caesarean delivery patients', *Canadian Journal of Anaesthesia,* vol. 53, no. 8, pp 776–780

9AP3-8

Dexamethasone for postoperative nausea and vomiting prophylaxis: Effect on glycaemia in normal patients undergoing laparoscopic surgery

C. Nazar, R. Flores, H. Lacassie, H. Muñoz

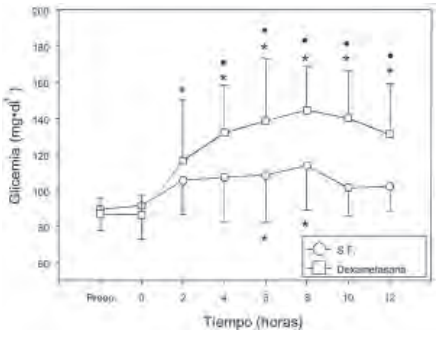
Anestesiología, Pontificia Universidad Católica de Chile, Santiago, Santiago, Chile

Background and Goal of Study: Dexamethasone given to prevent postoperative nausea and vomiting (PONV) may produce significant hyperglycaemia in the postoperative period. The effect of dexamethasone on normal patients is unknown. We hypothesized that the use of dexamethasone for PONV prophylaxis in normal patients potentiates hyperglycaemia in the postoperative period.

Materials and Methods: After approval by the Ethics Committee and written informed consent, fourty normal patients, ASA I–II, BMI between 20–30 $kg*m^{-2}$, undergoing Laparoscopic Cholecistectomy (LC) were studied in a prospective, double-blind and randomized trial. Patients were randomly distributed into two groups: dexamethasone group (n = 15) received dexamethasone 8 mg intravenously after induction of anaesthesia; control group (n = 15) received isotonic saline. Anaesthesia technique was standard. Fingerprick capillary blood glucose concentrations were measured at baseline and even 2 hours during the first 12 hours since the start of surgery.

Results and Discussion: There were no significant differences in patients characteristics data, duration of anaesthesia and surgery, risk or incidence of PONV or fentanyl consumption. Intragroup analysis showed that all measurements after the beginning of surgery were significantly higher than baseline in the dexamethasone group. In the control group, only at 6 and 8 hours the glycaemia levels were significantly higher than baseline. Intergroup analysis found significant differences in the postoperative glycaemias between groups at 4, 6, 8, 10 and 12 hours of the study. Maximum blood glucose value in the dexamethasone group (8.01 ± 1.15 $mmol*l^{-1}$) was significanly higher that the control group (6.28 ± 1.19 $mmol*l^{-1}$), both registrated at 8 hours ($p < 0.05$).

Conclusion(s): Normal patients undergoing LC develop postoperative hyperglycaemia. To compare both groups, we did find significant differences in postoperative blood glucose concentrations between the groups. The patients who received dexamethasone developed significant hyperglycaemia compared with patients did not receive the drug, since 4 to 12 hours of study. The use of dexamethasone for PONV prophylaxis potentiates hyperglycaemia in the perioperative period in this patients.



9AP4-2

Effect of perioperative analgesic regimens in CRP and cytokines of surgical cancer patients. A pilot study

M. Vassiliadis, P. Kazila, N. Barbetakis, S. Anisoglou, M. Tzouveleki

Anesthesiology and Intensive Care, Anticancer Hospital "Theageneio", Thessaloniki, Greece

Background and Goal of Study: Aim of this randomised/controlled pilot study was to estimate the influence of two different analgesic regimens in postoperative levels of C-reactive protein (CRP), interleukin-6 (IL-6) and 10 (IL-10) in surgical cancer patients.

Materials and Methods: Twenty-four surgical patients with non-microcytic lung cancer, undergoing segmentectomy/lobectomy, were randomised preoperatively in two groups. Group A (n = 11) was treated intra- and postoperatively with a complete opioid-sparing drug scheme (ropivacaine/clonidine epidurally and parecoxib IV). Group B (n = 13) was treated with opioids (remifentanyl IV and morphine epidurally). All patients' analgesic dosages were titrated post-op with VAS-guided protocols. Patients with metastatic disease or under chemotherapy, immunotherapy or cortisol were excluded. Five blood samples were collected: preoperatively, in the post-anesthesia care unit, on the first, second and fifth postoperative day. Levels of IL-6 (pg/ml), IL-10 (pg/ml) and CRP (mg/ml) were compared, using the area-under-the-curve (AUC) method. Two-sample t-test was used (NCSS 2007) and $p < 0.05$ was considered statistically significant.

Results and Discussion: There was a significant difference in IL-6 (*p = 0.032, power: ~60%) and IL-10 (^p = 0.02, power: ~~67%) between groups, but not with CRP. Mean values of AUC, Standard Deviation and 95%Confidence Interval are reported.

Table 1

	Means, SD and 95%CI of IL-6, IL-10 and CRP				
	AUC IL-6	AUC IL-6	AUC IL-10	AUC IL-10	AUC CRP
	Mean ± SD	95% CI	Mean ± SD	95% CI	Mean ± SD
Group A	673 ± 171*	558–789	8.1 ± 6.57^	3.7–12.5	431 ± 142
Group B	1055 ± 551	722–1388	17.1 ± 10.5	10.7–23.5	476 ± 252

Conclusion(s): According to our sample, it seems that patients who had been treated with no-opioid analgesic regimen had less cytokine production, comparing to patients with sole-opioid analgesic schemes. Until a long-term follow-up is fully conducted, the clinical relevance of this observed difference is not known.

9AP4-4

Performance of the Marsh and Schnider pharmacokinetic-dynamic model to target a clinical steady-state, when using effect-site controlled titration of propofol

M. Coppens, H. Vereecke, J. Vanlimmen, T. Schnider, M. Struys

Anaesthesia, University Hospital Ghent, Gent, Belgium

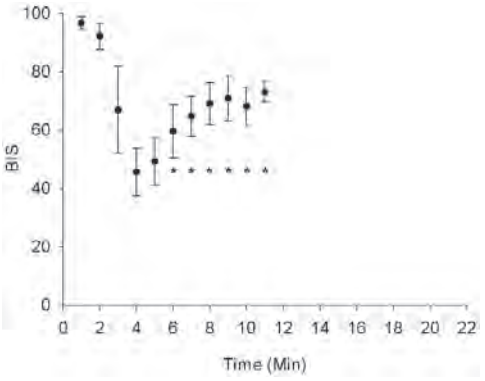
Background and Goal of Study: We compared the Marsh[1] and Schnider[2] pharmacokinetic-dynamic model for propofol in their ability to reach clinical steady-state when titrating their respective calculated effect-site concentrations.

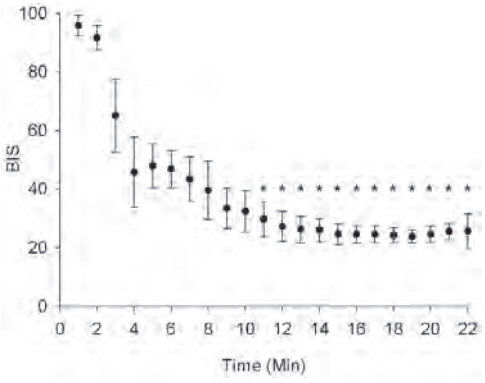
Materials and Methods: After ethical committee approval and informed consent, we randomized 40 patients in two groups. They received propofol1% at 300ml/h until loss of response to name calling (LORNC). At LORNC, the effect-site concentration of propofol (Ce_{PROP}), as calculated by the Marsh (group M) or Schnider model (group S), was set as target for effect-site controlled TCI, controlled by Marsh (Group M) or Schnider (Group S) parameters. We measured

BIS (Aspect Medical systems) during 20 minutes after LORNC. Name calling was repeated every 15 seconds for 20 minutes or until "return of consciousness" (ROC) was observed.

Results and Discussion: Demographics were comparable between groups ($p < 0.05$). The time at LORNC was respectively 163 (± 25) and 164 (± 30) seconds, for group M and S. In group M, all patients had ROC at a time of 401 (± 102) seconds versus none in group S. The BIS value at LORNC was 59 (± 12) and 59 (± 14) for group M and S, respectively. In group M, the BIS showed steady-state after 6 minutes, after ROC had occurred. (Figure 1) In group S, steady-state for BIS was seen after 10 minutes at deeper levels of anesthesia compared to BIS at LORNC. (Figure 2) Targeting Ce_{PROP} using Marsh or Schnider model results in significantly different pharmacodynamic and clinical behavior.

Conclusion(s): Both PKPD models can be optimized for controlling effect-site concentrations of propofol. Figure 1: Group M: Mean BIS (± SD) over time (* = steady state). Figure 2: Group S: Mean BIS (± SD) over time (* = steady state).





References:

1 Marsh B, Br J Anaesth 1991:41–8.

2 Schnider TW, Anesthesiology 1997;86:10–23.

9AP4-5

Propofol metabolites in blood after single intravenous bolus – Association to CYP2B6 pharmacogenetics

M. Lindqvist, I. Johansson, M. Hiratsuka, J. Jakobsson, M. Ingelman-Sundberg

Department of Physiology and Pharmacology, Karolinska Institutet, Stockholm, Sweden

Background and Goal of Study: The pharmacokinetics of propofol shows great interindividual variation and the reason for this is not known. Propofol is metabolized by enzymes encoded by the *CYP2B6* and *UGT1A9* genes. These genes are highly polymorphic meaning there is a genetic variation in the population and this might contribute to the interindividual differences in propofol elimination kinetics. *In vitro* studies showed a 43-fold difference in propofol metabolic capacity in microsomes isolated from different human livers, and a preliminary association was seen between a specific *CYP2B6* haplotype (No 4) and propofol hydroxylation, whereas no influence of the commonly described genetic variants *CYP2B6*4, *5, *6 and *9* was observed. Our objective in this study was to see if the interindividual difference in the rate of CYP2B6-mediated 4-hydroxylation of propofol exists *in vivo*, and to investigate whether there is a correlation between altered metabolic capacity of propofol and the specific haplotype 4.

Materials and Methods: One hundred otherwise healthy (ASA I–II) patients undergoing short elective orthopaedic surgery in general anaesthesia were included in the study. Blood samples were collected at 0, 4, 8, 12 and 16 min after a single i.v. dose of propofol of 2–2,7 mg/kg. Propofol metabolites of CYP2B6 (1-quinol, 4-quinol) were quantified using HPLC (high pressure liquid chromatography). The ratio [metabolite/substrate] was calculated to give an index of metabolic capacity. Genotyping for the CYP2B6 haplotype 4 was carried out using the TaqMan allele discrimination assay.

Results and Discussion: There was a great interindividual difference in production of the propofol 1-quinol and 4-quinol metabolites. We found 118-fold variation in the ratio [metabolite/substrate]. No apparent correlation between CYP2B6 haplotype 4 and the level of plasma hydroxylated propofol metabolites was registered.

Conclusion(s): We observed a pronounced interindividual variation in the pharmacokinetics of formation of hydroxylated propofol metabolites. The extent of variation was similar as seen *in vitro* identifying about 30% of the subjects being very efficient in propofol hydroxylation. It is plausible that this variation has impact on the overall propofol elimination kinetics. Specific genetic biomarkers associated with this variation is currently searched for in the *CYP2B6* and *UGT1A9* genes. Preliminary results show a possible connection between low propofol hydroxylation activity and a mutation associated with CYP2B6*6.

9AP4-6

Data driven optimized propofol pharmacokinetics versus published models in dogs

S. Brás, L. Ribeiro, P. Amorim, L. Antunes, C. Nunes

Serviço de Anestesiologia, Hospital Geral de Santo António, Porto, Portugal

Background and Goal of Study: Beths' original pharmacokinetic (PK) model[1] for propofol in dogs, models only its plasma concentration (Cp). In order to also estimate the effect site concentration, we added the pharmacodynamic (PD) parameter k_{e0} to the Beths model (Beths/Brás PKPDmodel)[2]. The EEG based Cerebral State Index (CSI)(Danmeter) was used to assess the PD effect of propofol and calculate the k_{e0}. However, the CSI may not perform well in dogs. The present study compares the Beths/Brás' model with an optimized Pk-model. The Pk-parameters were identified so as to obtain the individual Ce in each dog that best fitted the CSI trend.

Materials and Methods: Data were from 14 dogs anesthetized using propofol. Induction was performed with 200ml/h until loss of corneal reflex. Anesthesia was maintained with TCI at successive Cp targets (3,4,5,6,7,9,11µg/ml–Beths PK-model). An optimized estimate of Ce was performed using an inverted Hill equation between CSI and the Beths/Brás' estimated Ce and nonlinear least squares method. After obtaining the optimized Ce curve, new Pk-parameters (Vc and all six K parameters) were determined for each dog. Wilcoxon's test was used to compare the PK-parameters ($P < 0.05$).

Results and Discussion: The optimized Ce had a similar trend as the estimated Ce (Beths/Brás). At induction, the maximum estimated Ce (Beths/Brás) was 7.2 ± 2.1µg/ml and the maximum optimized Ce was 5.6 ± 1.5µg/ml. Six of the 7 optimized Pk parameters were statistically different from the Beths/Brás' Pk parameters (Fig. 1).

Conclusion(s): We found that our optimized Pk parameters for propofol in dogs differ significantly from published ones. These results suggest that the current published Pk models may be improved. The optimized model in this study could be an alternative, when the aim is to describe the relation between propofol infusion rates and its brain effect. Although improvements may also come from dog's specific depth of anesthesia indexes our technique may eliminate errors and seems to adapt the model to dog's individual responses.

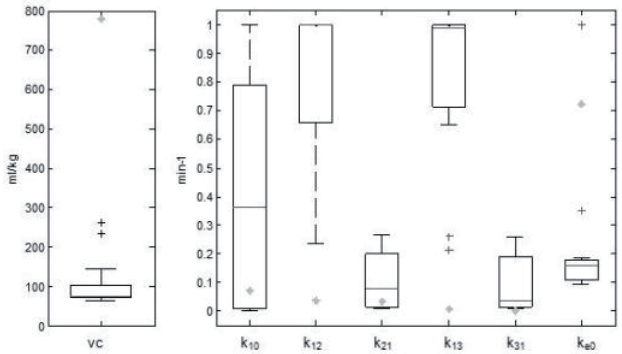


Fig 1: Boxplot of the PKPD parameters optimized individually to each dog. The light dots represent the parameters of the Beths/Brás model. For all parameters (except k_{21}) the null hypothesis (H0: mean of optimized parameters is equal to the Beths/Brás' parameters) was rejected, the P-values are: for vc $P=1.22\times10^{-4}$, for k_{10} $P=0.0126$, for k_{12} $P=1.22\times10^{-4}$, for k_{13} $P=1.22\times10^{-4}$, for k_{31} $P=1.22\times10^{-4}$ and for k_{e0} $P=2.44\times10^{-4}$.

Acknowledgements: FCT, CECAV-UTAD, UISPA-IDMEC, Portugal

References:

1 Vet Rec 2001,148,198–203.

2 J. Vet. Pharmacol. Therap. doi:10.1111/j.1365-2885.2008.01019.x.

9AP4-7

Reversal of bupivacaine-induced cardiac electrophysiologic changes by two lipid emulsions in anesthetized and mechanically ventilated piglets

D. Candela, G. Louart, L. Muller, J. Lefrant, J. De La Coussaye

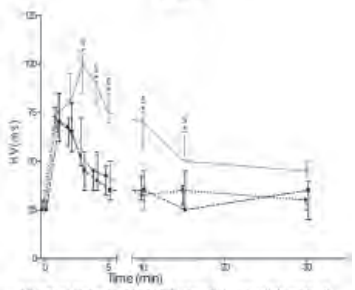
Division Anesthésie Réanimation Douleur Urgences, Centre Hospitalier Universitaire Nîmes, Nîmes, France

Background and Goal of Study: Accidental intravenous (IV) injection of bupivacaine can compromise cardiovascular function by inducing lethal arrhythmias whose hemodynamic consequences may be alleviated by lipid emulsions[1–3]. However, little is known about the electrophysiologic effect of lipid emulsion. The aim of the present study was to assess the cardiac endocavitary electrophysiologic effects of two lipid emulsions after IV injection of 4 mg/kg bupivacaine in anesthetized and mechanically ventilated piglets.

Materials and Methods: The present study was approved by the regional ethic committee on animal experimentations (CE-LR-0805, April 11th 2008). Four mg/kg intravenous bupivacaine were injected over a 30 seconds period in 26 piglets. Thirty seconds after the end of bupivacaine injection, 1.5 ml/kg of saline solution for control group, Medialipide® for Medialipide group or Ivelip® for Ivelip group were infused over one minute. Cardiac conduction parameters (RR, PQ, QRS, AH, HV, JT_c intervals) and hemodynamic parameters were monitored for 30 minutes after injection.

Results and Discussion: Before lipid infusion, bupivacaine induced similar electrophysiologic and hemodynamic changes in all groups. The figure 1 shows that both lipid emulsions similarly reversed the lengthening of HV, QRS, AH and PQ intervals. Lipid emulsions reversed the decrease of maximal first derivative left ventricular pressure. No difference was shown between Medialipide and Ivelip groups.

Figure 1



Effects of lipid emulsions on HV interval alteration induced by 4 mg/kg bupivacaine. Symbols indicate a statistical difference between the Medialipide (circles) and control groups (triangles) (§) and the Ivelip (squares) and control groups (*). No statistical difference between Medialipide and Ivelip groups was reported

Conclusion(s): Medialipide® and Ivelip® efficiently reverse the lengthening of HV, QRS, AH and PQ intervals induced by the IV injection of 4 mg/kg bupivacaine.

References:

1 Albright GA: Cardiac arrest following regional anesthesia with etidocaine or bupivacaine. Anesthesiology 1979; 51: 285–7.

2 Bruelle P, LeFrant JY, de La Coussaye JE, Peray PA, Desch G, Sassine A, Eledjam JJ: Comparative electrophysiologic and hemodynamic effects of several amide local anesthetic drugs in anesthetized dogs. Anesth Analg 1996; 82: 648–56.

3 Weinberg GL, VadeBoncouer T, Ramaraju GA, Garcia-Amaro MF, Cwik MJ: Pretreatment or resuscitation with a lipid infusion shifts the dose-response to bupivacaine-induced asystole in rats. Anesthesiology 1998; 88: 1071–5.

9AP4-8

A predictive display of effect site sevoflurane levels does not influence the speed and accuracy of step changes

R. Kennedy, M. McKellow, R. French, C. Brett

Dept of Anaesthesia, Christchurch Hospital, University of Otago, Christchurch, New Zealand

Background and Goal of Study: We wish to extend the advantages of TCI to inhaled agents and have developed a system which incorporates a validated model of sevoflurane uptake and distribution and anaesthetic gas flows and vaporisor dial setting to provide forward prediction of end-tidal (ET) and effect site sevoflurane (Ceff-sevo). We have shown that anaesthetists made ET changes faster with the display. In this study we investigated the value of these predictions on effect site changes.

Materials and Methods: The study was approved by the local Ethics Committee. Patients and anaesthetists where the planned surgery and anaesthesia was expected to last more than 120min were recruited. Anaesthetists were asked to make 4 changes of 0.3vol% in Ceff-sevo. These changes were increases and decreases in Ceff-sevo with and without the predictive display. The order of change was randomized. Fresh gas flow was 1.5l/min. Monitored data and Ceff were logged every 10s. Data was analysed for the speed (10–90% rise time) and accuracy (overshoot and stability) and the vaporisor dial excursion. Results were compared with paired t-tests. Increases and decreases were analysed separately.

Results and Discussion: 20 Subjects were recruited. Results are summarized in the table. There were no significant differences in any of the variables explored. There was a tendency towards more rapid changes and larger vaporisor dial excursion with prediction but these did not approach statistical significance and changes were completed with minimal overshoot.

	Increase		Decrease	
	Prediction Shown	Prediction Hidden	Prediction Shown	Prediction Hidden
10–90% change (s)	180 (77)	186 (50)	227 (81)	242 (87)
Overshoot (vol%)	0.09 (0.05)	0.11 (0.08)	0.06 (0.06)	0.17 (0.34)
Max dial change (%)	4.2 (1.4)	3.5 (1.6)	3.3 (1.0)	2.7 (1.1)

All values mean (SD)

Conclusion(s): This study failed to show an effect of a predictive display on the speed or accuracy of a specified (0.3vol%) change in Ceff-sevo. The relatively large vaporisor dial changes in all groups may suggest an inherent understanding of sevoflurane kinetics. As the system has been available on over 50% of our anaesthetic machines for several years, our study population of anaesthetists are not naive users. It may be that this familiarity combined with the relatively small magnitude of the change concealed potential advantages of the system. We plan further studies in other populations.

Reference:

1 Kennedy RR, French RA, Giles S. Anesth Analg 99:1159–63.

9AP4-9

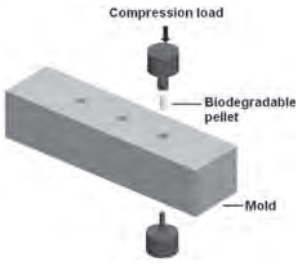
In vitro study of a solvent-free lidocaine-loaded biodegradable pellet

Y. Kau, S. Liu

Department of Anesthesiology, Chang Gung Memorial Hospital, Linkou Medical Center, Gueishan, Taoyuan, Taiwan

Background and Goal of Study: This study proposes a novel solvent-free method of manufacturing biodegradable lidocaine pellets. The final goal of this research was to develop solvent-free single-shoot local anesthetics for postoperative pain control.

Materials and Methods: To fabricate a biodegradable pellet, polylactide-polyglycolide (PLGA) copolymers were pre-mixed with lidocaine with two different ratios. The mixture was then compression molded and sintered to form a pellet with a height of 3mm and a diameter of 1mm. An elution method was utilized to characterize the in-vitro release characteristics of the lidocaine over a 14-day period. The toxicity of lidocaine pellets was checked by MTT test. The effect of various processing parameters on the release characteristics of the lidocaine delivery systems was investigated.



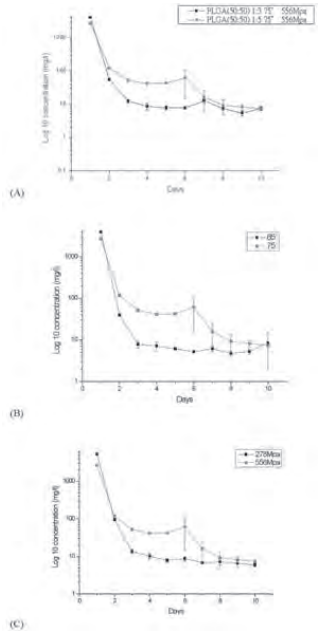
Weight and composition of the lidocaine pellets

	Weight of Lidocaine (mg)	Weight of PLGA (50:50) (mg)
1:3	1.625	4.875
1:5	1.08	5.4

Four types of the lidocaine delivery systems

Group	Temperature	Pressure
A	65°C	278MPa
B	75°C	278MPa
C	65°C	556MPa
D	75°°C	556MPa

Results and Discussion: The HPLC analysis showed that the pellets can prolong the total effectively release period of lidocaine from the beads by using lower anesthetic to polymer ratios, increasing the compression pressure, or increasing the sintering temperatures. MTT test showed the pellets did not induce cytotoxicity.
Conclusion(s): By adopting this novel technique, we will be able to fabricate biodegradable pellets of various types of anesthesia drugs for long-term local drug deliveries.



9AP4-10

TIVA vs volatile anesthesia. Influence on pro-inflammatory interleukins

D. Ionescu, S. Margarit, A. Radut, N. Miron, L. Azamfirei

Anaesthesia and Intensive Care III, University of Medicine and Pharmacy "Iuliu Hatieganu", Cluj-Napoca, Cluj, Romania

Background and Goal of Study: The influence of different anesthesia regimens on immune response in patients undergoing general surgery is still incompletely understood and the results are controversial. Our study investigated the effect of TIVA on pro-inflammatory interleukins as compared with isoflurane anesthesia for laparoscopic cholecystectomy.
Materials and Methods: 44 patients (ASAI/II) undergoing laparoscopic cholecystectomy were divided in 2 equal study groups: group 1 received TIVA (propofol-remifentanil) and group 2 received volatile anesthesia (isoflurane-remifentanil).Blood samples were taken immediately before (T1) and after (T2) induction,2 h and 24 h after surgery. Il-1 beta, 6, 8, 10, and TNF-alpha were measured (ELISA, Quantikine, Immunoassay kit, R&D Systems, Minneapolis, Mn, USA).
Results and Discussion: IL-1beta and TNF-alpha levels remained low in both study groups throughout the study period. There were significant differences after induction in Il-1beta, 8, between study groups, in favor of isoflurane group ($p = 0.04$ for IL-1beta). 2 h after surgery, Il-1beta,6,8, TNF-alpha plasma levels were also significantly different between study groups ($p = 0.002$ for Il-6, $p = 0.04$ for TNF-alpha). Il-6 was the interleukin with the greatest increase after surgery as compared with baseline values.
Conclusion(s): Also the results are difficult to interpretate, the greatest increase throughout perioperative period was for Il-6. TIVA significantly reduced the increase of Il-6 and Il-8. We consider that further research on large study groups are needed.
Acknowledgements: The study was funded by the research project 41025, CNMP.

9AP5-1

Is there a correlation between EEG-derived indices and sevoflurane minimum alveolar concentration (MACsev) during surgical anaesthesia?

H. El Beheiry, J. Wong, J. Wong, P. Mak

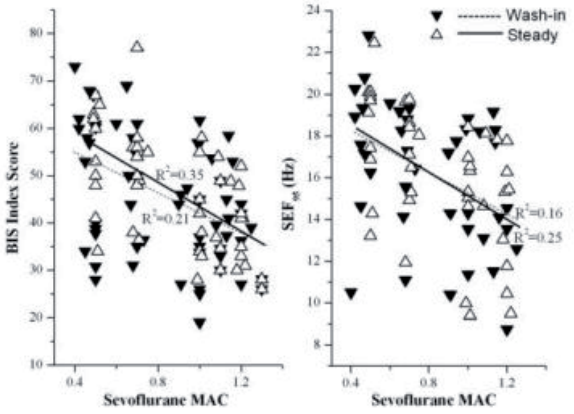
Department of Anesthesia, University of Toronto, Toronto, Ontario, Canada

Background and Goal of Study: EEG-guided anaesthesia is based on the assumption that during surgery EEG-derived indices are precise end-points for anaesthetic effects as they are highly correlated with MAC and plasma concentrations of anaesthetic agents. Such supposition is not thoroughly validated. Hence, we hypothesize that there is a linear relationship between EEG-derived indices and MACsev during wash-in and steady state anaesthesia before and during stable surgical stimulation respectively.
Materials and Methods: Twenty adult ASA I/II patients undergoing 1–3 hour surgery gave informed consent. BIS index, 95th percentile of the EEG power spectrum (SEF95) and MACsev were digitized and recorded. After induction with fentanyl and propofol (± rocuronium) a laryngeal mask or an endotracheal tube was inserted. All patients were given sevoflurane-air/O_2 to achieve steady MACsev titrated to maintain haemodynamic responses within 25% of baseline. Simple linear regression analysis determined the relationship between BIS and SEF95 and MACsev.
Results and Discussion: Regression analysis included pairs of measurements for EEG-derived indices and MACsev during wash-in before skin incision (61 pairs) and steady state anaesthesia at stable surgical stimulation (47 pairs). There was a significant linear relationship between the EEG-derived indices and MACsev. However, the determination coefficients (R^2) were low (0.16–0.35). Thus, there is a weak albeit statistically significant linear relationship between BIS and SEF95 and MACsev.

Regression of EEG-Derived indices (y) and MACsev

Y	r	SEM of r	p-value	R^2
BIS wash-in	–0.45	11.85	0.0001	0.21
BIS steady	–0.59	9.73	0.00001	0.35
SEF95 wash-in	–0.40	3.07	0.004	0.16
SEF95 steady	–0.51	2.77	0.01	0.26

r = regression coefficient, SEM = Standard error of mean, $p < 0.05$ is significant



Conclusion(s): There is only a weak correlation between EEG-derived indices and MACsev. Consequently, such indices may not signify precise pharmacodynamic end-points for anaesthetic effects. Hence, BIS and SEF95 values should not be the only factors that guide anaesthetic delivery.

9AP5-2

Influence on timelines and postoperative recovery profile comparing remifentanil- or alfentanil-based TIVA in day-case laparoscopy- and breast-surgery

A. Bauer, E. Ohlsson, E. Hävermark, L. Morén, P. Fritzell

Department of Anaesthesia and Intensive Care, Falun County Hospital, Falun, Sweden

Background and Goal of Study: Development of a cost-conscious climate in anaesthesia lays emphasis on quality assurance and cost-evaluation. The present study compares two fast-tracking regimen, using either remifentanil or alfentanil, with particular focus on timelines and recovery variables.

Materials and Methods: Following approval by the Ethics Committee of the University of Uppsala, this prospective, randomized and patient- and observer-blinded study was conducted at the Falun County Hospital, Sweden. Female patients, ASA I–II, (n = 145), scheduled for gynaecological laparoscopy (n = 73) or breast surgery (n = 72) were randomly allocated to either the remifentanil- or the alfentanil-group. BR = breast-surgery-remifentanil-group (n = 35), BA = breast-surgery-alfentanil-group (n = 37), LR = laparoscopy-remifentanil-group (n = 35), LA = laparoscopy-alfentanil-group (n = 38). Anaesthesia was conducted as propofol-based total intravenous anaesthesia (TIVA) with mivacurium-facilitated-endotracheal intubation in the laparoscopy group and laryngeal-mask in the breast-surgery group. Premedication, induction and maintenance of anaesthesia was identical in all groups. Timelines and Recovery variables: Time for emerge from anaesthesia, time spent on the recovery unit (PACU) and the modified Aldrete-PARSAP-score were recorded for all groups. Patients with PARSAP > 17 were considered ready for discharge from PACU. Data are expressed as means ± standard deviation. Statistical analysis was conducted using either analysis of variance, independent sample t-test, Mann-Whitney-U-test or x^2-test.

Results and Discussion: No significant differences regarding age, weight, ASA-class and duration of surgery or anaesthesia were found among groups. Mean-propofol consumption was significant higher using alfentanil (559.58 mg (LA) vs. 372.46 mg (LR) and 837.03 mg (BA) vs. 483.89 mg (BR), $p < 0.05$). Concerning time to extubation, time spent on PACU or mean-PARSAP, no significant differences were detected.

Table 1.

Timelines and PARSAP	Laparoscopy Remifentanil	Laparoscopy Alfentanil	Breast surgery Remifentanil	Breast surgery Alfentanil
time to extubation [min]	9.6 ± 3.7	10.9 ± 4.1	10.3 ± 4.6	9.8 ± 7.2
time on PACU [min]	61 ± 32	60 ± 18	70 ± 30	71 ± 36
mean-PARSAP [30 min]	16.86 ± 1.91	17.14 ± 1.69	16.94 ± 2.01	17.08 ± 1.92

Conclusion(s): We found no significant differences concerning recovery variables or timelines. Using remifentanil can lead to a decrease in propofol consumption, which might be of economic interest as this is an expensive drug.

9AP5-3

Fasudil, a Rho-kinase inhibitor, potentiates the relaxant effect of sevoflurane on continuous electrical field stimulation-induced smooth muscle contraction of rat trachea

O. Shibata, S. Matsunaga, A. Tsuda, T. Makita, K. Sumikawa

Anesthesiology, Nagasaki University Hospital, Nagasaki, Japan

Background and Goal of Study: In severe asthma, attacks last hours to days. Increased parasympathetic responsiveness is associated with asthma, and continuous parasympathetic nerve stimulation may constantly release acetylcholine (ACh), resulting in sustained contraction of airway smooth muscle. Electrical field stimulation (EFS) is used for the experiments of airway smooth muscle contraction to neuronal responses. Since ACh is considered to be exhausted easily in response to EFS, EFS at once is at most for 10 sec in experiments. Sevoflurane causes a decrease in airway resistance in asthmatic patients and a Rho-kinase inhibitor reduces cholinergic contraction in guinea-pig isolated tracheal preparations (1). Since asthma attacks last hours to days, continuous EFS (c-EFS) may sustain airway smooth muscle contraction for a long time. The present study was carried out to clarify the interaction of fasudil, a Rho-kinase inhibitor, with sevoflurane on c-EFS-induced contraction.

Materials and Methods: This study was conducted following guidelines approved by our Institutional Animal Care Committee. Seventeen male Wistar rats weighing 250–350 g were used for the experiments. Their tracheas were cut into 3-mm-wide ring segments. The resting tension was adjusted periodically to 1.0 g during equilibration period. Electrical stimuli were generated by SEN-7203 stimulator (Nihon Kohden, Tokyo). Pulses of 2 ms and 25 V were delivered continuously at frequency of 5 Hz. (1) Various concentrations of tetrodotoxin (TTX) or 4-DAMP (muscarinic M3 antagonist) were added 10 min after c-EFS. (2) c-EFS was started and 10 min later 0.1 or 1 μM fasudil was added, and further 10 min later 1.5MAC sevoflurae was added. Data were expressed as mean ± SD, and statistical significance ($P < 0.05$) was determined using ANOVA.

Results and Discussion: c-EFS-induced contraction was sustained over 180 min, and decreased by nearly 30% at 180 min. c-EFS-induced contraction was abolished by 0.1 μM TTX, suggesting that c-EFS directly stimulates the nervous system. It was also abolished by 0.03 μM 4-DAMP, suggesting that c-EFS-induced contraction is mediated by muscarinic M3 receptors. Fasudil, 1 μM, potentiated the attenuation by sevoflurane of c-EFS-induced contraction.

Conclusion(s): Fasudil potentiates the relaxant effect of sevoflurane on c-EFS-induced airway smooth muscle contraction. Fasudil added with sevoflurane might be useful for the treatment of asthma attacks.

Reference:

1 Eur J Pharmacol. 2006;550:155–61.

9AP5-5

The vasodilatory effect of ketamine is independent of the NMDA receptor: Lack of functional NMDA receptors in rat mesenteric artery smooth muscle

S. Kim, D. Kim, T. Kim, J. Lim, N. Woo

Department of Anesthesiology and Pain Medicine, School of Medicine, Konkuk University, Seoul, Republic of Korea

Background and Goal of Study: Ketamine, which is a general anesthetic that induces a dissociative anesthesia, acts by blocking the N-methyl-D-aspartate receptor (NMDAr) in the brain. Although ketamine elevates blood pressure under clinical setting, the *in vitro* effect of ketamine is vasodilatory. However, it is not clear yet as to whether the vasodilation by ketamine involves functions of NMDAr. Therefore, we examined whether NMDAr is functional in vascular smooth muscle and whether the vasodilatory effect of ketamine is associated with the NMDAr.

Materials and Methods: We measured isometric tension of endothelium-denuded arterial rings from rat mesentery. The relaxing effects of ketamine, after rings were pre-contracted with noradrenalin (10 mM) or high KCl (70 mM), were examined. The effects of DL-2-amino-5-phosphonopentanoic acid (AP-5), a competitive NMDAr blocker that is structurally distinct from ketamine, were also examined. The relaxing effects of ketamine in the presence of AP-5 were compared to those in the absence of AP-5. The effects of NMDAr agonists NMDA and glutamate were analyzed in order to examine the existence of functional NMDAr.

Results and Discussion: Both S(+)- and racemic(±)- ketamine, with similar potencies and efficacies and in a concentration-dependent manner, relaxed the pre-contracted arterial rings. However, AP-5 neither relaxed the arteries nor affected the vasodilatory actions of ketamine. NMDA and glutamate (0.01–1 mM) had negligible effects on isometric tension under the resting or pre-contracted condition.

Conclusion(s): These results suggest that the NMDAr is not functional in vascular smooth muscle, and that the vasodilatory action of ketamine is independent of NMDAr in the rat mesenteric artery.

9AP5-6

Does sevoflurane increase micronucleus rate in human lymphocytes

C. Oztin Ogun, S. Yildirim, T. Ogun

Anaesthesiology, Genetic, Orthopaedic &Traumatology, Selcuk University Meram Medical Faculty, Konya, Turkey

Background and Goal of Study: A moderate genotoxic activity of halothane and isoflurane applied as volatile anaesthetics has already been shown. Sevoflurane has not been studied sufficient enough to reach a consensus regarding its genotoxicity. Micronucleus (MN) represent small, additional nuclei formed by the exclusion of chromosome fragments or whole chromosomes lagging at mitosis. MN rates, indirectly reflect chromosome breakage or impairment of the mitotic apparatus and MN test is the most sensitive indicator of changes caused by anesthetic gases. The objective of this study is to assess whether exposure to sevoflurane, increases genotoxic risk using MN assay.

Materials and Methods: After local ethical comittee approval and written consent, ASA I–II; 30 patients undergoing major hand surgery following acute trauma were enrolled to the study. Exclusion criteria for the patients were smoking, history of malignancy in patients and/or their parents, chronic medication, occupational exposure to chemical waste products and any kind of radiation. Propofol, remifentanil and atracurium were used for anaesthesia induction in all patients. After induction, patients were randomized into two groups. In group P (n = 15); anesthesia was maintained by total intravenous anesthesia with propofol and remifentanil under BIS guidance. In group S (n = 15) maintanence was provided by sevoflurane and remifentanil under BIS guidance. In all patients, blood samples were taken at 5 minutes before anesthesia induction, 5 minutes after extubation and 21st day postoperatively. We used the Fenech–Morley method and examined 1000 cells per sample. Mann-Whitney U and Wilcoxon signed rank tests, χ^2 were used as appropriate ($p < 0.0$).

Results and Discussion: Patient demographics, perioperative durations were similar ($p > 0.05$). MN rate was similar in both groups preoperatively ($p > 0.05$). In group S, MN rate was increased significantly compared with group P at the 5th minute and 21st day postoperatively ($p < 0.001$). MN rates increased at the 5th minute ($p < 0.001$) and 21st day postoperatively

($p < 0.001$) in group S when compared to control values. In group P; MN was increased significantly at the postoperative 5th minute ($p = 0.044$), but there was no significant difference between control values and postoperative 21st day values ($p > 0.05$). The difference between genders was not significant in both groups ($p > 0.05$).

Conclusion(s): The results of the current study suggests a potential genotoxic activity of sevoflurane, a halogenated anaesthetic for the patients. Further studies are needed.

9AP5-7

Propofol decreases breast cancer cell migration in vitro

P. Ecimovic, D. Murray, P. Doran, D. Moriarty, D. Buggy

Department of Anaesthesia and Intensive Care Medicine, UCD-Mater Clinical research Center, Mater Misericordiae University Hospital, Dublin, Ireland

Background and Goal of Study: Propofol has antioxidant and immunosuppressive properties, but there is controversy about its effect on the metastatic potential of cancer cells. We aimed to determine its effect on *in vitro* breast cancer cell migration using two breast cancer cell lines with different metastatic potential. MCF7 is estrogen and progesterone receptor positive breast cancer cell line while MDA-MB-231 is estrogen-receptor negative and more invasive.

Materials and Methods: Cells were incubated with or without 1, 2, 4, 6, 8, 10 µg/ml propofol for 6, 12, 24 and 36 hr, corresponding to clinically relevant concentrations and exposure times. Cell proliferation was determined using an MTS (Promega Inc.). 24hr cell migration was determined using a 96-well flourescent kit (Chemicon). Results were compared using independent sample *t* test for differences between the groups.

Results and Discussion: Propofol had no significant effect on cell proliferation in either cell line. It caused significant decrease in migration of MCF7 cells at higher doses but not in MDA-MB-231 cells. Incubation with propofol at 10 µg/ml and 6µg/ml resulted in a 71% and 73% decrease in MCF7 cell migration ($P = 0.04$ and $P = 0.03$ respectively), but not at 8µg/ml or 4µg/ml (45% and 34% migration decrease respectively, not significant). There was a trend to decreased migration of MDA-MB-231 cells with 6µg/ml, 4µg/ml, and 2 µg/ml propofol, but this was not significant. Our experiments have shown propofol has potential to inhibit breast cancer cell migration in vitro, in MCF7 cells which are more differentiated, but not in MDA-MB-231 cells which are estrogen-receptor negative. Propofol had no significant effect on proliferation of either of these cell lines in vitro, excluding any potential contribution to change in migration.

Conclusion(s): Our data suggests a potential relationship between poor differentiation of cancer cells and the anti cancer effects of propofol. Our experiments have shown propofol has potential to inhibit breast cancer cell migration in vitro, in particular in more differentiated cells and at higher concentrations. Further studies are needed to determine its effect on other metastatic mechanisms such as invasion and gene expression.

References:

1 Mammoto T, Mukai M, Mammoto A, et al. Intravenous anaesthetic propofol inhibits invasion of cancer cells. Cancer Lett. 2002; 184: 165–70.

2 Garib V, Niggeman B, Zaenker KS, et al. Influence of non-volatile anesthetics on the migration behaviour of the human breast cancer cell line MDA-MB-468. Acta Anaethesiol. Scand. 2002; 46: 836–44.

9AP5-8

Early postoperative cognitive recovery and postoperative delirium after propofol-based total intravenous anaesthesia or desflurane-based balanced anaesthesia: A randomized controlled trial

F. Pizzichetta, A. Doronzio, C. Violi, G. Rosa, F. Bilotta

Anaesthesia, Intensive Care and Pain Therapy, University of Rome "Sapienza", Rome, Italy

Background and Goal of Study: Postoperative delirium is characterized by disorders of consciousness, perception, memory and psychomotor behaviour. The most prominent symptoms are changes in the state of alertness, hallucination and speech disturbances. This randomized trial was designed to compare early postoperative recovery and incidence of postoperative delirium after propofol-based total intravenous anaesthesia or desflurane-based balanced anaesthesia.

Materials and Methods: A total of 435 patients who underwent elective general anaesthesia, for non-cardiac or cerebral procedures, were prospectively enrolled and randomly assigned to one of two study groups to receive propofol-based total intravenous anaesthesia or desflurane-based balanced anaesthesia. Cognitive function was evaluated in all patients with the Short Orientation Memory Concentration Test (SOMCT) and the Rancho Los Amigos Scale (RLAS) and recorded at 4 time-points: preoperatively and postoperatively at 20, 40 and 60 min after extubation. Postoperative delirium was recorded for up to 72 postoperative hours.

Results and Discussion: Demographic data, preoperative cognitive status, baseline haemodynamics, intraoperative mean fentanyl dose were similar in the two study groups. Postoperative cognitive recovery was delayed in patients who received propofol-based total intravenous anaesthesia compared to those who received desflurane-based balanced anesthesia with significantly lower SOMCT scores at 20 min postanaesthesia (22.5 ± 2.4 vs. 26.3 ± 1.9; $P < 0.005$). Postoperative RLAS grade showed a similar trend at the same time point (65% vs. 82% of patients having VII–VIII RLAS level; $P < 0.005$). Postoperative cognitive recovery at 40 and 60 min were similar in the two study groups. Among patients who received propofol-based total intravenous anaesthesia postoperative delirium, evaluated as incidence of hallucinations, space-temporal disorientation and speech disturbances up 72 postoperatiuve hours, was more frequent compared to those who received desflurane-based balanced anaesthesia (6.4% vs. 1%; 9.4% vs. 0.5%; 8.6% vs. 1%) (24.3% vs. 2.5%; $P < 0.005$).

Conclusion(s): Patients receiving propofol-based total intravenous anaesthesia are at higher risk for delayed postoperative cognitive recovery and for postoperative delirium for up to 72 hours after the end of anaesthesia compared to those who receive desflurane-based balanced anaesthesia. Because desflurane-based balanced anaesthesia lasts lower intermediate active drug metabolite it is preferable in patients at risk for postoperative delirium.

9AP5-9

Evaluation of effects of magnesium sulphate in reducing intraoperative anaesthetic, analgesic and neuromuscular relaxant requirements in patients undergoing thoracotomies

B. Ozkaya, C. Oztin Ogun, S. Ceran

Anaesthesiology and Intensive Care and Thorax Surgery, Selcuk University Meram Medical Faculty, Konya, Turkey

Background and Goal of Study: The randomized, placebo-controlled, double-blind study assessed the effect of peroperatively and intraoperative administered i.v. magnesium sulphate (Mg) on anaesthetic and analgesic and neuromuscular relaxant requirements in patients undergoing thoracotomies.

Materials and Methods: After ethical committe approval and written consent; 75 ASA I–II patients (16–65yr) were enrolled. Group I ($n = 25$) and group II ($n = 25$) received 50 mg. kg^{-1} Mg as a loading dose before induction. For maintenance; group I received 8mg. $kg^{-1}hr^{-1}$ Mg while Group II received 15mg. $kg^{-1}hr^{-1}$ Mg by continuous infusion intraoperatively. The same volume of saline was administered to the control group ($n = 25$). Anaesthesia was induced with propofol, atracurium, fentanyl and maintaned desflurane (Des) (adjusted according to changes of BIS values in range of 47–53 (avarege 50)) and remifentanil (REM)(adjusted according to 20% changes in heart rate and mean arterial pressure.) infusion and atracurium (ATR) (administered if neuromuscular activity is above 25% by using TOF-GUARD). Haemodinamic parameters, endtidal DES; MAC and BIS values were recorded at baseline, induction and entubation, after surgical incision and at 15 min. intervals intraoperatively. Incidence of bradycardia and hypotension and requirements of atropine and ephedrine were recorded intraoperatively. Amount of used DES, REM and ATR were calculated and recorded. Administered fluid and blood products were also recorded. One way and two way ANOVA, T tests with Tukey-HSD and Kruscal Wallis and χ^2 were performed as appropriate ($p < 0.05$).

Results and Discussion: Patient demographics, intaroperative durations, blood and fluid requirements and haemodynamic data were similar among the groups. In Group III all of the MAC values except 135th and 240th min were lower than control group ($p < 0,05$); while In group II at 150th, 180th, 195th, 210th and 225th min were lower than control group ($p < 0,05$). The results of endtidal DES were similar to MAC results. Utilized DES and REM were less in group III than the others ($p < 0,05$); Used ATR was less in Group II and Group III than in control group ($p < 0,05$). Despite the incidence of bradycardia and hypotension was higher in Group III than control group; requirements of atropine and ephedrine were similar among the groups.

Conclusion(s): The results of the study suggest that, magnesium sulphate can decrease the hipnotic, analgesic and neuromuscular relaxant requirements under desflurane-remifentanil anaesthesia and it can also be considered as a safe adjuvant.

9AP6-1

Effect of cigarette smoking on recovery time after sevoflurane anaesthesia

T. Adanir, A. Atay, A. Sencan, M. Aksun, N. Karahan

Anesthesiology and Reanimation, Ataturk Training and Research Hospital, Izmir, Turkey

Background and Goal of Study: Smoking affects the pharmacodynamic and pharmacokinetic behavior of several drugs. As sevoflurane is metabolized by a cytocrome P450 pathway (CYP2E1) which is induced by cigarette smoking and excreted via lungs, there is the potential for delaying postoperative recovery. The aim of this study was to evaluate the effects of cigarette smoking on recovery time after one minimum alveolar concentration-hour (1 MAC-h) sevoflurane anaesthesia.
Materials and Methods: We investigated sevoflurane metabolism in 27 non-smokings and 25 smoking (≥ 20 cigarettes/day) generally healthy patients, aged 18–63 years, undergoing otorhinolaryngologic elective surgery under 1 MAC-h standardized sevoflurane anaesthesia. At the end of the surgery, turned off the sevoflurane vaporizer, the times of 1MAC down to MAC-awake (0.3) and 0.1 MAC was recorded. In addition, the ratio of fraction of inspired concentration (Fi) of sevoflurane and fraction of expired concentration (Fexp) of sevoflurane at 1 MAC and Fexp of sevoflurane at 0.1MAC were recorded.
Results and Discussion: There were no differences between the two study groups with regard to recovery time. The time of 1MAC down to MAC-awake was similar in both groups (106 ± 48 sec in non-smokers, 97 ± 37 sec in smokers, $p > 0.05$). The time down to 0.1MAC was also similar between non-smokers and smokers (491 ± 187, 409 ± 130 respectively, $p > 0.05$). There was no significantly difference for ratios of Fi/Fexp at 1MAC between non-smokers and smokers (1.18 vs. 1.19 at 1MAC respectively, $p > 0.05$). Similarly, Fexp of sevoflurane at 0.1MAC was no different in the groups (0.26 in non-smokers vs. 0.25 in smokers, $p > 0.05$).
Conclusion(s): Cigarette smoking results in faster metabolism and clearance of many drugs. However, smoking did not affect recovery time after 1MAC-h sevoflurane anaesthesia.

9AP6-3

Hypnotic and amnesic effect of remifentanil

T. Yokoyama, R. Hosoi, K. Kido, T. Yatabe, K. Yamashita

Department of Anesthesiology and Critical Care Medicine, Kochi Medical School, Nankoku, Kochi, Japan

Background and Goal of Study: In several cases using remifentanil during induction of anesthesia, we observed decrease in Bispectral Index (BIS) value with clear delta waves in the electroencephalogram (EEG) only by 1 micro-g/kg/min of infusion of remifentanil in a few minutes since the start of infusion. Therefore, we hypothesized that remifentanil might have hypnotic and/or amnesic effect and verbal stimulation might attenuate its hypnotic effect. In the current study, we investigated the hypnotic and/or amnesic effect of remifentanil with and without verbal stimulation.
Materials and Methods: Thirty patients were divided into two groups; non-stimulation group (NS group) and stimulation group (S group). Anesthesia was induced with 1 micro-g/kg/min of remifentanil. In the NS group, patients were left free from any stimulation except non-invasive blood pressure monitoring. In the S group, patients were asked to grip hands, to open eyes, to take deep-breaths every 15 seconds and to open their mouth at the 3rd minute and the 5th minute after the start of remifentanil infusion. Decrease in the conscious level was judged when BIS value decreased less than 60 with clear delta waves in the EEG. If the decrease in conscious level was not obtained in 5 minutes, sevoflurane was added. All patients were interviewed postoperatively about the memory during induction of anesthesia.
Results and Discussion: In the NS group, all 15 patients reached the BIS value of 60 or below in 5 minutes with ED_{50} being 3.8 micro-g/kg, and they were intubated without other hypnotics. In the S group, however, only one of 15 patients was judged to have reached the BIS value of 60 or below and was intubated without other hypnotics. Delta waves were observed in 8 patients. In the S group, all 15 patients could open their mouths at the 3rd minute. Postoperatively, 10 of them did not remember it, and 10 patients opened their mouths even at the 5th minute, but 9 of them did not remember it postoperatively.
Conclusion(s): Remifentanil decreased EEG activity markedly without other anesthetics for induction of anesthesia when stimulations were kept minimal, and exhibited amnesic effect even with verbal commands.

9AP6-4

Recovery in postoperative period after remifentanil and fentanyl administration for thyroid surgery

V. Vojinovic-Golubovic, L. Mitrovic, J. Milic-Rankovic, S. Petrovic, V. Malenkovic

Department of Anesthesiology, Institute of Oncology and Radiology of Serbia, Belgrade, Serbia

Background and Goal of Study: The objective of this study was to compare haemodynamic and recovery characteristics of two opioid regimens in combination with propofol for thyroid surgery.
Materials and Methods: Fifty patients of ASA physical status I–II, aged 24–72 years undergoing thyroid surgery were randomly assigned in two groups. Group R (n = 25) received remifentanil and propofol and group F (n = 25) received fentanyl and propofol. Patients with known neurologic, cardiac, metabolic disease or other serious conditions were excluded. All patients were premedicated with midazolam 0.07 mg/kg. Induction was with remifentanil 1 µg/kg followed by 0.3 µg/kg/min in group R and with fentanil 1.5 µg/kg followed by 2 µg/kg/h in group F. Propofol was titrated in concentration of 6 mg/kg/h, to maintain bispectral index (BIS) value at 40 ± 5 throughout the surgical procedure. Neuromuscular blockade was obtained with rocuronium 0.15 mg/kg in both groups. Both groups were mehanically ventilated with 30% oxygen in N_2O. Haemodynamic characteristics (blood preasure, heart rate) were assessed. Immediate recovery (eye opening and extubation time) was recorded. Recovery after arrival in post anaesthesia care unit (PACU) was evaluated by Aldrete Score after admission, 15, 30 and 60 min. Quantity of sedation was measured by Ramsey Sedatin Scale.
Results and Discussion: The median duration of surgery was 80 ± 15 min. No significant differences were detected in haemodynamic parameters (blood pressure and heart rate) in both groups. BIS values were similar. Immediate recovery was significantly earlier ($p < 0.05$) in group R (eye opening, 5.4 vs 7.6 min; extubation time, 6.9 vs 8.1 min). Mean Aldrete Score,15 min after arrival in PACU was 9 in group R and 8 in group F, but after 60 min there was no significant differences between two groups. Mean sedation level (Ramsey score) was 2 in group R and 3 in group F.
Conclusion(s): Assessment of two opioid-propofol combinations in patients underwent thyroid surgery, resulted in faster recovery in immediate postoperative period for patients receiving remifentanil combined with propofol than for those receiving fentanyl combined with propofol.

9AP6-5

The combination of dexmedetomidine, fentanyl, midazolam and atropine may result in dangerous respiratory depression and hypoxemia

J. Malek, L. Hess, M. Votava, F. Marecek, A. Kurzova

Anaesthesiology and Resuscitation, 3rd Faculty of Medicine, Charles University, Prague, Czech Republic

Background and Goal of Study: Dexmedetomidine is known to produce haemodynamic stability, amnesia, mild analgesia, decreased nausea and vomiting and augmentation of effects of anaesthetics, benzodiazepines and opioids. The aim of the study was to test combination of dexmedetomidine, fentanyl and midazolam in perioperative care. Atropine was added to prevent bradycardia.
Materials and Methods: After ethic committee approval and written patient consent, in a randomised, doubleblinded study, single injection of dexmedetomidine 1.0 $\mu g \cdot kg^{-1}$ + fentanyl 1.0 $\mu g \cdot kg^{-1}$ + midazolam 50 $\mu g \cdot kg^{-1}$ + atropine 0.5 mg (group D) or normal saline + fentanyl 10 $\mu g \cdot kg^{-1}$ + midazolam 50 $\mu g \cdot kg^{-1}$ + atropine 0.5 mg (group C) was administered to a deltoid muscle 15 min. before anaesthesia (GA) in patients elicited for laparoscopic cholecystectomy. GA was performed in a standard way, ECG, NIBP, respiration rate, SpO_2, onset of effect, Observers Assessment of Alertness Sedation Score (OAASS) before GA, circulatory reaction to intubation and capnoperitoneum, fentanyl dose during GA, time to the first request for post-operative analgesia and incidence of nausea and vomiting were measured. The data were processed by McNemara, Mann Whitney and Fisher tests. P-value < 0.05 was considered significant.
Results and Discussion: The study was early terminated and deblinded because of high incidence of respiratory depression in some patients. There were 8 pts. in D and 7 pts. in C, their demography was comparable. The onset of effect was 8.7; standard deviation (SD) = 1.9 min. in C and 8.8; SD = 0.7 min. in D. The significant differences were in C vs. D in OAASS (4.6; SD = 0.53 vs. 3.1; SD = 0.64, $p = 0.0171$), fentanyl dose during GA (207; SD = 109.7 µg vs. 25.0; SD = 37.6 µg, $p = 0.0014$), time to the first analgesia request (0.21; SD = 0.40 h. vs. 1.25; SD = 0.89h., $p = 0.0094$), respiratory rate < 6 (0/7 vs. 6/8, $p = 0.0070$) and SpO_2 < 90% after onset of effect (0/7 vs. 7/8, $p = 0.0014$). There was a trend in suppressed reaction to capnoperitoneum in D (3/7 vs. 0/8, $p = 0.0769$).
Conclusion(s): Dexmedetomidine in combination with small-dose midazolam and fentanyl exhibits the trend to suppress haemodynamic effects of capnoperitoneum, decreases the need for analgesia during GA, prolongs postoperative analgesia, potentiates sedation before GA, but precipitates respiratory depression. The combination of dexmedetomidine, fentanyl, midazolam and atropine is not recommended because may result in respiratory depression and hypoxemia.
Acknowledgements: The study was supported by grant IGA MZCR NR/9168 – 3.

9AP6-6

The combination of dexmedetomidine, atropine, ketamine and fentanyl provides haemodynamic stability and good postoperative analgesia

J. Malek, L. Hess, M. Votava, F. Marecek, A. Kurzova

Dept. of Anaesthesiology and Resuscitation, 3rd Faculty of Medicine, Charles University, Prague, Czech Republic

Background and Goal of Study: Dexmedetomidine is known to produce haemodynamic stability, amnesia, mild perioperative analgesia, decreased nausea and vomiting and augmentation of effects of anaesthetics and opioids. The combination with ketamine should potentiate the effects of opioids and antagonise bradycardia and hypotension caused by dexmedetomidine. Atropine was used to prevent bradycardia. This combination should theoretically offer many advantages in perioperative care. Comparison with pethidine and atropine that is standard premedication in our institution was performed.

Materials and Methods: After ethic committee approval and written patient consent, in a randomised, double-blinded study, combination of dexmedetomidine 1.0 $\mu g \cdot kg^{-1}$ + ketamine 0.5 $mg \cdot kg^{-1}$ + fentanyl 10 $\mu g \cdot kg^{-1}$ + atropine 0.5 mg (group D) or pethidine 1 $mg \cdot kg^{-1}$ + atropine 0.5 mg (group C) was administered to a deltoid muscle 15 min. before anaesthesia (GA) in patients elicited for laparoscopic cholecystectomy (LCHE). GA was performed in a standard way, ECG, NIBP, respiration rate, SpO_2, onset of effect, Observers Assessment of Alertness Sedation Score (OAASS) before GA, circulatory reaction to intubation and capnoperitoneum, fentanyl consumption during GA, time to the first request for post-operative analgesia and postoperative nausea and vomiting were measured. The data were processed by Mann –Whitney test a Fisher test. P-value < 0.05 was considered significant.

Results and Discussion: There were 15 patients in each group, their demography was comparable. The significant differences in C vs. D were in OAASS (5.0; SD = 0 vs. 4.33; SD = 0.62, p = 0.001), reaction to capnoperitoneum (11/15 vs. 2/15, p = 0.0025), hypertension during surgery (11/15 vs. 0/15, p = 0.0000), perioperative amnesia (1/15 vs. 13/15, p = 0.0000), fentanyl consumption (166.7; SD = 111.3 microgram vs. 31.7; SD = 53.4, p = 0.000) and time to the first request for analgesics (median 0.5; SD = 0,50 h. vs. 3.0; SD = 0.67 h., p < 0.01). Note: SD = standard deviation.

Conclusion(s): Dexmedetomidine-ketamine-fentanyl-atropine combination is superior to pethidine-atropine combination in suppressing of adverse haemodynamic effects of capnoperitoneum, decreased need for analgesia during GA and prolonged postoperative analgesia.

Acknowledgements: The study was supported by grant IGA MZCR NR/9168 – 3.

9AP6-7

A comparison of propofol and etomidate for anesthesia induction in patients with diabetic autonomic neuropathy

R. Sari, S. Uzman, A. Pirat

Anesthesiology and Reanimation, Baskent University Konya Traing and Research Hospital, Konya, Turkey

Background and Goal of Study: Diabetic autonomic neuropathy (DAN) is a serious and common complication of diabetes and is reported to be associated with increased perioperative hemodynamic problems. However, it is not clear if there is an association between the different anesthetics and the risk of perioperative hemodynamic complications in patients with DAN. We hypothesized that in patients with DAN anesthesia induction with etomidate causes less hemodynamic complications than propofol.

Materials and Methods: After ethics committee approval and obtaining informed consent from the patients, 40 ASA 2–3 patients with DAN who were scheduled for abdominal surgery were studied. Anesthesia was induced with either etomidate 0.3 mg/kg IV in Group E (n = 20) or propofol 2.5 mg/kg IV in Group P (n = 20). All patients also received fentanyl 1 µg/kg IV during anesthesia induction Two minutes after administration of 0.6 mg/kg IV rocuronium, endotracheal intubation was performed. Systolic (SAP), diastolic (DAP), and mean arterial pressures (MAP) and heart rate (HR) values were recorded at baseline (T0) and every minute after the anesthesia induction for 5 minutes (T1–T5). Serum adrenocorticotropic hormone (ACTH), cortisol, and insulin levels were measured at baseline, 5 minutes after endotracheal intubation and 5 minutes after surgical incision.

Results and Discussion: Both groups were comparable in terms of demographic features, systemic disease, and baseline hemodynamic measurements (p > 0.05 for all). Mean HR values were similar between the two groups at all measurement (p > 0.05 for all). Compared with T0 values, T1 mean HR significantly decreased only in Group P (p = 0.007). T2 Mean SAP was significantly lower in Group P than Group E (p = 0.016). Comparing with T0 values mean SAP significantly dropped at T2 measurement time point in both groups (p ≤ 0.001). Patients in Group P had significantly lower mean DAP measurements than those in Group E at T1, T2, T3, and T5 (p ≤ 0.037 for all). Compared with T0 values, T1 mean DAP significantly dropped only in Group P (p < 0.001). Mean MAP was significantly lower in Group P than Group E at T1 (p = 0.033). Compared with the T0 measurements, MAP significantly dropped at T1 in both groups (p ≤ 0.006 for both). Groups were not significantly different in terms of serum ACTH, cortisol, and insulin levels at any measurement time point (p > 0.05).

Conclusion(s): In conclusion, when compared with propofol, etomidate is associated with less hemodynamic disturbances during anesthesia induction in diabetic patients with DAN.

9AP6-8

Physical complexity recovery after general anesthesia

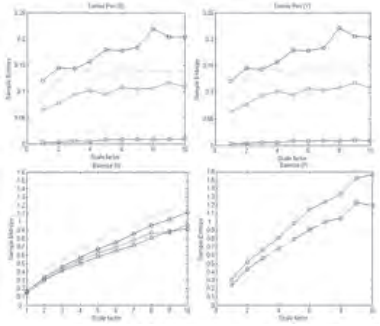
A. Tsai, S. Fan

Anesthesiology, National Taiwan University Hospital, Taipei, Taiwan

Background and Goal of Study: Preventing accidental falls is vital to patient satety after general anesthesia. Impaired postemergence posture-balancing ability is one of the major causes that pose the patients to this risk. Implementing a predictive tool mitigate the risk is challenging and important for anesthesiologists. The purpose of this study is to quantify the complex dynamics of postural control. We investigate the patients receiving laryngeal micro-surgery with general anesthesia, in order to observe the postural stability recovery after general anesthesia. Besides, we include Bispectral-Index Scale for monitor the anesthesia level and try to shorter the recovery time.

Materials and Methods: The equipment we use is CATSYS2000, it include the tremor pen, reaction handle, and force plank to evaluate the postural ability, tremor, balance and coordination ability. We collected 40 patients who receive LMS surgery with ASA I–II patient in our hospital. We evaluate the postural ability, tremor, balance and coordination before the day of surgery. After the operation, we evaluate the patient post-op one hour, second hour and third hour. The signals will be analyze with multiscale entropy analysis method to show the difference between each stage.

Results and Discussion: Currently we collected about 10 patients which showed interesting results. Patients received feneral anesthesia, he/she still at the risk of falling even he/she matched the discharge criteria (PADS). The postural ability and balancing ability cannot return to pre-operative level after he/her was totally awake and physically stable. The postural balancing return to pre-anesthesic level at the third hour.



Conclusion(s): Patients regain physical complexity after three hours postoperatively. Weather Bispectral-Index Scale (BIS) monitor has benefit in decrease recovery time is pending further evaluation.

References:

1 M. Costa, A. A. Proplata, L. A. Liositz, Z. Wu, N. E. Huang, et al. Noise and poise: Enhancement of postural complexity in the elderly with a stochastic-resonance-based therapy 2007.

2 Madalena Costa, Ary L. Goldberger, and C-K. Peng. Multiscale entropy analysis of biological signals. Physical Review E71, 2005.

9AP6-9

The influence of different opioids on intraoperative stress responses in a protocol guided, EEG controlled TIVA

G. Breuer, A. Hunsicker, K. Tschaikowsky, J. Schüttler

Dpt. of Anesthesiology, University Erlangen-Nürnberg, Erlangen, Germany

Background and Goal of Study: To evaluate the influence of different opioids on surgical stress reactions applying a protocol based, EEG controlled total intravenous anaesthesia (TIVA).

Materials and Methods: After approval of the ethics committee and informed consent 45 patients scheduled for transphenoidal pitiuitary surgery were randomised in three groups to receive TIVA with Propofol and either Remifentanil (R), Alfentanil (A) (continuous infusion) or Sufentanil (S) (bolus injection). Propofol infusion was titrated individually to maintain an EEG-Medianfrequency (MFQ) of 1.5 ± 0,5 Hz as an adequate level of hypnosis. For each opioid a protocol was implemented, defining additional opioid applications due to changing surgical stimuli or signs of inadequate depth of anaesthesia (DOA). Following rises in MFQ or hemodynamic responses were therefore considered as arousal reactions due to surgical stimuli and treated with increases in opioid infusion rate or bolus application respectively. Persisting rises in mean arterial pressure (MAP) above a predefined baseline despite increased opioid application and no concomitant signs of inadequate DOA were treated with Urapidil. Blood samples for Cortisol, Prolactin and human growth hormon (hGH) were collected before (T1) and after induction of anaesthesia (T2), after skin incision (T3), 5 (T4) and 20 minutes (T5) after drilling of the sella turcica as well as after extubation (T6).
Results and Discussion: At T4 and T5 a significant ($p < 0,05$) rise of cortisol compared to T3 was found in A but not in R. In S a trend toward higher Cotisol levels in T4 and T5 was seen (Tab. 1). There were no significant differences between groups concerning Prolactin or hGH levels. We observed in period T4 to T5 significant higher incidences of MAP rises above target range for A (18 ± 9%) and S (15 ± 7%) versus R (2 ± 2%). Corresponding increases were seen in T3 to T4 for absolut MAP values. Urapidil was significantly more often used in S and A compared to R (47 and 53 vs. 7%).

Table 1. Cortisol-Levels compared to the pre-operative Level (set as 100%)

	Remifentanil	Sufentanil	Alfentanil
T3	65 ± 5	56 ± 3	68 ± 10
T4	52 ± 9	47 ± 4	80 ± 22
T5	57 ± 9	93 ± 19	103 ± 23
T6	134 ± 18	117 ± 17	179 ± 34

Conclusion(s): Nociceptive stimuli are less effectively blunted in A and S compared to R indicated by stress-signs of blood pressure and Cortisol-level. MFQ seems to be effective as a tool to ensure adequate hypnosis but not to predict somatic stress responses to surgical stimuli. R seems to be a appropriate Opioid for transphenoidal pitiuitary surgery.

9AP6-11

Remifentanil and sevoflurane vs remifentanil and propofol in laparoscopic bariatric surgery

L. Trillo, C. García, J. Ramón, M. Sadurni, L. Moltó

Servicio de Anestesiología y Reanimación & Servicio Cirugía General, Hospital del Mar, Barcelona, Spain

Background and Goal of Study: To compare intraoperative consumption of remifentanil and time to extubation between two anesthetic techniques used in laparoscopic bariatric surgery in our centre: Remifentanil + Sevoflurane (RS) vs Remifentanil + Propofol (RP).
Materials and Methods: Fifty eight morbidly obese patients ASA II undergoing laparoscopic bariatric surgery were studied. Patients were randomized in two groups depending on the anesthetic agent used: Sevoflurane (N = 28) or Propofol (N = 30). ECG, pulsioximetry, continuous invasive blood pressure, CVP, muscle relaxation (TOF) and anesthetic depth (BIS) were recorded. Titration of the drugs was based on the ideal weight (IW) calculated as 22 x h $(m)^2$. Anesthesia was induced with propofol (2 mg/kg), suxamethonium (1.5 mg/kg) and remifentanil (0.2 micg/kg/min). Maintenance of the anesthesia was held with RS or RP plus cisatracurium bolus titrated by TOF monitoring. Hypertension and taquicardia were defined as an elevation >20% from the basal blood pressure and cardiac rate respectively. Hypotension and bradicardia as a reduction >20%. Remifentanil dosage was increased 0.1micg/kg/min in case of hypertension/taquicardia and decreased in case of hypotension/bradicardia. Anesthetic agents were titrated to maintain a BIS between 40–60 range. Half an hour before ending the surgery postoperative analgesia was initiated with a peridural bolus of 10 ml (3 + 3 + 4) bupivacaine 0.5% and fentanyl 100 micg. At the end of the surgery anesthetic agents and remifentanil were stopped. Time to extubation was recorded. Media dosage of remifentanil using ideal weight was calculated. Student t and U Mann-Whitnney were used for data analysis. $p < 0.05$ was considered statistically significant.
Results and Discussion: Sevoflurane group showed lower remifentanil consumption (0.15 micg/kg/min) than Propofol group (0.2 micg/kg/min) with a statistically difference ($p = 0.013$). It also showed a shorter time to extubation (300 sec vs 360 sec) also statistically different ($p < 0.001$).

	SEVOFLURANE/PROPOFOL		
	SEVO (N = 28)	PROPO (N = 30)	p-value
BMI	44.6	43.2	0.316
Remi (micg/kg*min)	0.148	0.204	0.013
Time to extubation (sec)	300 (240–320)	360 (300–640)	<0.001

Conclusion(s): Remifentanil use (titatred by ideal weight) gives great hemodynamic stability in laparoscopic bariatric surgery. Sevoflurane used as anesthetic agent decrease remifentanil consumption and time to extubation compared with propofol.
Acknowledgements: Sergi Mojal (Epidemiology Department).

9AP7-1

Midazolam stimulates steroidogenesis in mouse Leydig and MA-10 tumor cells

E. So, Y. Chang, P. Poon, K. Wong, B. Huang

Department of Anesthesia & Institute of Basic Medical Sciences, Chi-Mei Medical Center, National Cheng Kung University, Yung Kang, Tainan, Taiwan

Background and Goal of Study: Midazolam is a common drug used clinically as sedative and anticonvulsion purpose. Endocrine response to anesthetic drugs had been reported as early as 1973 and we hypothesized in this study that Midazolam might regulate Leydig cell and MA-10 cell steroidogenesis.
Materials and Methods: Midazolam (6, 30, 150, 600 μM) (1.5mg/ml, Roche) were added into primary mouse Leydig cells and MA-10 tumor cell culture (5 ~ 7 weeks old C57BL/6NCrj mice). MTT assay was used to measure cell viability. Western immunoblot analysis was used to quantify protein expression.
Results and Discussion: Significant time (1hr Vs 4 hrs) and dose dependent (50 and 600 μM Midazolam) production of testosterone were found in primary mouse Leydig cells culture ($p < 0.001$). However, when cells were observed under 200X for one hour, cell lysis was seen in cultures (MA-10) receiving 600 μM Midazolam. Long term observation (1,3,6,12 & 24 hours) showed significant increase of testosterone production in cultures receiving 30 & 150 μM Midazolam when compared with control of the same time ($p < 0.01$). Testosterone production was time dependent in study cultures receiving less than 300 μM Midazolam. Cell structures after 24 hours showed membrane blebbing in cultures receiving more than 300 μM Midazolam.
Conclusion(s): Midazolam can stimulate steroidogenesis in a dose and time dependent way in mouse Leydig and MA-10 tumor cells.

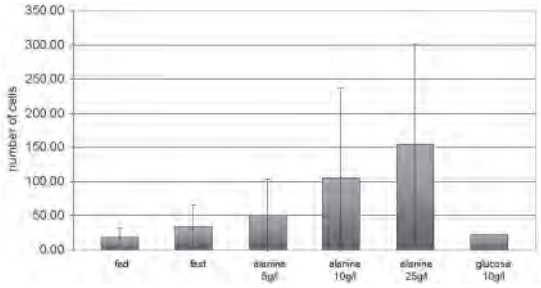
9AP7-3

Effect of alanine on apoptosis in an *ex vivo* rat liver after ischemia reperfusion

Y. Mefire, V. Nuyens, A. Berton, J. Philipp, J. Boogaerts

Anaesthesiology, University Hospital Centre of Charleroi, Charleroi, Belgium

Background and Goal of Study: Death of hepatocytes and other hepatic cell types is a characteristic feature of ischemia reperfusion (IR).[1] Cell death follows one of two patterns: oncotic necrosis and apoptosis.[2] Alanine (Ala) has shown to improve survival of liver cells exposed to oxidant stress.[2] The aim of this study was to determine the role of Ala on hepatic apoptosis after IR injury in *ex vivo* rat livers.
Materials and Methods: Rats were randomly divided into two groups: one had free access to food; the other was fasted for 16 hours. The portal vein was cannulated, the liver removed and perfused in a closed *ex vivo* system. The experiment consisted of perfusion for 15 min, warm ischemia for 60 min, and reperfusion during 60 min. Animals were divided into 6 groups (n = 5): control fast and fed, Ala 5,10 or 25 g/l and glucose 10 g/l added to perfusate. The number of apoptotic cells (n) was determined in tissue biopsies at 0 and 135 min by counting activated caspase 3-cells (x 400). ANOVA test.
Results and Discussion: IR increases the number of apoptotic cells in all groups mainly Kupffer and sinusoidal types (data not shown). Results at 135 min are displayed in Figure 1. Ala increases caspase 3 expression in a dose-dependent manner when compared to fed and glucose. Apoptosis requires ATP for apoptosome-dependent activation of caspase 3.[1] Ala is a key amino acid for ATP production through pyruvate and the Krebs cycle.[3]
Conclusion(s): Ala increases apoptosis revealed by caspase 3 expression after IR in *ex vivo* rat livers.



References:
1 Malhi H, Gores GJ, Lemasters JJ. Hepatology 2006;43:S31–S44.
2 Caraceni P, Nardo B, Domenicoli M et al. Hepatology 1999;29;1139–46.
3 Astarcioglu I, Adam R, Dimicoli JL et al. Transplant Proc 1995;27:507–8.

9AP7-4

High-dose remifentanil suppresses tracheal intubation induced activation of salivary alpha-amylase activity

T. Nakada, W. Hyun, R. Morino, I. Naya, M. Yokota

Anaesthesia and Pain Services, The Cancer Institute Hospital, Tokyo, Japan

Background and Goal of Study: Salivary alpha-amylase (SAA) activity is associated with adrenergic activity and being reported to be an indicator of various kinds of psychosomatic stresses in humans. We hypothesized that high-dose remifentanil infusion reduces tracheal intubation induced activation of SAA activity. In order to examine it, we tried to evaluate the SAA activity during anesthetic induction with other electrophysiological signs.
Materials and Methods: With IRB approval, 30 adult patients, each of ASA physical status I or II, for elective operations under general anesthesia participated into this trial at the Cancer Institute Hospital, Tokyo Japan. In a single-blinded and randomized design, following intravenous administration of propofol 1mg/kg and vecuronium bromide 0.1mg/kg, 10 patients as the high-dose (H) group underwent mask ventilation for 5 minutes in 6L oxygen flow with 1.0 μg/kg/min of remifentanil infusion intravenously until orotracheal intubation and 10 patients as the usual-dose (U) group with 0.5μg/kg/min of remifentanil infusion, and other 10 patients as the control (C) group underwent mask ventilation alone until orotracheal intubation. The measurements before and 5 minutes after orotracheal intubation are the following: noninvasive ambulatory blood pressure (NIBP), electrocardiogram-derived heart rate (HR), Bispectral (BIS) index, and SAA activity. We compared the changes between the measurements before and after the intubation. Each of the data of the both groups was compared and analyzed using a one-way analysis of variance (ANOVA). $P < 0.05$ was considered statistically significant.
Results and Discussion: The group H suppresses the all measurements and the change of the SAA revealing significant differences in comparison of 3 groups. The group U has only the change in HR with significant difference against the C group. Changes in the SAA of Group C: 34.00 ± 57.65kU/L (mean ± standard deviation). Changes in the SAA of Group U: – 5.90 ± 64.93kU/L. Changes in the SAA of Group H: – 30.40 ± 25.68kU/L* ($p < 0.05$). C vs. U: $p = 0.2211$. C vs. H: $p = 0.0272$*. U vs. H: $p = 0.5539$. It demonstrated that 1.0 μg/kg/min of remifentanil infusion should reduce the tracheal intubation-induced activation of SAA activity during anesthetic induction.
Conclusion(s): 1.0 μg/kg/min of remifentanil infusion before orotracheal intubation may reduce the tracheal intubation-induced activation of SAA activity during anesthetic induction.

9AP7-6

Genotoxicity of the inhalational anaesthetics on in-vitro sperm cell cultures, established by Comet assay

C. Kaymak, E. Kadioglu, E. Coskun, H. Basar, M. Basar

Anaesthesiology and Reanimation, Ministry of Health Ankara Training and Research Hospital, Ankara, Turkey

Background and Goal of Study: Large number of studies has been conducted to evaluate the embryotoxic, teratogenic, mutagenic and carcinogenic effects of inhalational anaesthetics. Karpinski et. al. have been demonstrated genotoxic effects of halothane, isoflurane, sevoflurane and desflurane in human lymphocytes in vitro. Incidence of infertility, spontaneous abortus and congenital anomaly are said to be increased with germ cell injury, sperm cell DNA damage and morphological changes of sperm cell due to effects of anaesthetic agents. Inhalational anaesthetics of new generation are known to be less effective on sperm cell morphology and spermatogenesis but effects of these new agents on sperm cell DNA damage is still lack of clear scientific data. We aimed to evaluate the genotoxic effects of four different concentrations of halothane, isoflurane, sevoflurane and desflurane on DNA damage on in-vitro sperm cell cultures.
Materials and Methods: We provided anaesthetic agents in dimethyl sulfoxide (1% DMSO) at four different concentrations (0,1mM, 1mM, 10mM, 100mM). Buffered sperm cell cultures at 37 °C are exposed to 4 different concentrations of 4 different anaesthetic agents for 30 minutes. The negative controls were samples with 1% DMSO. DNA damage is examined using Alkaline Comet Assay (Single Cell Gel Electrophoresis) method under fluorescent microscope (Image Analysis System- Perceptive Instruments).
Results and Discussion: Oxidative DNA damage caused by 1 mM concentration of halothane was significantly higher than damage caused by other agents of same concentration. Concentrations of 1 mM, 10 mM and 100 mM isoflurane and halothane caused significantly more DNA damage than 1% DMSO or 0.1 mM of these agents. In addition, concentraions of 100 mM caused significantly more DNA damage than 1 mM and 10 mM concentrations of halothane. Sevoflurane and desflurane at concentraions of 10 mM and 100 mM caused significantly more DNA damage than 1% DMSO and concentraions of 0.1 mM and 1.
Conclusion(s): Higher incidences of abortus and congenital anomaly in newborns of health care providers working in operating rooms are reported. In addition a decrease in sperm parameters was shown in in-vivo and in-vitro studies after inhalational anaesthesia. In our study same concentrations of different anaesthetic agents caused similar amounts of DNA damage. As a result; for undefined embryotoxic, teratogenic, mutagenic results, the effect of acute and chronic exposure to inhalational anaesthetics must be studied.

9AP7-7

Prevalence of in vivo skin and intradermal positive test to anaesthetic drugs in the surgical population with a prior history of allergy to other medication

N. Hagau, N. Gherman-Ionica, R. Bologa, C. Indrei, D. Hagau

Anaesthesia and Intensive Care, University of Medicine and Pharmacy "Iuliu Hatieganu", Cluj-Napoca, Romania

Background and Goal of Study: The prevalence of anaphylaxis during anaesthesia is difficult to ascertain. None of the available diagnostic test demonstrates absolute accuracy. The aim of the study was to assess the prevalence of in vivo and in vitro positive test to anaesthetic drugs in the surgical patients.
Materials and Methods: After giving their written consent, 39 surgical patients with a prior history of allergy to different than anaesthetic drugs, were tested in vivo and in vitro for 11 substances used during anaesthesia. According to the guidelines of the EAACI skin prick test (SPT) and intradermal test (IDT) were performed using validated drug maximal concentration (Cmax). The skin testing started with SPT, and IDT was restricted to patient with negative or questionable SPT results. Flowcytometric analysis of in vitro activated basophils (BAT) was performed; up-regulation of CD_{63} marker was measured. (Bühlmann Flow2Cast technique).
Results and Discussion: Prevalence of positive SPT and IDT to anaesthesia related drugs versus positive BAT is shown in Table 1. From 429 performed prick tests, 4 were positive (0.9% prevalence), 3 of these being confirmed by BAT. From 425 IDT, 26 were positive (6.1% prevalence), but only 4 of these were confirmed by BAT. There is a significant statistical difference between the two prevalences (Chi-square test, $p \leq 0.05$). Midazolam and atracurium were

Prevalence of the positive skin and intradermal test versus basophil activated test

	Positive SPT		Positive BAT vs Positive SPT	Positive IDT		Positive BAT vs Positive IDT
Drug	n	Cmax (mg/ml)		n	Cmax (μg/ml)	
Thiopental	0/39	25	0	0/39	2500	0
Propofol	0/39	10	0	2/39	1000	1/2
Etomidat	0/39	2	0	0/39	200	0
Midazolam	0/39	5	0	10/39	500	0
Fentanyl	1/39	0.05	1/1	0/39	5	0
Remifentanyl	0/39	0.05	0	1/39	5	0
Meperidine	1/39	25	1/1	0/37	2.5	0
Suxamethoniu	0/39	10	0	2/39	100	0
Atracurium	2/39	1	2/2	5/37	10	0
Rocuronium	0/39	10	0	3/39	100	2/3
Pancuronium	0/39	2	0	2/39	200	1/2

responsible for 15 of the false positive intradermal reactions leading to the need of establishing cut-off for maximal concentration. We used a validated maximal concentration for SPT and IDT, but the risk of misinterpretation is higher when the IDT are used.
Conclusion(s): When using the IDT there is a need for validated protocols for anaesthesia drugs.

9AP7-8

Dexmedetomidine attenuates OGD-induced kidney tubular cell injury *in vitro*

J. Gu, G. Tao, C. Pac-Soo, M. Maze, D. Ma

Department of Anaesthetics, Chelsea & Westminster Hospital, Imperial College, London, United Kingdom

Background and Goal of Study: Acute renal failure in the peri-operative period continues to be a significant contributor to morbidity and mortality. Yet there is a distinct lack of effective strategies to obviate this problem (1). Dexmedetomidine, an α_2 adrenoceptor agonist, exhibit organoprotective effects (2). Its protective effects may also exert against renal injury. Herein, we aim to investigate whether the administration of Dexmedetomidine provides renoprotection in an *in vitro* model of renal injury.
Materials and Methods: HK-2 cells, derived from adult human kidney proximal tubular epithelial cells, were cultured at 37°C in RPMI 1640 medium supplemented with 10% foetal bovine serum, 2mM L-glutamine, and 100U/mL penicillin streptomycin in a humidified air/5% CO_2 atmosphere. They were treated by depriving the culture medium of glucose and oxygen (OGD) for 6 hrs in the absence or presence of Dexmedetomidine (0.001 to 0.1 nM) alone or together with Atipamezole (10 nM), an α_2 adrenoceptor antagonist after reaching 80% confluence. The cell viability was measured with MTT assay. The cell viability was expressed as percentage of control (mean ± SD, n = 4–5).
Results and Discussion: Cell viability was increased from 42 ± 11% to 78 ± 5% by the administration of Dexmedetomidine at dose ranges from 0.001 to 0.1 nM ($p < 0.01$). This effect was abolished by an adrenoceptor antagonist of Atipamezole. Dexmedetomidine or Atipamezole at the highest studied dose did not cause any cell death.
Conclusion(s): These data suggest that Dexmedetomidine has renoprotective property and the effect is due to its action on alpha-2 adrenoceptor. This effect needs to be confirmed further in vitro experimental settings.
Acknowledgements: This study was supported by a grant from Westminster Medical School Trust, London, UK.
References:
1 Sear JW. Kidney dysfunction in the postoperative period. Br J Anaesth. 2005; 95; 20–32.
2 Ma D, et al. Dexmedetomidine produces its neuroprotective effect via the α_{2A}- adrenoceptor subtype. Eur J Pharmacol. 2004;502:87–97.

9AP7-9

A case of malignant hyperthermia without mutations in type1 ryanodine receptor and crucial part of dihydropyridine receptor alpha1 subunit

S. Takahashi, S. Obara, T. Isosu, A. Hazama, M. Murakawa

Anesthesiology, Fukushima Medical University School of Medicine, Fukushima, Japan

Background and Goal of Study: Malignant hyperthermia (MH) is a potentially lethal disease induced by volatile anesthesia and depolarizing muscle relaxant. Since mutations are widely distributed in ryanodine receptor type 1 gene (RyR1), there are a variety of phenotypes. Here we describe the case of a patient who developed MH after his third general anesthesia. We attempted to identify the precise location of the mutations in the patient to facilitate the understanding of the pathophysiology of the atypical MH.
Materials and Methods: After obtaining IRB approval and informed consent, the patient's genomic DNA was extracted from peripheral blood lymphocytes. All exons of RyR1 gene and regions crucial to the normal function of alpha1 subunit of voltage-gated dihydropyridine receptor (CACNA1S), another candidate gene which is associated with susceptibility to MH, were amplified by polymerase chain reaction (PCR) and sequenced.
Results and Discussion: A male patient experienced general anesthesia four times at the age of 41, 49, 50 and 61. Although the patient was exposed to potential triggers of MH, enflurane and succinylcholine in the first and isoflurane in the second anesthesia, he did not develop symptoms of MH. Anesthesia times were 282 and 220 minutes respectively. At the third anesthesia, when sevoflurane was used, the patient showed MH symptoms, such as hyperthermia and hypercapnia. After 3 days in the intensive care unit, his condition improved. He was discharged on postoperative day 15 without further complications. For the fourth anesthesia, total intravenous anesthesia was performed and the patient recovered uneventfully. An enhancement of the rate of calcium-induced calcium release was confirmed using skinned fibers prepared from patient's skeletal muscle. It is well-accepted that MH is triggered by volatile anesthesia and depolarizing muscle relaxants. However, there are case reports about MH patients with previous uneventful anesthesia. Although we expanded gene sequencing from hot spots of mutations in RyR1 to all exons of RyR1 and parts of CACNA1S, no mutations were detected. The clinical manifestations may depend on location of the mutations. Further studies will be required.
Conclusion(s): We attempted to identify RyR1 and CACNA1S mutations in a MH patient who developed MH symptoms after his third general anesthesia However, mutations were not detected. There are a variety of phenotypes of MH. Identifying mutations of each case may facilitate to understand underlying mechanisms. Further studies are required.

Paediatric Anaesthesia and Intensive Care

10AP1-1

Use of laryngeal mask airway and its removal in deeply anesthetized state reduces emergence agitation after sevoflurane anesthesia in children

Y. Lee, J. Kim, A. Kim

Anesthesiology and Pain Medicine, Keimyung University, Daegu, Korea

Background and Goal of Study: Emergence agitation is a well-known adverse effect of sevoflurane anesthesia in children. The purpose of this study was to investigate whether the use of LMA and then its removal while patients are deeply anesthetized can decrease emergence agitation compared with extubation of an endotracheal tube by reducing laryngeal stimulation, sore throat, fear, and discomfort during the awakening period.
Materials and Methods: In a blinded, randomized, prospective trial, we studied 168 patients who were ages 2 through 7 years and had an ASA physical status of I or II who were undergoing elective subumbilical (inguinal hernia, hydrocele, cryptorchidism) surgery. Exclusion criteria were known history of a neurologic or psychological disorder, sleep apnea, and developmental problems. Induction and maintenance of anesthesia was done with sevoflurane. The patients were randomly assigned to one of the three groups by computer-generated numbers: group ET-A, tracheal intubation using an endotracheal tube and extubation in an awake state; group ET-D, tracheal intubation using an endotracheal tube and extubation in a deeply anesthetized state; and group LMA-D, insertion of LMA and removal of it in a deeply anesthetized state. In the postanesthesia care unit (PACU), one anesthesiologist who was blinded to patient group assignment evaluated patients' agitation levels. Agitation was recorded on a 4-point scale (1 = calm; 2 = not calm but still consolable; 3 = agitated, restless; 4 = combative, excited, must be restrained). We defined emergence agitation as a score of 3 or 4 points. The data were evaluated using analysis of variance and the chi-square test, with the assistance of SPSS for Windows (version 14.0, SPSS, Chicago, IL, USA). A *P* value of < 0.05 was considered statistically significant.
Results and Discussion: No significant differences were found among the three groups in demographic data regarding age, sex, body weight, or type of surgery. There were no significant differences in anesthesia data. However, there was a statistically significant difference in incidence of agitation between group ET-A and group LMA-D.

Incidence of Emergence Agitation

	Group ET-A (n = 56)	Group ET-D (n = 56)	Group LMA-D (n = 56)
Incidence of agitation (score 3, 4)	23 (41.1%)	19 (33.9%)	12 (21.4%)*

* : $p < 0.05$ vs. Group ET-A.

Conclusion(s): Using LMA and then removing it when patients are in a deeply anesthetized state decreases the incidence of emergence agitation compared with tracheal intubation and then extubation in an awake state.

10AP1-2

Gentle chest compression for immediate treatment of laryngospasm

R. Al-metwalli

Anaesthesiology, King Faisal University, Dammam, Eastern, Saudi Arabia

Background and Goal of Study: Extubation laryngospasm is encountered frequently in children undergoing upper airway surgery. Different drugs and techniques have been used for its treatment. The aim of the present study is to evaluate the effectiveness of gentle chest compression as an immediate treatment of laryngospasm compared the traditional technique.

Materials and Methods: The study was conducted over 4 years on all children scheduled for elective tonsillectomy or adeno-tonsillectomy. At the end of surgery patients were extubated using the criteria of awake extubation. In the first two years extubation laryngospasm was managed with 100% O2 with CPAP and gentle positive pressure ventilation via a tight-fitting face mask (traditional group), while in the next two years extubation laryngospasm was managed with 100% O2 via a tight-fitting face mask without positive pressure ventilation, in the same time concurrent gentle chest compression was immediately started (chest compression group). In both groups if the spasm was not relieved and oxygen saturation fell to 85%, a small dose of succinylcholine (0.5mg. kg^{-1}) was administered with subsequent ventilation.

Results and Discussion: During the 4-year study period,1226 children aged 3–12 years were rolled in the study (632 children in the traditional group and 594 children in the chest compression group), out of them 52 children developed laryngospasm in the traditional group (8.2%) compared to 46 children (7.8%) in the chest compression group (p = 0.83). There was statistically significant difference between the number of the patient successfully treated with chest compression 34/46 (73.9%) compared to 20/52 (38.4%) in the traditional group (p = 0.0005). None of the children in the chest compression group developed gastric distension compared to 45/52 (86.5%) children in the traditional group. Limitation of this study is the lake of randomization. This is because we were dealing with emergency situation which required clear protocol of management that should be fixed over a period of time to avoid hesitation and perplexity in a critical situation.

Conclusion(s): We concluded that gentle chest compression with 100% oxygen via a tight-fitting face mask, could be a suitable, effective and less harmful alternative technique to the traditional famous technique (100% oxygen with CPAP and positive pressure ventilation) for the immediate management of post-extubation laryngospasm. However further studies are required to confirm the clinical merits of this technique and confirm its efficacy and reliability.

10AP1-3

First observations using "Truview" laryngoscope with pediatric patients

G. Kaya, C. Tutuncu, P. Kendigelen, Y. Tunali, T. Utku

Anesthesiology and Reanimation, Cerrahpasa Medical Faculty of Istanbul University, Istanbul, Turkey

Background and Goal of Study: In children, difficult intubation causes more rapid deterioration compared to adults. Truview laryngoscope is suggested for difficult intubation for its superior optical system and its ability to supply oxygen during the procedure. In our study, we aimed to compare the effectiveness of the Truview blade to the Macintosh blade.

Materials and Methods: After obtaining informed approval from the faculty ethical committee, we evaluated children by Mallampati score when we could. After performing standard monitoring procedures, all patients received standard general anesthesia. Laryngoscopy was first performed with Macintosh blade and after with a Truview blade and the Cormack Lehane score (CLS)for each was determined. The patient was subsequently intubated using a Truview blade. During the evaluation with the Truview blade and intubation, O_2(10L/min) was administered. A decrease in SpO_2 levels was noted.

Results and Discussion: 64 patients participated in the study. In the 1–14 years group (n = 42), the mallampati score (14 patients) was found to be 1.7 ± 1.05. The CLSwere found to be 2.0 ± 0.6 and 1.2 ± 0.4 when using a Macintosh blade and a Truview blade, respectively. In the 0–1 year group (n = 22), the CLSwere found to be 2.4 ± 1.0 and 1.4 ± 0.7 when using a Macintosh blade and a Truview blade, respectively. The newborns (0–30 days) in this group (n = 8) had CLS of 2.8 ± 1.0 and 1.9 ± 0.8 when using a Macintosh blade and a Truview blade, respectively. In the case of a patient with Pierre Robin syndrome, CLS was found to be 4 and 3, using a Macintosh and a Truview blade, respectively, although intubation was unsuccessful. Also, one intubation was performed with a classic laryngoscope following a loss of view quality due to fogging. All other intubations were performed with a Truview laryngoscope.No desaturation was observed in any of the patients. The glottic view, evaluated by CLS, was significantly better with Truview blade than the Macintosh blade. The fogging of the optical system, drops left in the apparatus after washing may reduce view quality.

Conclusion(s): Truview laryngoscope displays a very clear view of the larynx. It is especially helpful with new-borns with respiratory distress by revealing the anatomy of the laryngeal area, potentially aiding in diagnosis. One advantage of using a Truview laryngoscope is that it enables a constant O_2 flow and thereby prevents a decrease in SpO_2 levels. Another advantage is its ability to transfer the image to the monitor, hereby aiding in trainee education.

10AP1-4

Prediction of endotracheal tube size in children with failure to thrive undergoing cardiac surgery

N. Bunchungmongkol, T. Pipanmekaporn

Anesthesiology, Chiang Mai University, Chiang Mai, Thailand

Background and Goal of Study: Children with cardiac diseases usually have delayed growth and development. This condition may affect airway development. The age-based formula is widely used to predict the appropriate size of endotracheal tube (ET) in children. The objective of this study was to assess the accuracy of age-based formula for predicting ET size in children with failure to thrive undergoing cardiac surgery.

Materials and Methods: We conducted a prospective study in children aged 1–8 years. Children with failure to thrive had a weight that was below the 3rd percentile for their age on a national growth chart. An uncuffed ET was selected according to the age-based formula (internal diameter (mm) = age in years +16 divided by 4). The appropriateness of this ET selection was assessed using an audible air leakage around the tube of between 15 and 30 cm of H_2O pressure. We calculated percent exact fit and percent clinically relevant fit, defined as the porportion of exactly matching the predicted size and proportion matching within ± 0.5 mm of the predicted size.

Results and Discussion: Sixty children were enrolled in this study. The age, height and weight were 95 ± 20.5 months, 113.5 ± 12.5 cm. and 18 ± 2.8 kg, respectively (mean ± SD). Thirty nine children (65%) had their height below the 3rd percentile. The age-predicted ET size exactly matched the actual size for 37 children (61.7%; 95% CI, 49%–72.9%). It underestimated the actual ET size in 10 cases (16.7%) and overestimated in 13 cases (21.6%). The age-based predicted an ET size was within the clinically relevant range for 54 children (90%; 95% CI, 79.9%–95.3%).

Conclusion(s): The age-based prediction of endotracheal tube size can be applied for most children with underlying heart diseases and failure to thrive condition.

10AP1-5

Laryngeal mask airway (LMA) versus orotraqueal tube in otoryngologic procedures: Comparison in children under low-flow general anaesthesia with desflurane

I. Cardoso, P. da Fonte, L. Gomes, T. Pinto Pais, M. Loução

Anesthesiology, Hospital de São Sebastião, Santa Maria da Feira, Portugal

Background and Goal of Study: The aim of the study was to find if the supraglotic dispositives were as effective and safe as orotraqueal tube for maintaining airway during otoryngologic procedures like tonsillectomy and/or adenoidectomy since there are high concerns about ventilation and airway protection.

Materials and Methods: Sixty two children ASA I were prospectively randomied to receive either a LMA or a RAE preformed tube and then submitted to low-flow general anesthesia for short duration otoryngologic procedures. The induction was made with fentanyl (2ug/kg), propofol (3mg/kg) and rocuronium (0,3mg/kg), and the maintenance with desflurane, oxygen and nitrous oxide. Ventilation pressure was adjusted according to the weight of the children. After the introduction of the open mouth, surgeons were asked if they could see any insufflated cuff in the airway. At the end of the surgery all LMA and RAE were checked for the presence of blood. Main ventilatory adverse events were also noted.

Results and Discussion: In LMA group mean ventilation pressure was 13 mm Hg (±2) before and 13 mm Hg (±2) after the introduction of the open mouth. Surgeons weren't able to see any inflatted cuff in the LMA. In the group with RAE, the mean ventilation pressure was 14 mm Hg (±2) and 15 mm Hg (±1). There was no visible blood in the device of any patient of any group. One case of stridor and 2 cases of cough after the removal of the RAE tube. No respiratory events were noted in LMA group.

Conclusion(s): This study has shown that LMA is a safe alternative for providing ventilation in short otoryngologic procedures and it seems to reduce adversal reactions in the airway.

Reference:

Paediatr Anaesth. 2008 Oct; 18(10):952–6. Anesthesiology. 2007 Nov;107(5):714–9. Can J Anaesth. 1993 Dec;40(12):1171–7.

10AP1-6

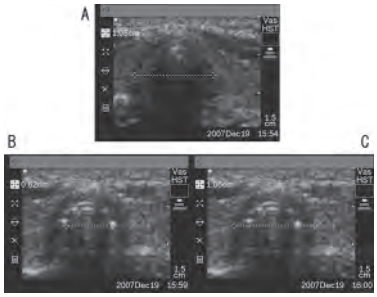
Pediatric endotracheal tube size selection by ultrasonography

M. Shibasaki, Y. Nakajima, S. Ishii, F. Amaya, T. Mizobe

Anesthesiology, Kyoto Prefectural University of Medicine, Kyoto, Japan

Background and Goal of Study: Previous formula based on age and height dose not reliably help to select the proper endotracheal tube (ETT) size in pediatric patients. The aim of our clinical investigation is to establish more precise formula by ultrasonographic measurement, and to select the proper ETT size in pediatric patients.

Materials and Methods: Two hundred pediatric patients (age 1–86 month) undergoing general anesthesia in the operating room of university hospital were enrolled in this prospective clinical investigation. In the derivation group of patients, the proper ETT size was selected according to Cole's formula and Motoyama's formula for uncuffed and cuffed ETT, respectively. Selection of ETT size was considered as correct if air leakage occurred at the peak inspiratory pressure between 20cm H_2O and 30cm H_2O. After tracheal intubation, the subglottic upper airway diameter and the ETT outer diameter (OD) were measured by ultrasonography. We calculated the regression equation between the subglottic upper airway diameter and the OD of finally selected ETT. In the validation group of patients, ETT size was selected by this regression equation after the ultrasonographic measurement.



Results and Discussion: The subglottic upper airway diameter and the OD of finally selected ETT were highly correlated. The coincident ratio between the finally selected ETT size and the predicted ETT size based on ultrasonographic measurement was 98% for cuffed ETT and 96% for uncuffed ETT, respectively. Although patients' tracheal diameter reflects their age, height, and weight, it has individual variations. Further, patients receiving tracheal intubation have growth abnormality on occasion. As these formula can not reflect individual variations nor growth abnormalitiy, direct measurement of subglottic upper airway diameter by ultrasonography in pediatric patients can resolve this problem.

Conclusion(s): Previous established formulas based on age was a poor predictor to select the proper ETT size. Our results strongly suggest that the subglottic upper airway diameter measured by ultrasonography is a good predictor to select both cuffed and uncuffed ETT size correctly in pediatric endotracheal intubation.

10AP1-7

MRI-based biometry of the subglottic section in children

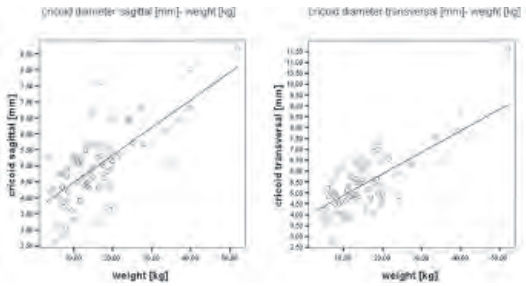
D. Kallias, U. Burkhardt, P. Simon, W. Hirsch, U. Kaisers

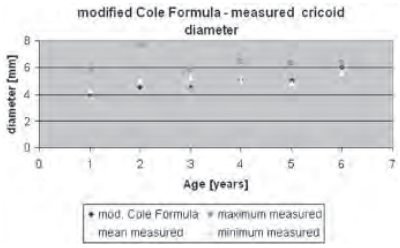
Department of Anaesthesiology and Intensive Care medicine, University of Leipzig, Leipzig, Germany

Background and Goal of Study: The optimal endotracheal tube size is a critical factor for successful intubation of children. The circular cricoid cartilage is a nonelastic anatomic structure and cannot accommodate larger tube sizes. The purpose of this study is to determine the age-dependent size of the airway at cricoid level.

Materials and Methods: The study was approved by the ethics committee. In 101 children, MRI images (MRI Philips Intera 1, 5 Tesla) of the head and neck in transverse and sagittal planes were used to obtain measurements of the structures at the level of the cricoid cartilage. Age-dependent means were statistically correlated with age and weigth. Children 0–12 years of age that required MRI of the head for diagnostic purposes were included in the study. Exclusion criteria were ASA higher than III, malformations, stridor, acute infections of the upper airways, or history of a tracheotomy. All children were sedated with propofol 1–3 mg/kg for the study. Oxygen was continuously insufflated via a face mask and the children were continuously monitored. The head of the child was fixed in the sniffing position.

Results and Discussion: The mean dimensions of the airway in the sagittal and transverse planes were found to be about 1 mm per 10 kg weight at cricoid level (figure 1). Correlation between size and age is similar. The cole formula (tube size equals age in years divided by 4 plus 4) corresponds very well with the mean diameters of the cricoid cartilage (figure 2).





Conclusion(s): The size of the circular cricoid cartilage is variable, but correlates best with the weight in all age groups. The cole formula corresponds quite well with actual airway diameter. However, there is singificant interage variation of cricoid size and these biometric formulae should not be used alone to determine endotracheal tube diameter.

10AP1-8

Comparison of endotracheal tube and cricoid diameter in childhood

P. Simon, U. Burkhardt, D. Kallias, W. Hirsch, U. Kaisers

Department of Anaesthesiology and Intensive Care medicine, University of Leipzig, Leipzig, Germany

Background and Goal of Study: Endotracheal tubes for children must be of exact fit, as the circular cricoid cartilage is a nonelastic anatomic structure and cannot accommodate larger tube sizes. The purpose of this study is to determine the age-dependent size of the airway at cricoid level and to compare this to size of the endotracheal tubes utilized.

Materials and Methods: The study was approved by the ethics committee. In 72 children, MRI images of the head and neck in transverse and sagittal planes were used to obtain measurements of the structures at the level of the cricoid cartilage. The age-dependent means were statistically correlated. Children 1–6 years of age that required MRI of the head for diagnostic purposes were included in the study. Exclusion criteria were ASA higher than III, malformations, stridor, acute infections of the upper airways, or history of a tracheotomy. All children were sedated with propofol 1–3 mg/kg for the study. Oxygen was continuously insufflated via a face mask and the children were continuously monitored. The head of the child was fixed in the sniffing position.

Results and Discussion: The cole foruma (tube size equals age in years divided by 4 plus 4) corresponds very well with actual airway diameter. Transverse cricoid diameter in all ages was larger than sagittal diameter (figure 1). However, there is a striking discrepancy between the age related tube size recommended by the manufacturers and the mean diameters of the cricoid cartilage (figure 2).

Conclusion(s): There is a discrepancy between the cricoid diameter and outer diameter of the endotracheal tubes. Because the outer diameter is substantially larger than the mean cricoid diameter, a potential lesion of the cricoid cartilage by chosing a tube that is too large cannot be excluded.

Figure 1: Cricoid diameter

age (years)		1	2	3	4	5	6
n		16	12	11	17	9	7
sagittal cricoid diameter (mm)	minimum	3.2	3.1	4.4	3.8	3.2	4.4
	mean	4.3 ± 0.7	5.1 ± 1.5	5.2 ± 0.2	5.0 ± 0.5	4.9 ± 1.0	5.6 ± 0.5
	maximum	5.8	7.6	5.9	6.5	6.3	6.4
transverse cricoid diameter (mm)	minimum	3.7	4.5	4.6	4.0	4.3	4.3
	mean	4.9 ± 0.5	5.7 ± 1.4	6.0 ± 0.7	5.1 ± 0.5	6.0 ± 1.2	5.8 ± 1.4
	maximum	5.9	8.3	7.1	6.5	7.6	7.3

Figure 2: Comparision cricoid diameter with outer diameter of endotracheal tubes

age (years)		1	2	3	4	5	6
Sagittal cricoid diameter (mm)	mean	4.3±0.7	5.1±1.5	5.2±0.2	5.0±0.5	4.9±1.0	5.0±0.6
transverse cricoid diameter (mm)		4.9±0.5	5.7±1.4	6.0±0.7	5.1±0.5	6.0±1.2	5.8±1.4
uncuffed tubes	ID (mm)	4.0	4.5	4.5	5.0	5.0	5.5
Sheridan Tracheal Tube uncuffed murphy	OD (mm)	5.5	6.2	6.2	6.9	6.9	7.5
Mallinckrodt TT Contour		5.7	6.2	6.2	6.9	6.9	7.6
Portex TT – Blue Line: Magill uncuffed		5.5	6.2	6.2	6.9	6.9	7.6
Rüsch Ruschelit Safety Clear		5.3	6.0	6.0	6.7	6.7	7.3
cuffed tubes	ID (mm)	3.5	4.0	4.0	4.5	4.5	5.0
Sheridan Tracheal Tube cuffed Murphy	OD (mm)	4.9	5.5	5.5	6.2	6.2	6.6
Sheridan Tracheal Tube cuffed Magill		NA	5.6	5.5	NA	NA	6.0
Mallinckrodt TT Lo-Contour Magill		4.9	5.7	5.7	6.5	6.5	6.9
Mallinckrodt TT Lo-Contour Murphy		5.0	5.6	5.6	6.2	6.2	7.0
Mallinckrodt TT Hi-Lo Murphy		NA	NA	NA	NA	NA	6.9
Portex TT – Profile Soft Seal Cuff, Murphy		NA	NA	NA	NA	NA	6.9
Rüsch Ruschelit Super Safety Clear Magill		5.3	6.0	6.0	6.3	6.3	6.7
Rüsch Ruschelit Super Safety Clear Murphy		NA	NA	NA	NA	NA	6.7

ID uncuffed tubes: ID=age/4+4; ID cuffed tubes: ID=age/4+3.5; OD=outer diameter, NA=not available

Reference:

Takita et al. Do age-based formulae predict the appropriate endotracheal tube sizes in Japanese children? J Anesth 2001; 15:145–148.

10AP2-2

Narcotrend index indicates age-related changes during propofol induction in children

S. Münte, J. Klockars, A. Hiller, M. Van Gils, T. Taivainen

Department of Anaesthesiology and Intensive Care Medicine, Helsinki University Clinics, Children´s Hospital, Helsinki, Finland

Background and Goal of Study: We tested the reliability of the Narcotrend® EEG-monitor in assessing hypnotic state and loss of consciousness (LOC) during propofol induction in children.

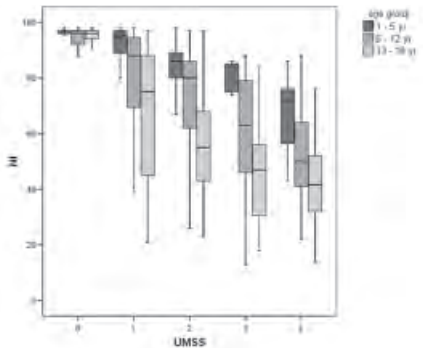
Materials and Methods: 61 children (1–16 yrs) were premedication using oral midazolam 0.5 mg/kg. Propofol target controlled infusion (TCI) was increased by 0.5 mg/ml every two minutes until the child did not respond to any verbal command or physical stimuli. Hypnotic state was measured using the University of Michigan Sedation Scale (UMSS). LOC was defined as a transition of UMSS scale value 2 to 3.

Results and Discussion: The P_K-value of 0.84 of NI for LOC and for agreement between NI and UMSS values are shown in Table 1. The average NI values differed between successive UMSS sedation levels 0 and 1 and levels 1 and 2. The NI values differed significantly between age groups at UMSS levels 1–4 ($p < 0.005$). The average NI value at LOC was 68. For the detection of consciousness, a sensitivity of 0.67 and specificity of 0.79 were achieved.

Relationship between UMSS, NI and TCI

Age	1 – Pk	Rho Spearman	Rho Spearman	Rho Spearman
1 – 5 yrs	0.86 [0.75 0.96]	–0.85 [–0.96 –0.73]	0.96 [0.95 0.98]	–0.84 [–0.98 –0.71]
6 – 12 yrs	0.82 [0.74 0.91]	–0.73 [–0.85 –0.60]	0.95 [0.94 0.97]	–0.69 [–0.84 –0.53]
13 – 16 yrs	0.80 [0.73 0.87]	–0.68 [–0.81 –0.55]	0.94 [0.92 0.96]	–0.63 [–0.77 –0.49]
overall	0.82 [0.78 0.87]	–0.74 [–0.81 –0.67]	0.95 [0.94 0.96]	–0.68 [–0.77 –0.59]

The table shows prediction probability (Pk)-values of the relationship between UMSS (University of Michigan Sedation Scale16) and NI (Narcotrend Index), Spearman correlation coefficient between NI and TCI (Target Controlled Infusion), TCI and UMSS and NI and UMSS in various age groups. Values are means of individual correspondence measures and in brackets 95% CI of mean.



Conclusion(s): The Narcotrend®-monitor was capable of following changes in the sedation level, but also had a relatively high probability of incorrectly predicting changes in conscious state.

10AP2-3

Clonidine in penile block for foreskin's average length surgery of in children

A. Skhiri, S. Ben Khalifa, T. Regaya, M. Trifa, K. Brini

Pediatric Anesthesia and Intensive Care, Children Hospital, Bab Saadoun, Tunis, Tunisia

Background and Goal of Study: The aim of the study was to evaluate the effect of clonidine added to bupivacaine in penile block for foreskin's average length surgery in children.

Materials and Methods: The study protocol was approved by the local committee of ethics and all parents gave written informed consent before enrolment. We performed a prospective randomized; double-blind trial including children aged from 1 to 6 years, ASA I –II, sheduled for hypospadias surgery or ureteral fistula repair. General anaesthesia was standardized (sevoflurane inhalation induction, maintenance with isoflurane 1 MAC). Patients were then randomly assigned to have a penile block using either: –Bupivacaine 0.5% ($0.2ml \cdot kg^{-1}$) + Clonidine ($1ug \cdot kg^{-1} = 0.1ml \cdot kg^{-1}$) ($G_1$)–Bupivacaine 0.5% ($0.2ml \cdot kg^{-1}$) + normal saline solution ($0.1ml \cdot kg^{-1}$) (G_2). Postoperative analgesia was assessed using CHEOPS score on the recovery (H_0), the 1st (H_1), 2nd (H_2), 3rd (H_3), 4th (H_4), 8th (H_8), 12th (H_{12}) and 24th (H_{24}) postoperative hours. If CHEOPS ≥ 7, the child received paracetamol $15 mg \cdot kg^{-1}$ and if insufficient, nalbuphine $0.2 mg \cdot kg^{-1}$ by intravenous route. The time to first requirement and the total doses of analgesic given were recorded. Chi-square and Students t-test were used in statistical analysis; $p < 0.05$ was considered significant.

Results and Discussion: Thirty six children were included in the survey ($G_1 = 19$, $G_2 = 17$). There was no difference between the two groups as regards demographic data, kind and duration of surgery. CHEOPS score was significantly lower in G_1 at H_1 ($p = 0.02$), H_4 ($p = 0.01$), H_8 ($p = 0.001$) and H_{24} ($p = 0.03$). Two children in G_1 required supplementary analgesia (paracetamol) compared to 11 patients in G_2 ($p = 0.001$). None of them necessitated the administration of nalbuphine. The two children of G_1 had received paracetamol at H_0, whereas mean time to the first requirement of analgesics was 4 hours in G_2.

Conclusion(s): The addition of the clonidine to bupivacaine in the penile block improves postoperative analgesia in foreskin's average length surgery in children.

10AP2-4

A comparison of two doses of intrathecal morphine for post operative analgesia in paediatric surgery

S. Ben Khalifa, A. Skhiri, T. Regaya, M. Trifa, H. Bel Haj

Pediatric Anesthesia and Intensive Care, Children Hospital, Bab Saadoun, Tunis, Tunisia

Background and Goal of Study: Intrathecal morphine has been widely used in adults undergoing various surgical procedures. Its reported use in the paediatric surgical population has been limited to spine surgery (1). The doses used in these studies usually ranged from 5–30 $\mu g \cdot kg^{-1}$. There are a few data concerning its use in other surgical procedures. This study was designed to compare the postoperative analgesic effect of two doses of intrathecal morphine: 5 versus 10 $\mu g \cdot kg^{-1}$ in sus-mesocolic and thoracic surgery in children.

Materials and Methods: After ethics committee approval and parental informed consent, we conducted a prospective randomised double blinded study including ASA I–II children, aged between 1 and 10 years, undergoing sus-mesocolic or thoracic surgery. Patients were randomly allocated to receive either 5 $\mu g \cdot kg^{-1}$ (GA) or 10 $\mu g \cdot kg^{-1}$ (GB) intrathecal morphine, immediately after induction of standardised general anaesthesia. The injected volume was 0.1 $ml \cdot kg^{-1}$ for all the patients (Morphine: GA (50 $\mu g.ml^{-1}$) GB (100 $\mu g.ml^{-1}$)). Isoflurane, remifentanil and cisatracurium were used for maintenance of anaesthesia. Children received paracetamol $15 mg \cdot kg^{-1}$ at the end of surgery. Postoperative pain was assessed at regular intervals during the first 24 hours using CHEOPS score. Analgesia was supplemented whenever pain score was ≥ 7 (nalbuphine $0.2 mg \cdot kg^{-1}$). The time to first requirement, the total doses of analgesic given and morphine adverse effects were noted. Chi-square and Students t-test were used in statistical analysis; $p < 0.05$ was considered significant.

Results and Discussion: Forty seven children were included. Three patients in GB developed postoperative respiratory depression requiring naloxone administration and were excluded of the study. Data of 44 patients were analyzed (GA = 20; GB = 24). There were no differences between groups concerning demographic characteristics, kind and duration of surgery. Mean CHEOPS scores, time to first requirement and total doses of analgesic given were similar in the two groups. Patients of GB were more sedated (Ramsay scores > 2) on recovery ($p = 0.03$) and at the first postoperative hour ($p = 0.04$). The incidence of nausea-vomiting, pruritus and urinary retention was similar in the two groups.

Conclusion(s): Intrathecal morphine 5 µg·kg $^{-1}$ compared to 10 µg·kg $^{-1}$ provided equivalent postoperative analgesia with less severe respiratory depression and sedation in thoracic and sus-mesocolic surgery in children.

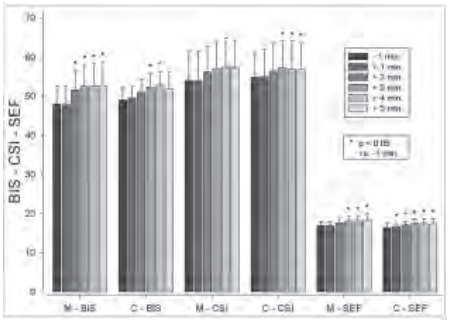
10AP2-5

The effect of a muscle relaxant bolus on Bispectral Index, Cerebral State Index and Spectral Edge Frequency in children under propofol-anaesthesia

F. Weber, N. Kriek, H. Blusse

Anesthesiology, Sophia Children's Hospital, Erasmus University Medical Center, Rotterdam, Netherlands

Background and Goal of Study: In adults anaesthetized with propofol, muscle relaxant may decrease the Bispectral Index (BIS). The aim of this prospective randomized trial was to detect the influence of a muscle relaxant bolus on BIS, Cerebral State Index (CSI) and Spectral Edge Frequency (SEF) in children under propofol anaesthesia.
Materials and Methods: After obtaining approval from the institutional ethics committee and written informed parental consent, fourty paediatric patients, age 6.6 ± 3.3 years, weight 24 ± 9 kg, scheduled for surgical procedures requiring general anaesthesia were enrolled. Two minutes after i.v. injection of 0.3 mcg kg $^{-1}$ of sufentanil general anaesthesia was induced by an initial bolus of 3 mg kg $^{-1}$ of propofol, followed by a continuous infusion of initially 10 mg kg $^{-1}$ h $^{-1}$. Immediately after loss of consciousness BIS and CSI monitoring was started. The propofol infusion rate was titrated to achieve a stable BIS value of 50 ± 5 for at least 60 seconds and remained further unchanged until the end of the study period. Patients were prospectively randomized to receive either mivacurium 0.25 mg kg $^{-1}$ (group M) or NaCl 0.9% 0.12 ml kg $^{-1}$(group C.) BIS, CSI and SEF (recorded via the BIS-monitor) per minute were recorded from 1 min. before study drug administration until 5 min. thereafter. Mean BIS, CSI and SEF values per min. were compared between (M vs. C, T-test) and within groups (– 1 – 5 min., Friedman test).
Results and Discussion: A marginal, clinically insignificant rise of BIS, CSI and SEF values over time (see figure), irrespective of the administered study medication was found. Intergroup comparison of the EEG parameters at each time point revealed no differences, except for SEF 5 min. after study drug administration (p = 0.019).



Conclusion(s): These data suggest that in paediatric patients anaesthetized with propofol, administration of mivacurium does not lead to clinically relevant alterations of BIS-, CSI- and SEF- levels.

10AP2-6

Relative analgesic potencies of levobupivacaine and different doses of clonidine for caudal anesthesia in children

N. Disma, L. Mameli, M. Dufour, G. Montobbio, P. Tuo

Anesthesia and Intensive Care, Gaslini Children's Hospital, Genoa, Italy

Background and Goal of Study: Clonidina is a non-opioid adjuvant able to prolong the analgesia provided by the local anesthetics. The intraoperative synergism between local anesthetics and clonidine has not been previously studied. We performed a study to determine and compare the minimum local analgesic concentration (MLAC) of caudal levobupivacaine and different doses of clonidine in children. Moreover, the ED50 and ED 95 of levobupivacaine and different doses of clonidine have been compared over the dose response curves.
Materials and Methods: We performed a prospective, randomized, double-blinded study to determine the dose response curves of caudal levobupivacaine and clonidine. Ninety children, aged between one and six years, undergoing inguinal hernia and cryptorchidism repair under sevoflurane anesthesia were randomised to receive levobupivacaine and 1 (group LC1), 2 (group LC2) or 3 (group LC3) mcg kg $^{-1}$ of clonidine. General anesthesia for all patients was maintained with inhalational sevoflurane at a fixed dose of 2% (1 MAC). The caudal anaesthetic ED 50 doses (MLACs) were determined by the up-and-down sequential allocation method of Dixon and Massey. The ED 50 and ED 95 have been determined and compared within the three groups, to determine the degree of intraoperative synergism.
Results and Discussion: A significant difference in ED50 and ED95 values were found between the three groups. The ED50 of levobupivacaine estimated by the *Probit* regression was 0.11% with 1 mcg kg $^{-1}$ of clonidine, 0.082% with 2 mcg kg $^{-1}$ of clonidine, and 0.033% with 3 mcg kg $^{-1}$ of clonidine. Similarly, the estimated ED95 of levobupivacaine were 0.131%, 0.108% and 0.078% with 1, 2 and 3 mcg kg $^{-1}$ of clonidine respectively. The postoperative analgesia evaluated through the survival curves demonstrated a longer duration with 2 and 3 mcg kg $^{-1}$ if compared with 1 mcg kg $^{-1}$ of clonidine. The wake-up time was longer in group LC3 and the incidence of postoperative agitation was statistically higher for patients in group LC1.
Conclusion(s): There was a significant difference in ED50 and ED95 for caudal levobupivacaine and 1, 2 and 3 mcg kg $^{-1}$ of clonidine. The addiction of 1, 2 and 3 mcg kg $^{-1}$ of clonidine increase the relative potencies of 30%. This demonstrated synergism of clonidine and levobupivacaine. Moreover, the addiction of clonidine is able to reduce the total dose of levobupivacaine, with the same intra and postoperative efficacy. The suggested dose of clonidine is 2 mcg kg $^{-1}$.

10AP2-7

Does mode of delivery influence the pain response of infants at their first vaccination?

F. De Buck, K. Allegaert, J. Deprest, M. Van de Velde

Department of Anaesthesia, UZ Leuven, Leuven, Belgium

Background and Goal of Study: Early pain experiences influence the development of later pain behaviour in neonates (1). Term neonates born vaginally experience more stress than those born through a caesarian section (2). Does this difference in perinatal stress influence the pain response of infants on the injection of their first vaccines at two months of age?
Materials and Methods: 61 infants (40 vaginal births, 21 elective caesarian sections, all term) were videotaped during their first vaccination at the age of 2 months. Mothers rated the pain of their infant on a VAS scale from 0 to 10. Two blinded researchers (FDB, KA) quantified pain behavior on a modified behavioral pain score (facial expression, cry, movements)(3). Heart rate of the infants was recorded at baseline and after the injection, HR change is calculated as a% of baseline. At birth, cortisol levels were measured in arterial cord blood for quantification of perinatal stress. Results are statistically compared using one-way ANOVA, $p < 0.05$ is considered significant.
Results and Discussion: Cortisol levels were significantly higher for vaginal births, showing a greater stress response than for caesarian sections. No statistically significant differences were seen in MBPS or heart rate changes. Reported VAS scores from the mothers were significantly higher after a caesarian section.

Results

	Vaginal birth	Caesarian section	p-value
Cortisol (µg/dL)	10.68 [0.77]	7.69 [1.07]	0.0277 *
MBPS	7.76 [0.16]	7.95 [0.23]	0.4992
VAS	5.82 [0.33]	7 [0.44]	0.0358 *
HR change (%)	29.07 [2.78]	27.77 [3.88]	0.7876

Results are presented as mean [SD]

Conclusion(s): Although we could document the higher neonatal stress levels in vaginal birth by measuring the cortisol levels in arterial cord blood, our objective pain measurements (MBPS, HR change) did not demonstrate a statistically significant difference. Only the more subjective VAS score from the mothers was significantly different, with mothers rating the pain of their infants during vaccination higher after a caesarian section. Whether this is due to the difference in perinatal stress for the children or due to maternal factors, is not yet known.
References:

1 Taddio A, Katz J, Ilersich AL, et al. Lancet 1997;349:599–603.
2 Zanardo V, Soldà G, Trevisanuto D. Int J Gynaecol Obstet 2006;95:52–53.
3 Taddio A, Nulman I, Koren BS, et al. J Pain Symptom Manage 1995;10:456–463.

10AP3-1

Ischemia-reperfusion injury after tourniquet release in children: Comparison between inhalational and regional anesthesia

I. Budic, D. Pavlovic, T. Cvetkovic, D. Novakovic, V. Marjanovic

Anesthesiology Department, Clinic for Pediatric Surgery and Orthopedics, Nis, Serbia

Background and Goal of Study: Tourniquets used in extremity surgery provide a relatively bloodless field but may cause an ischemia-reperfusion injury. The aim of the study was to investigate the effects of inhalational and regional anesthesia on oxidative stress during extremity surgery at children's age.
Materials and Methods: After obtaining the ethical committee approval and written informed consent from the parents we studied sixteen patients ASA I or II, 9 to 17 years of age, undergoing orthopedic procedures that required bloodless limb surgery. Children were randomized to sevoflurane (n = 8) or peripheral nerve block (n = 8) group. All patients were premedicated with midazolam. In the sevoflurane group general anesthesia was induced with thiopental (5 mg/kg) with alfentanyl (10 mcg/kg) and maintained with inhalation of sevoflurane (3–4 vol%) and mixture 60% N20 in oxygen. In the regional anesthesia group, patients received peripheral nerve blocks using bupivacaine 0.25% (volume adjusted according to patient's weight). Peripheral nerves were identified using peripheral nerve stimulator. Venous blood samples were obtained from the contralateral extremity at four time points: before peripheral nerve block and induction of general anesthesia (baseline), 1 min before tourniquet release (BTR), 5 and 20 min after tourniquet release (ATR). Postischemic reperfusion injury was estimated by measurement of plasma and erythrocytes malondialdehyde (MDA) levels as well as plasma catalase activity.
Results and Discussion: Plasma MDA level was increased significantly in the sevoflurane group at 20 min after tourniquet release compared with peripheral nerve block group (6.79 ± 0.33 vs 3.23 ± 0.91, $p < 0.001$). Also, significant difference was noted within the sevoflurane group regarding different time points. Plasma MDA level was increased significantly ($p < 0.001$) at 20 min after tourniquet release compared to the baseline (6.79 ± 0.33 vs 3.49 ± 1.38), 1 min BTR (6.79 ± 0.33 vs 3.09 ± 1.41) and 5 min ATR (6.79 ± 0.33 vs 3.79 ± 1.46). In the inhalational group, erythrocyte concentration of MDA was increased at 5 min ATR compared to the baseline (5.89 ± 0.88 vs 5.12 ± 1.53, $p < 0.05$). Plasma catalase activity, although not statistically significant, was slightly increased compared to baseline in both groups.
Conclusion(s): These data show that peripheral nerve blocks attenuate oxidative stress, decrease concentrations of MDA and improve catalase activity.
Reference:
Turan R et al. European Journal of Anaesthesiology 2007;24:185–189.

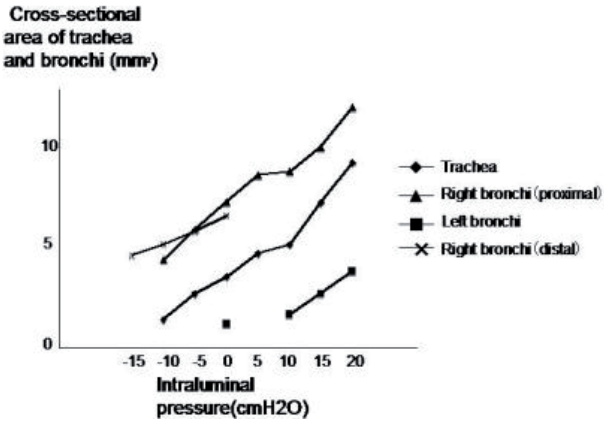
10AP3-2

Total intravenous anesthesia for infants with tracheobronchomalacia undergoing diagnostic fiberoptic bronchoscopy

Y. Miyahara, K. Suzuki, H. Takeuchi, S. Kokubo

Department of Anesthesiology, Seirei Hamamatsu Hospital, Hamamatsu, Japan

Background and Goal of Study: Tracheobronchomalacia requires quick and accurate diagnosis to initiate appropriate treatment. In our hospital, anesthesiologists are called on to assess tracheal and bronchial collapsibility quantitatively in infants with suspected tracheobronchomalacia by fiberoptic bronchoscopy. The purpose of this study is to discribe our experience of fiberoptic bronchoscopy in infants with suspected tracheobronchomalacia using total intravenous anesthesia (TIVA) infused with propofol and remifentanil.
Materials and Methods: Fiberoptic bronchoscopy was performed on eight infants with suspected tracheobronchomalacia (aged from 1 month to 1 year, and weighing between 3.4 kg and 7.7 kg) in the operating room. Anesthesia was induced with intravenous ketamine, propofol, remifentanil and vecuronium. Before muscle relaxation was achieved, we observed the upper airway during spontaneous breathing. Following endotracheal intubation, we assessed tracheal and bronchial collapsibility visually. To assess quantitatively, static intraluminal pressure and the cross-sectional area of trachea (bronchi) were obtained.
Results and Discussion: Static intraluminal pressure and the cross-sectional area of trachea were fitted on a linear regression model, followed by calculation of the estimated closing pressure. Treatment was decided using this data. Of the 8 patients, 6 were diagnosed with tracheobronchomalacia by this method. Significant complications were not reported in any of our patients. To asses tracheal and bronchial collapsibility required much non-breathing time, so we chose not to use inhaled anesthetics as the depth of anesthesia might be unstable. Inhaled anesthetics have been reported to decrease tracheal smooth muscle tone, which may lead to overestimation of tracheal and bronchial collapsibility. On the other hand, TIVA keeps a stable depth of anesthesia, reduces airway secretion and allows for easy administration of the appropriate inspired oxygen fraction.
Conclusion(s): We believe that TIVA is safe and adequate for diagnostic fiberoptic bronchoscopy in infants with tracheobronchomalacia.



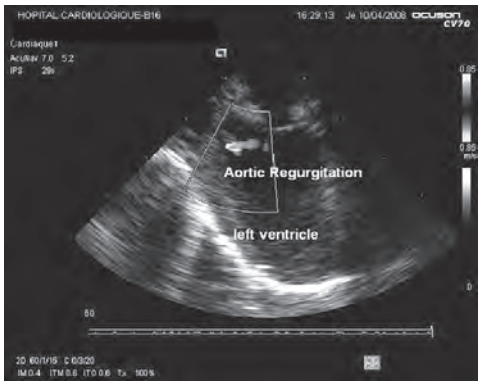
10AP3-3

Miniaturized transoesophageal echocardiography in neonates undergoing cardiac surgery

V. Collange, G. Keller, R. Hénaine, C. Védrinne, M. Cannesson

Department of Anesthesiology, Hospices Civils de Lyon – Louis Pradel Hospital, Lyon, France

Background and Goal of Study: During neonatal cardiac surgery transesophageal echocardiography (TEE) is rarely used because probe manipulation can induce hemodynamic compromise. In this study, we describe our experience with the intraoperative use of a miniaturized transducer in neonates weighting less than 3.5 Kg and undergoing cardiac surgery.
Materials and Methods: We studied all neonates weighting less than 3.5 Kg referred for cardiac surgery. We used a phased-array intracardiac echocardiographic catheter (AcuNav, Acuson-Siemens Corp., Mountain View, CA, USA). After lubrification, the catheter was carefully inserted (naso-esophageal introduction). The transducer has a 64-element phased-array oriented in a longitudinal plan with multiple frequencies from 5.5 to 10 MHz with maximal tissue penetration of 12 cm and was connected to a commercially available echocardiograph (CV 70, Acuson-Siemens Corp., Mountain View, CA, USA). Data obtained with this transducer were compared with conventional transthoracic echocardiographic images obtained in the post-operative period.
Results and Discussion: Twenty six neonates (from aortic coarctation to HLHS) were studied. Mean age was 10 ± 15 days. Insertion of the transducer was easy and lasted less than 10 seconds neonates. Two-dimensional images of the left atrium, right atrium, left ventricle, right ventricle, mitral valve, aortic valve, pulmonary valve, tricuspid valve and aorta were recorded for each patient when that structure existed. Visual estimation of left and right ventricular systolic function was assessable in all patients. Pulsed Doppler of mitral and pulmonary venous flows, as well as the atrial septum with residual defect or patent foramen ovale were obtained for each patient. In four cases, intraoperative examination revealed residual ventricular septal defect, in three cases it revealed a mitral valve insufficiency and in two cases it revealed an aortic valve insufficiency. This data were confirmed by postoperative transthoracic echocardiography.



Conclusion(s): These data show that this miniaturized transducer can be used easily in neonates undergoing cardiac surgery. A wide range of both functional and anatomic informations can be assessed with color and pulsed Doppler.

10AP3-4

Biventricular pacing after pediatric cardiac surgery: Impact on hemodynamics and ventricular dyssynchrony

Z. Vichova, R. Hénaine, F. Wautot, J. Lehot, M. Cannesson

Department of Anesthesiology, Hospices Civils de Lyon – Louis Pradel Hospital, Lyon, France

Background and Goal of Study: Biventricular (BiV) pacing has been shown to improve cardiac output (CO) in adults. We thought to evaluate the effects of BiV and left ventricular (LV) pacing compared with conventional right atrio-ventricular (RV) pacing in the early postoperative period after pediatric heart surgery. We hypothesized that (1) RV pacing decreases CO compared with atrial (RA) pacing; (2) BiV and LV pacing improve CO compared with RV; (3) The changes in CO are related to changes in LV dyssynchrony induced by cardiac pacing.
Materials and Methods: We enrolled children ≤ 2 yrs of age. Temporary epicardial pacing leads were placed before cardiopulmonary bypass weaning (LV and RV free walls and RA). Each patient underwent four methods of pacing (RA, RV, BiV, LV) performed in a random order, at a rate 10 beats/minute faster than their intrinsic rythm. Haemodynamic data were recorded for intrinsic rythm and for each pacing mode. LV dyssynchrony was assessed by Tissue Doppler imaging as the difference in time-to-peak velocities of the basal septal and basal lateral walls. CO was estimated using the mean systolic aortic velocity (MSAV) mesured with pulsed Doppler in the LV outflow tract.
Results and Discussion: We enrolled 12 patients (median age 62 days, [7–242]; weight 5493 ± 2420 g). RV pacing induced a significant decrease in CO compared with RA pacing. This decrease was associated to a significant increase in LV dyssynchrony. During BiV pacing we observed a significant increase in CO and a significant reduction in LV dyssynchrony compared with RV pacing. LV pacing reduced LV dyssynchrony compared with RV pacing and slightly improved CO.

Hemodynamic changes induces by changes in pacing modality.

	IR	RA	RV	BiV	LV
QRS (ms)	54 ± 7	54 ± 8	89 ± 10*¥	62 ± 7†	62 ± 10¤
MAP (mm Hg)	58 ± 10	57 ± 9	57 ± 8	59 ± 10†	59 ± 10
MSAV (m/s)	0.56 ± 0.21	0.54 ± 0.22	0.47 ± 0.19*¥	0.54 ± 0.20†	0.52 ± 0.23

IR: intrinsic rythm, RA: right atrium, RV: right ventricular, BiV: biventricular, LV: left ventricular, MAP: mean arterial pressure, TVI: aortic velocity time integral, MSAV: mean systolic aortic velocity, $p < 0.05$ compared to RA (*), compared to IR (¥), compared to RV (†), compared to RV (¤)

Conclusion(s): Our study suggests that in children requiring pacing in the postoperative period after repair of congenital heart disease, BiV pacing improved CO compared to RA-RV pacing. This improvement in CO is related to resynchronisation of the LV contraction.

10AP3-5

Intraabdominal pressure after pediatric cardiothoracic surgery

J. Krastins, Z. Straume, J. Auzins

Intensive Care, University Children's Hospital, Riga, Latvia

Background and Goal of Study: Intraabdominal pressure (IAP) now is widely recognized as an important variable and its monitoring is used in a variety of critically ill patients. Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) have been increasingly recognized in the critically ill as causes of significant morbidity and mortality. Physical exam is inaccurate in predicting IAP, sensitivity 40–61%, positive predictive value 45–76%. IAP measurements are essential to the diagnosis of elevated IAP and the management of IAH. The aim of this study was to measure IAP in children after surgical correction of congenital heart disease and to establish relationship between IAP and other variables: Pressures during mechanical ventilation, pressure in the inferior v.cava and amount of fluids removed from the abdomen.
Materials and Methods: We conducted prospective, non randomized observational study in pediatric intensive care unit at a University Children's hospital. Study protocol was approved by Hospital's Ethics commision. Measurements of IAP were performed in 15 children, median body weight 8 ± 5,83 kg, (Range 3,1–28 kg), median age of 10 months (range 8 days–8 years) after cardiothoracic surgery. Cardiopulmonary bypass was used in 12 patients. IAP was measured during first 24 hours postoperatively at 12 hour intervals via indwelling urinary catheter with bladder volumes of 1 mL/kg of normal saline. Of the 15 patients, 12 were mechanically ventilated at the time of the IAP measurements. Ventilation pressures (Pmax, Pmean, PEEP) and central venous pressure via femoral vein were recorded. In some patients (6 from 15) amount of fluid removed via intraperitoneal drain.from the abdomen in first 24 hours was recorded
Results and Discussion: IAP was 12,24 ± 3,54 mm Hg (Range 5,44–20,4 mm Hg), CVP 13 ± 2,19, PIP 20 ± 2,48 cm H_2O, MAP 9 ± 2,3 cm H_2O, PEEP 5 ± 1,35 cm H_2O. Amount of fluid removed from peritoneal cavity during first 24 hours was 0,8 ± 0,54 ml/kg/h (Range 0,04–1,7 ml/kg/h).
Conclusion(s): We find elevated intraabdominal pressure (IAP > 12 mm Hg) in 10 from 15 (66,67%) pediatric patients in the first 24 hrs after cardiothoracic surgery. There was a difference in IAP in patients with abdominal drain vs pts w/o drain. We did not find any correlation between IAP, MAP and IVC pressures. We, however, did not observe development of abdominal compartment syndrome.
Reference:
M.N.L.G. Malbrain et al. Intensive Care Med (2006) 32:1722–1732.

10AP3-6

Usefulness of ultrasonographic screening to detect anatomical vessels variations in pediatric patients

S. Grousson, E. Souza Neto, F. Tahon, C. Mottolese, F. Dailler

Neurological Hospital, Hospices Civils de Lyon, Lyon, France

Background and Goal of Study: The use of ultrasound (US) guidance for central venous access is mandatory in several situations as hypovolemia, cannulation failure, obesity and infant. Anatomical cervical vessels variations as frequents as 20% could elucidate rate of catheterization failures or complications of the landmark technique [1, 2]. The aim of this US evaluation was to highlight some anatomical position variations for the femoral vein (FV), the subclavian vein (SCV) and the internal jugular vein (IJV) in children.
Materials and Methods: 102 children were prospectively enrolled on a 7 months study period. US measurements using Siemens Acuson X300 and 13–5 MHz linear probes were performed on anesthezied, intubated and mechanically ventilated children in a neutral position (without Trendelemburg and without volume expansion). Age, weight, height and body surface area (BSA) and duration to identify deep vessels for both sides were collected by 2 senior anesthesiologists. Post hoc US data analyze was registred by an independent radiologist. Was considered as anatomical variation each location different from medial or posteromedial for the FV, anteromedial for the SCV and anterolateral for the IJV. Non inclusion criteria were ventriculoatrial shunt, prior local surgery, deep venous thrombosis and anterior cannulation.
Results and Discussion: Expressed as median ± median absolute deviation, age, weight, size and BSA of the patients were 45.5 ± 42.5 months, 15 ± 9.2 kg, 97.5 ± 34 cm and 0.64 ± 0.29 m2 respectively. Time taken to characterize all of these vessels was 13 ± 4 mn (total amount of 597 US measures). Venous anatomical variations [table 1] can be described as follows : for the femoral location, 11 anteromedial, 2 posterolateral, 2 posterior, and 1 lateral; for the subclavian location, 7 posteromedial, 6 medial, 3 anterolateral and 1 anterior; and for the internal jugular location, 8 anterior, 7 posterolateral and 3 lateral.
Conclusion(s): US location of the FV, the SCV and the IJV in children is easy to perform without extending the surgical procedure. The large percentages of anatomical variations obtained for all of these locations would support in the future the systematic use of US guidance to facilitate central venous cannulation in pediatrics.
References:
1 Mortensen JD et al. Anatomical Record 1990.
2 Alderson PJ et al. Br J Anaesth 1993.

10AP3-7

Neonatal CDH: Respiratory indexes in choosing surgical timing

A. Gentili, S. Blandino, M. Bacchi, M. Latrofa, S. Baroncini

Paediatric Anaesthesia and Intensive Care, S. Orsola-Malpighi University Hospital, Bologna, Italy

Background and Goal of Study: Congenital diaphragmatic hernia (CDH) has still a high mortality (30–60%) despite advanced respiratory assistance techniques. Reaching clinical stability represents a further progress to improve the prognosis of this pathology (1). The aim of the study is to verify the reliability of some respiratory indexes, such as oxygenation index (OI), alveolar-arterial O2 difference (A-aDO2) and arterial-alveolar O2 tension ratio (a/AO2), in order to define the parameters of pre-surgical stabilization, and to guide the treatment towards it.
Materials and Methods: Our experience is based upon 51 neonates (32 [male], 19 [female], mean gestational age 37 + 2.1, mean weight 2874 + 530 gr) affected by CDH and treated from 2000 today. The indexes have been evaluated at six times, the same for each patient (ICU admission, 6, 12, 24 hours after admission, before surgery, after surgery). Data have been analyzed globally and

then the two subgroups (survivors vs non-survivors) were compared. Statistical analysis was performed using Fisher exact test and Mann-Whitney test; the null hypothesis was rejected when $p < 0.05$.

Results and Discussion: Among 51 patients, 38 (66%) survived and 13 (34%) died. The trend of respiratory indexes shows a statistically significative difference between survivors and non-survivors, with $p = 0.003$ for OI, $p = 0.017$ for A-aDO2, and $p = 0.017$ for a/AO2. All the indexes were out of range at ICU admission, thus confirming the severity of neonatal respiratory pattern. Their progressive normalization (<5 for OI, <250 mm Hg for A-aDO2 and >0,70 for a/AO2) represented the definition of pre-surgical stabilization, thus allowing CDH surgical correction; we also obtained a good correlation with our patients' survival.

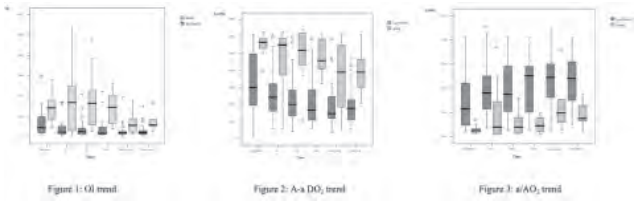


Figure 1: OI trend Figure 2: A-a DO_2 trend Figure 3: a/AO_2 trend

Conclusion(s): The respiratory indexes that we analyzed can be considered as valid references in the assessment of many pathologies characterized by severe respiratory failure (ALI/ARDS) in children and in adults. Less informations are available about their systematic use in CDH. Our study data seem to validate these indexes also for the treatment of neonates with CDH, showing a good reliability in identifying the pre-surgical stabilization.

Reference:

1 Schultz C et al. J Pediatr Surg 2007;42:510–6.

10AP3-8

Ability of the respiratory variations in the arterial pulse pressure and in the plethysmographic waveform amplitude to predict fluid responsiveness in mechanically ventilated children

E. Souza Neto, C. Ducreux, H. Joly, C. Mottolese, M. Cannesson

Groupement Hospitalier Est, Hospices Civils de Lyon, Bron, France

Background and Goal of Study: Dynamic parameters relying on the respiratory variations in the arterial pulse pressure (ΔPP) and in the plethysmographic waveform amplitude (ΔPOP) have been shown to be accurate predictors of fluid responsiveness in adults under genral anaesthesia and mechanical ventilation [1]. However, these indices have not been studied in children undergoing surgery under general anaesthesia. Our goal was to study the ability of ΔPP and ΔPOP to predict fluid responsiveness in mechanically ventilated children under general anesthesia.

Materials and Methods: Twenty mechanically ventilated children (age: 4 ± 3 years; weight: 17 ± 7 kg; height: 98 ± 16 cm) were studied immediately after induction of general anesthesia. The anaesthetic management of all patients followed a standard procedure. Mechanical ventilation was maintained using 50% oxygen with a tidal volume of 10mL/kg of body weight. Hemodynamic data (systolic, diastolic and mean arterial pressure (MAP), heart rate (HR)), ΔPP, ΔPOP, and aortic velocity – time integral (VTIao) were recorded before and after a volume expansion (20ml/kg of normal saline over 15 minutes). Patient was considered as responder to volume expansion when VTIao increased more than 15% after volume expansion (VE). Nonparametric Wilcoxon matched pairs test was performed to compare the changes in data following volume expansion. A p value < 0.05 was considered as statistically significant. All data are expressed as median ± median absolute deviation.

Results and Discussion: VE induced changes in ΔPP (14 ± 4 to 8 ± 2; $p < 0.05$) and in ΔPOP (13 ± 4 to 7 ± 2; $p < 0.05$) in all patients but there was no difference in MAP (54 ± 5 to 57 ± 6 mm Hg). Volume expansion induced increased in VTIao of more than 15% in 8 patients (from 12 ± 1 to 19 ± 2; $p < 0.05$). There were no difference in ΔPP and ΔPOP between responders and non-responders (Table 1).

Hemodynamic data at baseline in responders and non-responders to volume expansion.

	Responders (n = 8)	Non - Responders (n = 12)	p value
MAP (mm Hg)	56 ± 5	54 ± 5	0.24
HR (bpm)	91 ± 15	86 ± 7	0.93
ΔPP	16 ± 3	12 ± 4	0.33
ΔPOP	16 ± 7	11 ± 4	0.39

Data are median ± median absolute deviation

Conclusion(s): In our experience, both ΔPOP and ΔPP where sensitive to changes in cardiac output induced by VE. However, in this study, we were not able to show that neither ΔPOP nor ΔPP were acurate predictors of fluid responsiveness. This may be related to the small sample size of our study.

Reference:

Cannesson et al., Anesthesiology. 2007.

Obstetric Anaesthesia

11AP1-1

Evaluation of oral pregabalin as an adjuvant to epidural analgesia during late termination of pregancy

S. Lessire, F. Roelants, P. Lavand'homme

Anesthesiology Department, St Luc Hospital UCL Medical School, Brussels, Belgium

Background and Goal of Study: Late termination of pregnancy (LTOP) represents a challenge (Benhamou 2007). Pain experienced by the parturients is severe and can remain difficult to relieve despite the use of epidural analgesia. Perioperative pregabalin (PGB) shows analgesic and anxiolytic properties. Further, a study previously demonstrated potentiation of postoperative epidural analgesia by gabapentin, PGB analog (Turan et al. 2006). The present study assessed the benefit of adding oral PGB to labor epidural analgesia in patients undergoing LTOP (medical abortion for severe congenital anomalies or intrauterine death, gestational age ≥24 weeks).

Materials and Methods: Healthy women undergoing LTOP under epidural analgesia were included. Before induction of the standardized procedure, an epidural catheter was placed at L3–L4 level followed by a test dose. The women were randomly allocated to receive either oral PGB 150 mg/12h or oral prazepam 10 mg/12h from LTOP induction until delivery. When the women felt abdominal pain and requested the activation of epidural analgesia, they were connected to a PCEA device delivering ropivacaine 0.1% with sufentanil 0.25 µg/mL, set as continuous infusion of 5 mL/h with bolus dose of 5 mL/30 min. Rescue analgesia was available as needed by administration of 10 mL bolus of ropivacaine 0.1% (VAS <60/100) or 0.2% (VAS ≥60/100). Duration of LTOP procedure and epidural infusion, VAS score when activation of PCEA, number of PCEA boluses and rescue doses and hourly ropivacaine use during epidural analgesia were recorded. Statistical analysis used unpaired t-test, $P < 0.05$ was considered significant.

Results and Discussion: Demographic data were similar between both groups (age 32 ± 6 yrs, weight 65 ± 7 kg, nulliparas, fetus weigth 1490 ± 900 g, duration of LTOP procedure 17 ± 6 h and PCEA infusion 11 ± 6 h). Results are expressed as mean ± SD or median (IQR). No particular side effects were recorded except one case of blurred vision in PGB group.

	Prazepam (n = 12)	Pregabalin (n = 10)	P value
VAS at PCEA activation	46 ± 20	26 ± 16	0.02
PCEA bolus doses (n)	9 ± 5	6 ± 3	0.21
Rescue doses (n)	2 (1–3)	1 (0–1)	0.05
Ropivacaine use (mg/h)	14.5 ± 5	10.3 ± 3	0.04

Conclusion(s): The preliminary results demonstrate that oral PGB may be a helpful adjuvant to manage pain associated with LTOP, certainly in relation with analgesic and anxiolytic properties of the drug. As previously reported for gabapentin, PGB also potentiates epidural analgesia (Turan et al. 2006).

11AP1-2

Spatial distribution of labor pain

S. Stirparo, M. Camorcia, A. Farcomeni, G. Capogna

Dpt. Anesthesia, Città di Roma Hospital, Roma, Italy

Background and Goal of Study: Localization of labor pain has been traditionally reported by authoritative but anecdotal reports[1,2]. Our study is a systematic evaluation of the distribution of labor pain during the first stage.

Materials and Methods: After informed consent we interviewed 250 parturients in active labor, divided according to parity (nulliparous and multiparous women) and progression of labor (less or more than 5 cm cervical dilation). We evaluated the spatial distribution of pain by using a dermatome chart, and

whether pain was distributed throughout the dermatome area or a part of it. We also assessed the intensity of pain by the visual analogue pain scale. Statistical analysis was performed by using the Chi square test.

Results and Discussion: The spatial distribution of pain did not change with labor progression or parity but its intensity increased as labor progressed ($P < 0.001$). In the Table the percentage of parturients experiencing pain in each dermatome is shown. Only the most frequently (more or equal to 2%) chosen dermatomes are reported. Pain was perceived in the middle of the dermatome in 57% and throughout the dermatome in 43% of cases.

Dermatomes	Anterior	Posterior
T9	6	0.8
T10	12	2.5
T11	34	7
T12	71	31
S2	60	1
L1	23	73
L2	2	28

Conclusion(s): Pain localization did not change throughout the first stage of labor and it was mainly perceived in T12 and S2 dermatomes. In more than 50% of cases, pain did not follow the dermatomic area and matched that of the ilio-hypogastric nerve.

References:

1 Melzack R. et al. Can Med Assoc J 1984;130:579–584.
2 Bonica JJ Davis Pub Co, Philadelphia, 1967.

11AP1-3

Cervimetric curve in spontaneous and induced labor with epidural analgesia

S. Stirparo, M. Camorcia, A. Farcomeni, F. Ventrice, G. Capogna

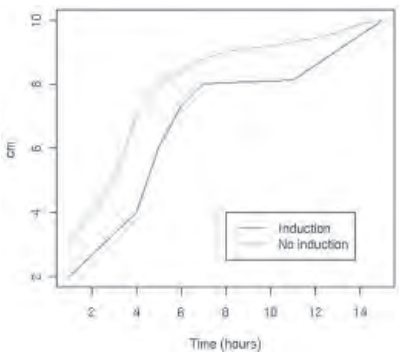
Dpt. Anesthesia, Città di Roma Hospital, Roma, Italy

Background and Goal of Study: The pattern of labor progression in contemporary practice differs significantly from the standard Friedman curve[1,2]. The aim of this prospective study was to examine the pattern of labor progression in nulliparous women with spontaneous or electively induced labor under epidural analgesia.

Materials and Methods: After informed consent, we assessed the cervimetric curve of 251 low-risk, nulliparous women (24–35 yrs) at term with singleton, cephalic fetuses (2500–4000g). For continuous variables with a skewed distribution, median and the values at the 10th and 90th percentiles were calculated and the Wilcoxon rank sum test was performed. For categorical data, percentages were calculated and the Chi^2 test was used. Cervimetric curves were assessed by non parametric isotonic regression.

Results and Discussion: 104 parturients were induced by prostaglandins and/or oxytocin, and 147 were in spontaneous labor. Results are presented in the Table (CD = cervical dilation). Cervimetric curve is reported in the Figure. Induced labors were associated with a longer I stage duration, slower cervical dilatation rate, increased c-section rate and earlier epidural request compared with spontaneous labors.

	Spontaneous	Induced	P
I stage duration (h)	6 (6–7)	7 (6–8)	0.02
II stage duration (min)	55 (30–95)	64 (20–90)	NS
CD (cm/h)	0.91 (0.8–0.9)	0.82 (0.7–0.8)	0.0011
Vacuum (%)	21.1	12.5	NS
C-S for dystocia (%)	22	38	0.006
CD at epidural request	4 (2–6)	3 (2–5)	0.0001



Conclusion(s): The pattern of labor progression under epidural analgesia in women with induced labor differs substantially from those with spontaneous labor.

References:

1 Friedman EA. Obstet Gynecol 1955;6:567–89.
2 Zhang J et al. Am J Obstet Gynecol 2002;187:824–28.

11AP1-4

In early labour, IVPCA remifentanil bolus during the contraction pause does not improve the analgesic effect but reduces sedation compared with bolus given during the uterine contraction

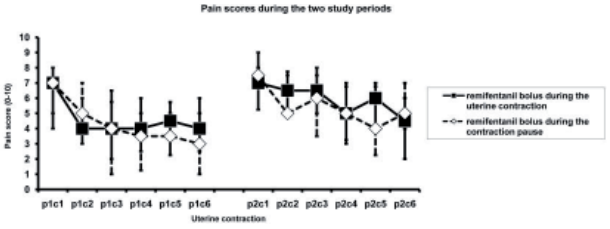
P. Volmanen, E. Akural, S. Alahuhta

Anaesthesiology, Oulu University, Oulu, Finland

Background and Goal of Study: We investigated whether a remifentanil bolus delayed until the contraction pause would give better analgesia than bolus given during the uterine contraction, in early labour.

Materials and Methods: After permission by the local Ethical committee, 50 ASA1-2 parturients with uncomplicated singleton pregnancies and more than 4 min contraction interval, with written informed consent, participated in the double blind, cross-over study. PCA doses of intravenous remifentanil 0.4 mg kg^{-1} with 60 sec infusion and lock-out times were used during two study periods of 6–8 contractions. Syringes containing remifentanil or saline–according to a randomization list–were attached to 2 PCA devices one of which started the bolus immediately after the trigger and the other after a delay calculated as the mean of 3 contraction intervals before each study period – 140 sec. The parturients assessed the intensity of contraction pain (Numeral Rating Scale) after every contraction. Pain relief, sedation and nausea scores were recorded after every second contraction. Need for O_2 supplement was defined as $SaO_2 < 95\%$. Mann-Whitney U- and Prescott's tests were used for statistical analyses.

Results and Discussion: The study was completed by 45 during stage 1 of labour. The results are presented in the figure and the table.



Variables during contraction cycles 4–6

	Bolus during contraction	Bolus between contractions	P-value
Pain score (0–10) period 1	4 (3–5)	3 (2–5.2)	0.26
Pain score (0–10) period 2	5.3 (3.6–6.0)	4.7 (3.3–6.3)	0.84
Pain relief score (0–4) period 1	3 (2.5–3.5)	3.3 (2.9–3.6)	0.42
Pain relief score (0–4) period 2	3 (1.8–3.5)	3 (2.5–3.5)	0.74
Sedation score (0–3)	2 (1–3)	1.7 (1–2.5)	0.03
Nausea or vomiting (%)	31	16	0.1
MAP (mm Hg)	96 (88–101)	96 (89–104)	0.94
p (beats/min)	81 (72–91)	80 (72–90)	0.36
Needed O_2 supplement (%)	23	23	> 0.9
SaO_2 (%)	97.6 (96.6–98.3)	97.8 (96.9–98.2)	0.53

Results expressed as median (25^{th}–75^{th} percentiles) or count (%)

Conclusion(s): Giving the IVPCA remifentanil bolus during the uterine contraction pause does not improve the pain relief but reduces the sedation slightly.

11AP1-5

Labour's chronopharmacology: Duration of analgesia effect in light phase and in dark phase

A. Puga, A. Maçarico, J. Costa Martins

Anaesthesiology, Maternidade Alfredo da Costa, Lisboa, Portugal

Background and Goal of Study: Chronopharmacology is related to biological time's interaction and drug administration. There is a temporal change of pain and it seems to have important clinical implications in labour's pain treatment. The aim of our retrospective study is to determine if the time when epidural analgesia is performed, time of the first administration of ropivacaíne (with daylight/in night time), influences the duration of labour's analgesia.

Materials and Methods: This is an observacional study of 252 pregnant women clinical records in the first stage of labour. Inclusion criteria were: ASA 1,2, nulliparous women, of singleton vertex pregnancy, who presented up to 4 cms of cervical dilatation, which were managed with epidural analgesia using ropivacaine, according to protocol of the institution, during the months of June, July and August. We divided these women in two main groups: the A group (*clear phase*–06h31m/20h29m), and B group (*dark phase*–20h30m/06h30m), according to the first epidural administration time of ropivacaíne. We evaluated the duration of the effect until the second administration, for each group. The data had been worked in Excel.
Results and Discussion: Our findings show for the A group a ropivacaine duration of action of 179,80 ± 8.694 minutes and for the B group 161,80 ± 9.849 minutes. That is a longer effect of ropivacaine's action when given in daytime (±18 minutes longer) rather than in night time. The intraday variation of analgesia duration among the 2 groups reached 14%. Of course, with this design, we have to be careful to drawn definite statistical conclusions since we could not control all variables (anesthetic technique, anesthetic zealous records, and obstetrical practice), but we believe that the biological rhythms are important and should be considered as well the time of injection in the practical anesthesiology.
Conclusion(s): The present study suggests a tendency: the hour at which occurs ropivacaíne administration (daytime/night time) may influence duration of the analgesia effect and this should be taken into account when enrolling parturients in comparative studies designed to assess or treat labour pain. Although this is just a tendency (as reported in several international studies), our findings should lead us to go for more definite prospective studies so we can evaluate its statistic significance.

11AP1-6

Epidural labour analgesia and the incidence of instrumental assisted deliveries in tertiary perinatology centre 2004–2008

K. Rimaitis, E. Tamulioniene, A. Morkunaite

Clinic of Anaesthesiology, Kaunas Medical University Hospital, Kaunas, Lithuania

Background and Goal of Study: There were conflicting data about the influence of epidural labour analgesia on instrumental assisted deliveries (IAD) rate in literature of last few decades. Moreover, the most of older studies showed results, that epidural analgesia during labour increases the incidence of IAD. Goal of our study was to determine if modern epidural labour analgesia has any influence on the number of IAD.
Materials and Methods: Our study was performed in maternal unit at tertiary medical centre. All the patients in whom instrumental assistance for delivery was applied from January 1, 2004, until November 24, 2008 were studied. All computer registry data and medical records were analyzed. Study patients were alocated into two groups: epidural analgesia group–who received epidural analgesia and had IAD, and control group–women in labour who did not receive epidural analgesia, but had IAD. Maternal demographic data, delivery characteristics, indications for the use of instrumental assistance, use of oxytocin and duration of delivery stages were studied. Neonatal outcomes of interest were birth weight and Apgar scores. Statistical analysis was performed using Student's T test, Mann-Whitney U test and χ^2 test where appropriate.
Results and Discussion: Total of 7675 vaginal deliveries occured in our hospital during study period and 184 (2,4%) women had IAD. EA was applied to 3093 (40,3%) parturients and 4582 (59,7%) received systemic opioid, inhalation analgesia or no analgesia. Instrumental assistance for delivery was applied to 65 (2,1%) women in labour who received EA and to119 (2,6%) who did not. Use of labour EA was not statistically significantly associated with increased number of IAD, relative risk RR = 0,81 (0,60 < RR < 1,09, χ^2 = 1,94, p = 0,16). Demographic data was similar in study groups and the most common obstetric indication for IAD was acute foetal hypoxia. Patients in EA group more often had their labour induced by oxytocin 80,3% as compared to 58,3% in control group (p = 0,003). The first stage of labour was longer in EA group–median 510min as compared to 390min in control group (p = 0,001). The second stage was also prolonged in EA group–median 60 min as compared to 40 min in control group (p < 0,0005). There were no differences in newborns weight and Apgar scores between study groups.
Conclusion(s): Modern labour epidural analgesia does not increase incidence of instrumental assisted delivery but is associated with prolonged first and second stage of labour. Epidural analgesia is used more often if labour is induced by oxytocin.

11AP1-7

What do our pregnants know about epidural analgesia?

E. Ramos Martinez, E. Morales Palma, B. Martinez Tasis, B. Fernandez Torres, M. De las Mulas Bejar

Anesthesiology, Virgen Macarena Hospital, Seville, Spain

Background and Goal of Study: The epidural is the most used analgesia technique nowadays for the pregnant population during the labor. Our experience in the daily practice shows us that in spite of its accepted application, it exist a great disorientation related to the same one among the pregnant women. The aim of this study is to investigate the degree of knowledge and the fear that exists about epidural analgesia.
Materials and Methods: We have realized a questionnaire of 23 questions of multiple answers on the pregnant population with beginning of childbirth in the area of Virgen Macarena Hospital. There have been excluded those that already carried catheter epidural. We have recopilated 185 completed questionnaires for three months in 2008.
Results and Discussion: 22.86% of the women were not from Spain. The major group of age was included between 31 and 40 years (42.80%). 43.80% has had previous pregnancy of which 76% has received epidural analgesia with good results in 94.28% of the cases. Around 13.33% does not know anything about this skill, and 50% of this group doesn't have lacks academic qualifications. More than 28% refer that they don't know anything about the procedure. And if they have any idea about it, in most of the cases they get the information for the matron or making use of internet. More than 10% don't know that anaesthesiologists are the responsible ones, and even think we aren't doctors (43.5%). Even when they have made used of it before (35.5%), 42.85%, is afraid because of the technology, but they would use it again 93.75%. It doesn't matter if they have all the useful information or they have used previously epidural analgesia, they don't know about adverse effects.
Conclusion(s): In spite of the fact that 73.33% of the polled ones affirms to know that the anaesthesiologist is the responsible of epidural analgesia, only half of them defines him as a doctor. Previous pregnancies with epidural analgesia help women to understand better about this skill and the anaesthesiologist role. Just the third part of the polled women thinks that they have received information enough about epidural and its possible complications. We think that the information received by our patients is not enough, and sometimes it isn't even true. It should be necessary to explain better our techniques and role related to epidural analgesia.

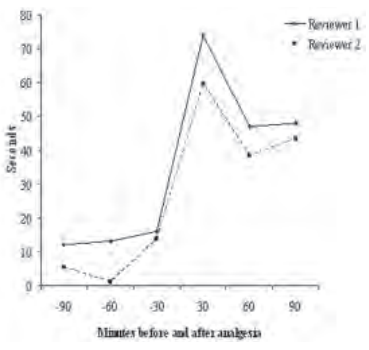
11AP1-8

Epidural analgesia with ropivacaine and sufentanil is associated with transient fetal heart rate changes

G. Sortino, A. Wolfler, F. Izzo, K. Gervasio, I. Salvo

Anesthesia and Intensive Care, Women and Children's Hospital V. Buzzi, Milan, MI, Italy

Background and Goal of Study: Fetal heart rate (FHR) changes have been reported after regional labor analgesia [1–2]. In this prospective single blinded study we aimed to assess whether epidural analgesia with ropivacaine and sufentanil is associated with significant fetal heart rate changes.
Materials and Methods: Fetal heart rate traces from 120 women in active labor requesting epidural analgesia were recorded and analysed by two reviewers 90 minutes before and after epidural analgesia for baseline fetal heart rate, accelerations, decelerations and long term variability.
Results and Discussion: The interval from initiation of epidural analgesia and delivery ranged from 10–500 minutes (mean 215). Forty eight women had oxytocin augmentation of labour because of a reduction in uterine contractions while no women had a uterine hyperactivity. Eighty three women delivered vaginally, 10 were delivered by cesarean section (none because of a non reassuring FHR pattern) and the remaining 7 had a vacuum delivery. A significantly decreased number of fetal heart rate accelerations (ANOVA $p = 0.0001$) and a higher percentages of segments with decelerations ($p < 0.05$) were founded in the three segments after analgesia in comparison with the three before. The minimum number of accelerations occurred during the 30 minutes immediately after starting analgesia. The reviewers were concordant in finding a significant change from the 60 minutes before to the 60 minutes after analgesia, during which period there were more traces with reduced variability ($p < 0.05$).



Conclusion(s): Epidural analgesia with ropivacaine and sufentanil is associated with fetal heart rate changes. These modifications are transient and should be considered when evaluating fetal heart rate monitoring during labor in order to prevent inappropriate obstetric management decision for operative labor.

References:

1 Hill JB, Alexander JM, Sharma SK, McIntire DD, Leveno KJ. A comparison of the effects of epidural meperidine analgesia during labor on fetal heart rate. *Obstetrics and Gynecology* 2003; 102: 333–337.

2 Capogna G. Effect of epidural analgesia on the fetal heart rate. *European Journal of Obstetrics and Gynecology and Reproductive Biology* 2001; 98:160–164.

11AP1-9

The effect of intrathecal different sufentanil doses on fetal heart rate during first stage of labor in normal pregnancies

G. Sortino, A. Wolfler, F. Izzo, K. Gervasio, I. Salvo

Department of Anesthesia and Intensive Care, Women and Children Hospital V. Buzzi, Milan, MI, Italy

Background and Goal of Study: Combination of local anesthetic and sufentanil is widely used for intrathecal analgesia in labor while data on the use of sufentanil only and its effect on fetal heart rate traces are limited (1). Aim of this study is to determine the effect of different doses of intrathecal sufentanyl on first stage of labor and to assess the effect on fetal heart rate.

Materials and Methods: After local ethics committee approval, 30 parturient ASA I/II with singleton and uncomplicated pregnancy who asked for labor analgesia were enrolled in the study. All parturient were in active labor with cervical dilation between 2 and 3 cm and received a combined spinal epidural analgesia. Women were randomized in one of four groups to receive either 3, 4, 5 or 6 mcg of intrathecal sufentanil. The opiate was diluted to 2 ml with saline solutions. Efficacy and duration of analgesia, side effects like pruritus, nausea and vomiting, hypotension were collected. Failure of analgesia was defined as a VAS score higher than 30 after 20 minutes from intrathecal injection. Fetal heart rates were recorded 30 minutes before and 60 minutes after intrathecal injection of the opiate and examined by a gynaecologist expert in fetal heart rate tracing blinded to the time of analgesia.

Results and Discussion: Demographic differences, labor characteristics and outcome of labor were similar among the four groups. The failure rate of analgesia was higher in the 3.0 mcg group (3 patients). The mean time of analgesia has been similar among the four groups while no FHR changes were observed in none of the four groups except for reduced variability that was more frequent in the 6.0 mcg group.

The effect of intrathecal sufentanil. Data are expressed as mean (±DS) or n

	3.0 mcg (n = 7)	4.0 mcg (n = 8)	5.0 mcg (n = 7)	6.0 mcg (n = 8)
Onset time (min)	8 (±2)	7 (±1)	7 (±2)	6 (±2)
Failure rate (n)	3	2	0	0
FHR changes				
Accelerations	0	0	0	0
Decelerations	0	0	0	0
less variability	0	1	2	4
Side effects				
Pruritus	0	0	6	8
Hypotension	0	0	0	0

Conclusion(s): Reduction of the dose of sufentanil during intrathecal analgesia seems to be effective for pain without developing non reassuring fetal heart traces.

Reference:

1 Van de Velde M, Dreelinck R, Dubois J, et al. Anesthesiology 2007; 106: 149–56.

11AP1-10

The role of epidural analgesia in the memory of childbirth experience

Y. Leykin, F. Foltran, P. Portolan, F. Turchet, S. Pavanello

Anesthesia, Intensive Care and Pain Treatment, "Santa Maria degli Angeli" Medical Centre, Pordenone, Italy

Background and Goal of Study: Litterature data on mother recall of labour pain are contrasting. The aim of the study was to investigate labor pain experience, exploring in a cohort of nulliparous, which anamnestic characteristics, intra-partum factors, particularly epidural analgesia (EA), and postpartum factors could be associated with pain recall.

Materials and Methods: The study enrolled 187, ASA I–II nulliparous, recruited between 34th and 38th gestational week. Exclusion criteria were: any pregnancy complication, Cesarean or instrumental delivery, communication difficulties. Data collection was made at the recruitment moment, during the delivery (at 4;7 cm and complete cervix dilatation), 24 hours, 15 days, 1 and 6 month after the delivery. The first questionnaire included socio-demographic and anamnestic data. EA was performed in case of parturient request. The postpartum questionnaire investigated the delivery experience memory and the general health status. Continuous variables were compared by t-tests, while categorical by χ^2 test. Multivariate logistic regression identified factors associated with the pain recall intensity.

Results and Discussion: 107 parturient concluded the study, 30 underwent EA. There were no socio-demographic and anamnestic differences between women who underwent or not analgesia. The EA was effective (VAS 5.3 vs. 8.2; P = 0.0006) and 76.6% desired to repeat it in the future. However, there was no statistical support for the association between EA and recall of pain. Health troubles affected pain recall at 15 days and 1 month (OR being respectively 2.49 (95%CI: 1.01–6.12) and 3.48 (95%CI: 1.50–8.07)).

Characteristic	Total (n = 107)	No Analgesia (n = 77)	Analgesia (n = 30)	P
Age				
<30	51 (47.7%)	40 (51.9%)	11 (36.7%)	0.155
>30	56 (52.3%)	37 (48.0%)	19 (63.3%)	
Education				
Low	20 (18.7%)	15 (19.5)%	5 (16.7%)	0.573
Medium	52 (48.6%)	35 (45.4%)	17 (56.7%)	
High	35 (32.7%)	27 (35.0%)	8 (26.7%)	
Pre-delivery courses				
Yes	78 (72.9%)	54 (70.1%)	24 (80.0%)	0.302
No	29 (27.1%)	23 (29.9%)	6 (20.0%)	
Partner support				
Yes	105 (98.1%)	76 (98.7%)	29 (96.7%)	0.485
No	2 (1.9%)	1 (1.3%)	1 (3.3%)	
Anxiety STAIY1	48.80 (9.7)	48.18 (8.9)	50.08 (11.1)	0.425
Anxiety STAIY2	44.58 (8.1)	44.34 (7.4)	45.12 (9.3)	0.692

Conclusion(s): Maternal recall of childbirth experience was not influenced by the EA, but rather by the health status at the moment of the administration of the questionnaire.

Reference:

1 Waldeström. Birth 30;248–54:2003.

11AP2-1

Prediction of difficult tracheal intubation for emergency cesarean section is a waste of time

G. Basaranoglu, G. Lyons

Anaesthesia, St James' University Hospital, Leeds, United Kingdom

Background and Goal of Study: Difficult intubation following induction of general anaesthesia for cesarean is a cause of morbidity and mortality. Several predictors of difficult intubation have been described, but none of them have been validated in women requiring emergency cesarean section. Our aim was to investigate several predictors that might identify women with potential intubation difficulty immediately prior to emergency cesarean section.

Materials and Methods: Women requiring emergency cesarean section with general anaesthesia and tracheal intubation who had been evaluated by the same experienced anaesthesiologist preoperatively were included in this study. The age, final weight, height, weight gain during the pregnancy, BMI (body mass index) were recorded. Mallampati score, sternomental distance, thyromental distance, interincisor gap and atlantooccipital extension were measured. Measurements were compared with published ranges and accordingly defined as within normal range (predicting no intubation difficulty) and one or more measurement outside normal range (predicting potential difficulty). The same anaesthesiologist performed laryngoscopy and graded the laryngeal view according to Cormack and Lehane (CL). Subsequently the women were divided into two groups according to grading of laryngeal view (CL1-2 vs CL3). Analysis was with *t* test (comparison of means) or Fisher's exact test (categorical data). $P < 0.05$ was considered significant.

Results and Discussion: In three years 239 women were recruited. 225 were allocated to group 1 (CL 1-2) and 14 to group 2 (CL 3). There were no important differences in age, height, weight, BMI or weight gain. The incidence of CL 3 appearance was 1:17. The predictive value of the combined airway assessment in the prediction of a CL 3 appearance was 0.038. BMI > 30 had a predictive value of 0.289 for a CL 3 appearance.

Conclusion(s): Assessment of the airway using these tests in unlikely to predict a difficult intubation at emergency caesarean section. Neither can BMI be used to predict a difficult intubation.

11AP2-2

Hemodynamic effects of spinal anesthesia for cesarean delivery: The sitting versus left lateral decubitus positions

M. Oueslati, M. Saidi, S. Darmoul, S. Ghedira, M. Houissa

Anesthesiology and Intensive Care, Charles Nicolle Hospital, Tunis, Tunisia

Background and Goal of Study: Many studies suggest that spinal anesthesia (SA) is safe, in the absence of contraindications to regional anesthesia, for Cesarean Delivery. The major problem of this technique is hypotension, which can induce complications for the mother and/or the fetus (Ann fr Anesth Réanim 2007; 2: 688–693). The aim of this study was to compare incidence and severity of hypotension during SA for Cesarean Delivery in The Sitting (SP) versus left lateral decubitus positions (LP).
Materials and Methods: After approval of the local ethics committee a prospective, randomized study we include the parturient undergoing an elective caesarean delivery under SA (0.5% bupivacaine, fentanil, morphine). Women were distributed in two groups: group SP and group LP. Hypotension was defined by a systolic blood pressure < 100 mm Hg or 30% decrease in mean blood pressure in both groups. We collected the demographic data, technical difficulties, Intraoperative hemodynamics were recorded every 2 min, the dose of ephedrine, Nausea/vomiting, The extent and degree of sensory and motor block, Apgar scores and umbilical arterial blood pH. Statistical analysis was performed using the unpaired two-tailed Student-*t*-test and the test of Chi ^{2} with a $p < 0.05$ value was considered to be significant.
Results and Discussion: Sixty parturients were included (group SP n = 28 and group LP n = 32). Nine patients were excluded for failure of the SA in lateral position. The incidence of hypotension was comparable in two groups (61% vs 65%, p = O, 694). In the lateral group, the incidence of Nausea/vomiting was more 8 min after SA (0% vs 16%, p < 0.029). The total ephedrine doses administered was less in the sitting group but this difference did not achieve statistical significance ((13 mg ± 14 VS 11 mg ± 16, p = 0.646). The incidence of the sensory block at T4 in 8 min was significantly more in the lateral group (25% vs 78%, P < 0.005). Apgar scores were similar in the two groups.
Conclusion(s): SA for Cesarean delivery in the sitting position was technically easier and induced less severe hypotension. In left lateral position, blocks extended more cephalad.

11AP2-3

The effects of remifentanil during general anaesthesia induction for caesarean delivery of severe preeclamptic patients

M. Orhan Sungur, T. Ozkan Seyhan, H. Parlak, E. Altuntas, M. Tugrul

Anaesthesiology, Istanbul University Istanbul Faculty of Medicine, Istanbul, Turkey

Background and Goal of Study: General anaesthesia induction in severe preeclamptic patients might be related with excess haemodynamic disturbances. This double blind, placebo controlled study aims to test the effects of remifentanil on maternal haemodynamics during general anaesthesia for c-section in severe preeclamptic parturients.
Materials and Methods: 22 patients were randomised to placebo (P) or remifentanil (R) groups. Group P group received saline whereas Group R 1 µg/kg remifentanil in 30 sec. Thiopental, succinylcholine for induction and sevoflurane for maintenance was administered. Until opening of peritoneal cavity, Group R received 0.05 µg/kg/min remifentanil and Group P saline. Heart rate (HR) and systolic arterial pressure (SAP) were recorded prior and after induction, after intubation, post-intubation1 min, at birth and 1 min after birth. Hypertension (>30% SAP increase from pre-induction) and tachycardia (HR >119 bpm) were treated with iv 100 µg glyseroltrinitrate (G) and 1 mg metoprolol (M) boli, respectively. Newborn data (Apgar scores, umbilical blood gases, need for ventilatory support) were recorded. The study was completed after umbilical cord clamping.
Results and Discussion: Results are shown below: Median gestational age was similar in Group P and R (31 [26–37] and 33 [27.5–36.5] weeks respectively). Remifentanil attenuated hypertensive response to intubation and decreased the need for G. There was no difference in post-intubation hemodynamics explained by aggressive management with G. No differences were found for Apgar scores and umblical cord blood gases. The indifference noted between the groups may be the result of impaired uteroplacental circulation of preeclampsia which is further responsible of the observed rate of respiratory support and neonatal low birth weight.

Table 1.

	Placebo (n = 11)	Remifentanil (n = 11)	p
Glyseroltrinitrate (µg)	200 [0–300]	0 [0–300]	0.03
Nr of patients treated	9	3	0.03
Metoprolol (mg)	1 [0–3]	0 [0–2]	NS
SAP-preinduction	166.5 ± 21.2	159.5 ± 15.9	NS
SAP-intubation	178.3 ± 20	142.6 ± 33.3	0.02
SAP-intubation 1min	165.5 ± 25.1	147.9 ± 23.9	NS
Neonatal weight (g)	1471 ± 778	1591 ± 633	NS
Bag-mask ventilation (n)	6	8	NS
Intubation (n)	4	5	NS

Data are presented as mean ± SD or median[min-max]

Conclusion(s): Remifentanil effectively attenuated hypertensive response to intubation and decreased the need for G in severe preeclamptic patients without significant neonatal compromise.

11AP2-4

Development and validation of clinical indicators to measure iatrogenic complications in obstetrics: A Delphi-based study

G. Haller, C. Kern, M. Morales, R. Pfister, F. Clergue

Department Anaesthesiology, Pharmacology and Intensive Care, University Hospitals, Geneva, Switzerland

Background and Goal of Study: Patient safety indicators offer interesting perspectives to measure iatrogenic complications in obstetrics. To date, only a few have been validated and their use is largely limited to measure surgical complications. The purpose of this study was to identify and validate safety indicators that could be used to detect iatrogenic complications across specialties, by anaesthetists, obstetricians and neonatologists involved in labour and delivery units.
Materials and Methods: We first conducted a systematic review of the literature to identify existing patient safety indicators in obstetrics. Indicators were then validated by a panel of 31 experts representing different professions and specialties involved in labour and delivery units. We used the Delphi method, an iterative questionnaire-based consensus seeking technique. Experts determined on a 7-point Likert scale (1 = most representative/7 = less representative) the soundness of each indicator as a measure of safety. The procedure was repeated until a consensus was reached. To conclude the validation process experts ranked indicators according to their level of association with potential errors and complications caused by medical management.
Results and Discussion: We identified 44 potential clinical indicators from the literature. Following the Delphi consensus seeking process, 13 indicators were found by experts to be highly representative of safety during obstetrical care (mean score < = 2.3). Experts ranked 8 of these indicators as being strongly associated to potential errors and complications.

Table 1. List of clinical safety indicators with the highest correlation with errors and complications

Indicator Name	Mean Score
In-hospital maternal mortality following a complication	1.30
Maternal peri-operative mortality	1.50
Rate of nosocomial infections following caesarean section	1.70
Rate of central and peripheral nervous injuries following anaesthesia	1.90
Rate of ischaemic cardiac complications following anaesthesia	2.00
Rate of neonatal trauma and complications per 1000 neonates born alive	2.10
Rate of neonates with an arterial ombilical cord pH < 7.1	2.20
Maternal mortality during pregnancy and within 42 days after delivery	2.30

Conclusion(s): We identified and validated by the Delphi method 8 clinical indicators to measure iatrogenic complications in labour and delivery units. Further studies are required to determine to which extent these complications may be preventable.

11AP2-5

Anatomical risk factors and complications associated with difficult epidural puncture for obstetric analgesia in a universitary hospital: A prospective observational study

B. Alonso, A. Muñoz, E. Guasch, N. Brogly, F. Gilsanz

Servicio de Anestesia y Reanimación, Hospital Maternal – Hospital Universitario La Paz, Madrid, Spain

Background and Goal of Study: The prediction of difficult epidural puncture (DEP) is an important issue in obstetric analgesia for labour in terms of incidence of complications and maternal satisfaction. The aim of this study was to determine if simple anatomical factors were associated with DEP and complications.
Materials and Methods: After ethics local committee approval, a prospective observational study was performed in parturients asking for an epidural analgesia. DEP was defined as a puncture requiring more than one attempt, or one or more needle redirections, before reaching the epidural space. Anatomical predictors were the visual and/or palpatory localization of spinal processes, the iliac crests palpatory localization and the BMI. Epidural puncture complications were accidental dural puncture (ADP) and inadequate analgesia (IA). Maternal satisfaction was based on a 0–10 score. Statistical significance was assessed by Chi-squared test, Fisher's exact test or Pearson's test when appropriate. $p < 0.05$ was considered statistically significant.

Results and Discussion: A linear association was found between DEP and studied anatomical landmarks. ADP or IA incidence were more frequent in patients with redirection of the needle (p = 0.015), but not in those with a repeated puncture to reach epidural space (p = 0.5). Patients with DEP factors did not present more complications compared with those without DEP (spinal process not visible and/or palpable p = 0.765, palpable iliac crests p = 0.342, and body mass index >30 Kg/m^2 p = 0.647). Mothers satisfaction was correlated to the incidence of complications (ADP and IA), p = 0.014.
Conclusion(s): These simple anatomical factors are risk factors of DEP, but not of complications. In case of a predictable DEP, it would be preferable to try to avoid needle redirections, and to proceed to a new puncture to reduce the risk of complications and increase mothers' satisfaction.

Anatomical landmarks and DP association

		1 attempt	> 1 attempt	No redirection	≥ 1 redirection
Spinal process	Visible & palpable	93 (78.2%)	26 (21.8%)	88 (73.9%)	31 (26.1%)
	Palpable	116 (73.9%)	41 (26.1%)	97 (61.8%)	60 (38.2%)
	No Visible no palpable	18 (45%)	22 (55%)*	18 (45%)	22 (55%)•
Iliac crests	Palpable	222 (73.8%)	79 (26.2%)	199 (66.1%)	102 (33.91%)
	No palpable	5 (33.3%)	10 (66.7%)♠	4 (26.7%)	11 (73.3%)•
BMI	<30	170 (74.2%)	59 (25.8%)	154 (67.2%)	75 (32.8%)
	30–40	57 (70.4%)	24 (29.6%)	49 (60.5%)	32 (39.5%)
	>40	0	6 (100%)*	0	6 (100%)♠

*p = 0.001; •p = 0.03; ♠p = 0.002

11AP2-6

Prospective study of hypotension after combined spinal-epidural anesthesia for cesarean delivery: Do we realize the magnitude?

F. Pissarra, I. Dias, L. Pissarra

Anesthesiology, Maternidade Alfredo da Costa, Lisboa, Portugal

Background and Goal of Study: Many studies have demonstraded the efficacy of a combined Spinal-Epidural technique for cesarean delivery with low dose local anesthetic and opioid to prevent maternal hypotension. In this study two different definitions of hypotension are applied to the same population of women submitted to Combined Spinal-Epidural Anesthesia.
Materials and Methods: Prospective study where a record was made to evaluate Blood Pressure trends in pregnant women scheduled for a cesarean section. A Combined Spinal-Epidural technique was performed with 7,5 mg Levobupivacaine and 2,5ug Sufentanil. Two definitions of hypotension were used: A- a decrease in systolic arterial blood pressure (SAP) of >20% below baseline and B – SAP below 100 mm Hg. Blood pressure measurements were performed before injection, 1, 5, 10 and 15 minutes after and at the end of surgery.
Results and Discussion: A total of 78 pregnant women entered the study. 15% of women were over 35 years old, 41% had a Body Mass Index over 30 and 35% were less than 160cm tall. Using the lowest SAP recorded, incidence of hypotension was 80,8% with definition A and 50% with B. 46,5% of women had a SAP decline of >30% and 26,9% >40%. Ephedrine was used in 78% of hypotensive women with definition A and 100% with B. With both definitions, the period of maximum hypotension incidence was 5 minutes after injection. In clinical practise decreases of SAP >20% are sometimes difficult to recognize and measures to treat hypotension are not always employed. There is not a consensus in the literature regarding the best definition of hypotension and SAP < 100 mm Hg is often used in many studies and in clinical practise. We believe this definition underestimates the true incidence of hypotension and may pose at risk the mother and fetus.
Conclusion(s): There is a substantial variation in the incidence of hypotension after Combined Spinal-Epidural Anesthesia for Cesarean Delivery using different definitions of hypotension. SAP under 100 mm Hg definition probably underestimates hypotension and should not be the only one used in clinical practise.

11AP2-7

Failure of epidural anesthesia induction for urgent cesarean section in patients carrying an epidural catheter for labour: Incidence and risk factors in a university hospital

E. Guasch, A. Gago, J. Díez, N. Brogly, F. Gilsanz

Anesthesia, Hospital Universitario La Paz, Madrid, Spain

Background and Goal of Study: Induction of an epidural anesthesia is the reference technique for urgent cesarean section (CS) in patients carrying an epidural catheter for labour. Our aim was to evaluate the incidence of epidural catheter failure when epidural anesthesia was induced for urgent CS, and to analyze which were the risk factors associated to its inefficacy.
Materials and Methods: After ethics local committee approval, we performed a prospective observational study. In a 2 months period of time, we included all consecutive patients with an indication of urgent CS with ongoing epidural catheter for labour analgesia. The catheter top-up was considered successful when analgesic supplements or general anesthesia were not needed during CS. Epidural puncture was considered difficult if more than 2 attempts were necessary to insert the catheter. Body mass index, hematic puncture, previous CS, need for rescue analgesia and efficacy of epidural analgesia during labour were evaluated as well. Data were collected in an Excel database, processed with SPSSv15.0, and analyzed with chi square and Fisher exact test and relative risk calculated with 95% interval.
Results and Discussion: 133 urgent CS were performed in patients with an epidural catheter for labour. In 18 patients (13.4%), the catheter revealed failure (CF). In 9 cases (6.7%), general anesthesia was required. Difficult puncture, was associated with an increased risk of CF (p = 0.064). Relative risk of CF in patients who required more analgesia during labour, compared with those hadn't was 2.86 (p = 0.021). Adequate analgesia during labour was associated with a minor incidence of CF (p = 0.01). Body mass index >30 (p = 0.738), hematic punction (p = 0.347), previous cesarean section or professional experience were not associated with a higher rate of CF.

Epidural catheter failure risk factors

Epidural catheter	Failure (n &%)	Success (n &%)	Total (n)
Difficult insertion	4*(30.8%)	9 (69.2%)	13
Not difficult	13 (10.8%)	107 (89.2%)	120
Rescue dose	7• (29.2%)	17 (70.8%)	24
No rescue dose	11 (10.1%)	98 (80.9%)	109
Good analgesia	6† (6.2%)	91 (93.8%)	97
Incomplete analgesia	11 (30.6%)	25 (69.4%)	36

*p = 0.064, •p = 0.021, OR = 2,890 (IC95% 1,25–6,683), †p = 0.01. OR = 0,202 (IC95% 0.81–0.507)

Conclusion(s): The CF incidence in our hospital is in accordance with data of the literature. High analgesic needs and insufficient analgesia during labour are important predictors of epidural inefficacy in case of urgent CS.
Reference:
1 P. H. Pan, et al. IJOA 2004; 13: 227–233.

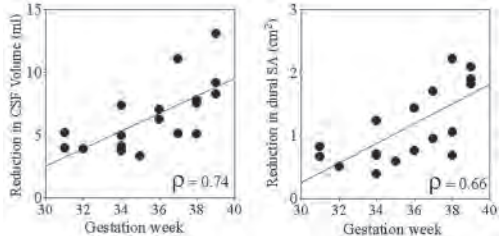
11AP2-8

Gestation-related reduction in cerebrospinal fluid volume and dural surface area

E. Onuki, H. Higuchi, N. Fujita, S. Takagi, M. Ozaki

Department of Anesthesiology, Tokyo Women's Medical University, Tokyo, Japan

Background and Goal of Study: Facilitation of the spread of neuraxial anesthesia in pregnant women is due in part to compression of the dural sac by the engorged epidural venous plexus. The present study was designed to examine the change in cerebrospinal fluid volume (CSF) and dural sac area (SA) induced by pregnancy using magnetic resonance imaging.
Materials and Methods: Magnetic resonance images of 18 healthy women (aged 29 yr; 158 cm; 58 kg) were obtained for measurements of lumbosacral CSF volume and dural SA in the nonpregnant state and the pregnant state (36 weeks' gestation), respectively, and the paired images were compared.
Results and Discussion: Pregnancy was associated with compression of the dural sac by the enlargement of epidural veins, resulting in a significantly decreased CSF volume and dural SA in all patients with some variability in the extent of the reduction (*Ps* < 0.001). The mean reduction in CSF volume and was 6.4 ± 2.7 ml, and that in dural SA was 1.1 ± 0.6 cm^2. Gestation week was significantly correlated with the reduction in CSF volume (r = 0.74, *P* < 0.001) and dural SA (r = 0.66, *P* < 0.01).
Conclusion(s): These findings indicated an association between gestation week and a reduction in both the CSF volume and dural SA. These reductions may relate to the facilitation of the spread of neuraxial anesthesia in pregnant women.



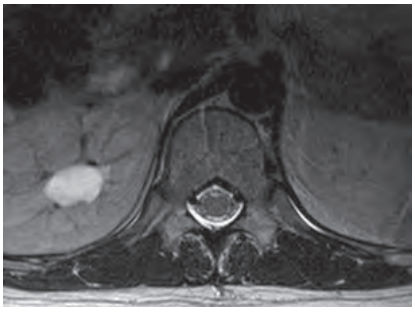
11AP2-9

The distribution of epidural saline upon injection in pregnant women using magnetic resonance (MR) imaging

N. Fujita, H. Higuchi, S. Takagi, E. Onuki, M. Ozaki

Department of Anesthesiology, Tokyo Women's Medical University Hospital, Tokyo, Japan

Background and Goal of Study: The epidural venous plexus is enlarged in pregnant women, which may enhance the distribution of epidural anesthesia. We previously demonstrated that saline injected into the epidural space spreads freely through the epidural space and coats the cylindrical dural sac while partly passing out of the foramina in healthy men. In late-stage pregnant women, however, the engorged epidural venous plexus could potentially interfere with coating of the dural sac and decrease leakage from the foramina, which would explain the facilitation of the spread of local anesthetic in pregnant women. This study was designed to investigate the distribution of epidural saline upon injection in pregnant women using magnetic resonance (MR) imaging.
Materials and Methods: Lumbar epidural catheters were placed in 3 full-term (>36 weeks) parturients for labor. MR images were obtained before and after injection of 10 ml saline into the epidural space through the catheter.
Results and Discussion: In all 3 patients, MR images revealed enlargement of the epidural venous plexus. Saline injected into the epidural space coated the dura in all patients despite the engorged epidural venous plexus.



Conclusion(s): Contrary to our hypothesis, saline injected into epidural space spread freely through the epidural space and coated the dural sac in late pregnancy. The number of subjects examined in this study, however, was small. Additional studies are needed to evaluate the distribution of local anesthetics or saline injected epidurally in pregnant women.

11AP2-10

To compare the epidural sonoanatomy between parturient and non-pregnant young female in Chinese population

S. Wu, I. Lu, C. Tsai, F. Wang, K. Chu

Anesthesiology Dept, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan

Background and Goal of Study: The relationship between epidural space and demographic data has been reported in large scale study (1,2). However, it lacks clinical data in parturient population. The aim of this study was to explore the difference of epidural space between parturient and non-pregnant women by assessing ultrasound image.
Materials and Methods: We enrolled 30 non-pregnant female vollunteers and 30 parturient underwent epidural blocks. A low frequency ultrasound (2–5 Mhz) with a curved array transducer is used to obtain spinal sonograpgy for each subject. The oblique paramedian axis provided the optimal ultrasound image for spinal sonography. Outcome was evaluated by the depth of epidural space at three lumbar spine levels. Paired T-tset was carried out to evaluate the statistical signifiance of epidual depth.
Results and Discussion: Demographic data of volunteers and parturients (before pregnancy) did not differ significantly. Mean pregnant age of parturient was 38.2 ± 1.2 weeks. The depth of epidural space for volunteers and partuitants were 3.25 ± 0.64 and 3.52 ± 0.61 cm respectively ($p = 0.018$). The diameter of epidural space for volunteers and partuitants were 2.9 ± 0.3 and 4.5 ± 0.6 mm respectively ($p < 0.001$).
Conclusion(s): We concluded that the epidural space was significantly narrower in parturients than non-pregnant women at lumbar interspaces. It might explain the technical difficulty in epidural block for parturients.
References:

1 Adachi YU, Sanjo Y, Sato S. *Acta anaesthesiol Scand.* 2007; 51: 731–5.
2 Warman P, Youngs P. *Int J Obstet Anesth.* 2008; 17: 283–7.

11AP2-11

Crystalloid preload during spinal anesthesia for cesarean delivery in women with preeclampsia

M. Oueslati, M. Saidi, A. Slama, M. Othmeni, M. Houissa

Anesthesia and Intensive Care, Charles Nicolle Hospital, Tunis, Tunisia

Background and Goal of Study: Hypotension is less frequent and less severe during a cesarean section under spinal anesthesia (SA) in preeclamptic patients than in healthy parturients (Anesth Analg 2003; 97: 867–72). Several studies demonstrated the ineffectiveness of intravenous fluid preload by crystalloid, for the prevention of hypotension during cesarean under SA in women with normal pregnancy (Anesth Analg 2001; 92: 997–1005). The aim of this study was to evaluate the effects of Crystalloid preload during Spinal Anesthesia for cesarean delivery in women with preeclampsia.
Materials and Methods: After approval of the local ethics committee, a prospective single blind study was performed in preeclamptic women undergoing SA for caesarean section. Protocol of SA include: 10 mg bupivacaïne + 25 µg fentanyl + 100 µg morphine. Patients were assigned to one of two groups: group preload (group P) receiving 15 mL/Kg lactated Ringer's solution over 20 min before the SA and group no preload (group NP). Hypotension was defined by a systolic blood pressure <100 mm Hg or 30% decrease in mean blood pressure in both groups. Hypotension was treated by a bolus of 6 mg of ephedrine. We collected the demographic data, intraoperative hemodynamics were recorded every 2 min, the dose of ephedrine, Apgar scores and umbilical arterial blood pH. Statistical analysis was performed using the unpaired two-tailed Student-*t*-test and the test of χ^2 with a $p < 0.05$ value was considered to be significant.
Results and Discussion: Thirty one parturients were included (group P n = 16 and group NP n = 15). The incidence of Hypotension was more frequent in the group P, but the difference was not statistically significant. The severity of hypotension was comparable in the two groups, as well as the doses of ephedrine required (Table 1). Apgar scores were similar in the two groups.

Table 1. Incidence and severity of Hypotension

	Group P	Group NP	p
Incidence of hypotension (%)	42	32	0.433
doses of ephedrines (mean ± DS)	14 ± 11	14 ± 9	0.947

Conclusion(s): Crystalloid preload during Spinal Anesthesia for Cesarean Delivery in Women with Preeclampsia does not reduce incidence and severity of hypotension.

11AP3-1

The effect of haemodilution with 6% hydroxyethyl starch (130/0.4) on haemostasis in pregnancy. An in vitro assessment using thromboelastometry

T. Ansari, W. Riad

Department of Anaesthesia, Corniche Hospital, Abu Dhabi, United Arab Emirates

Background and Goal of Study: Hydroxyethyl starches (HES) are more effective than Ringer Lactate (RL) in maintaining or expanding blood volume, but their use is limited by concerns over their effect on haemostasis. Late Pregnancy is characterized by increased blood coagulability. The aim of this study is to evaluate the effect of haemodilution to 60% using RL, or a mixture of RL and 6% HES (130/0.4) on blood haemostasis in pregnant women at term presenting for elective caesarean section using thromboelastometry.
Materials and Methods: After obtaining the hospital ethical committee approval, and written informed consent, 8 patients presenting for elective caesarean section were included. Patients were ASA I with a singleton term pregnancy. None of them were on aspirin, anti-coagulants or NSAID. Before starting the intravenous fluids, a blood sample was drawn into glass blood collection tube containing 0.129 M trisodium citrate. Using thromboelastometry (ROTEM) each citrated blood sample was analyzed undiluted (baseline), diluted to 60% using RL or a mixture of RL and HES at a ratio of 1:1. ROTEM measurements were performed using 300µl of blood at 37°c. Measurements included EXTEM coagulation time (CT), clot formation time (CFT) which reflects clot initiation and propagation respectively, alpha angle and maximum clot firmness (MCF) for assessing clot formation kinetics and quality, FIBTEM maximum clot firmness (MCF) for assessing fibrinogen activity and polymerization. Sample size calculation showed that 8 patients should be included in the two treatment groups in order to detect a difference of 1.2 mm in MCF value using FIBTEM. The data were analyzed using paired two-tailed t-test. P-value of 0.05 was used as the level of significance.

Results and Discussion: A significant impairment of EXTEM variables CT, CFT, alpha angle and MCF and also FIBTEM MCF were observed in both dilutions. Significant impairment was observed in RL & HES combination compared to RL alone (P value < 0.05).

	Baseline	RL	RL + HES
EXTEM			
CT (sec)	56.7 (8.1)	78.3 (10.3)*	143 (74.9)*†
CFT (sec)	79.1 (28.6)	231.1 (58.1)*	534 (124.5)*†
a angle (degree)	74.3 (5.3)	51.3 (6.9)*	34.1 (10.4)*†
MCF (mm)	66.2 (4.7)	46.8 (5.1)*	36.5 (9.1)*†
FIBTEM			
MCF (mm)	20.3 (2.9)	9.1 (2.5)*	3.3 (1.5)*†

CT: clotting time, CFT: clot formation time, MCF: maximum clot firmness. Data expressed as mean (SD). Against baseline *P value < 0.001- Against RL †P value < 0.05

Conclusion(s): Haemodilution in pregnant women with RL alone causes less impairment of coagulation parameters compared to RL/HES combination.

11AP3-2

The effect of saline prior to epidural catheter insertion in obstetric patients

C. Berritta, M. Camorcia, S. Stirparo, G. Capogna

Dpt Anesthesia, Città di Roma Hospital, Roma, Italy

Background and Goal of Study: The insertion of an epidural catheter may be associated with signs of nerve root irritation such as paresthesia or even pain[1,2]. We aimed to investigate whether the administration of saline prior the insertion of the catheter may reduce the incidence and severity of these signs.
Materials and Methods: After informed consent we investigated 64 parturients having a 16 G clear nylon, closed end, 3 lateral eyes (Portex Minipack kit) epidural catheter inserted for labor analgesia or as a part of a CSE technique for cesarean section. Parturients were randomly allocated to receive either 5 mL of saline through the Tuohy needle or no saline prior the insertion of the catheter. Parturients were asked about the occurrence of paresthesia or pain during the catheterization and to grade these sensations on a visual analogue scale (VAS). The difficulty of insertion of the catheter was also assessed. Statistical analysis was performed by Fisher exact test and Mann Whitney U-test.
Results and Discussion: In the Table the incidence (%) of paresthesia, pain and difficult insertion are shown. The intensity (VAS) of paresthesia, pain and difficulty during catheterization was reduced by the administration of saline in the CSE group (P < 0.02). The difficulty of catheter insertion was significantly lower in the CSE when compared to the epidural group, whatever saline administration (P = 0.0001).

	Epidural Analgesia		CSE Anesthesia	
	Saline	Control	Saline	Control
Paresthesia	50	47	25*	41
Pain	28	29	12,5*	29
Difficult insertion	28	29	0*	6

*P <0.02

Conclusion(s): In conclusion, saline significantly reduced the incidence and severity of signs of nerve irritation and the difficulty of catheter insertion only in the CSE group.
References:
1 Scott DA et al. Anaesth Intens Care 1993; 284:287.
2 Rolbin SH et Al Can J Anaesth 1990; 37: 337–340.

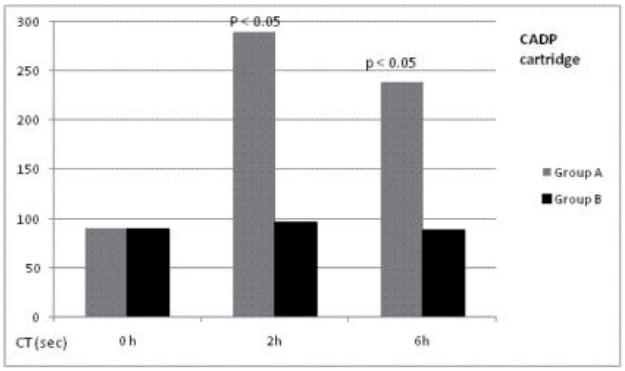
11AP3-3

Comparison of the effect of lornoxicam versus parecoxib on the PFA-100 closure time

A. Spyridonidou, A. Alexoudis, T. Vogiatzaki, D. Margaritis, C. Iatrou

Anesthesiology, Democritus University of Thrace, Alexandroupolis, Greece

Background and Goal of Study: Due to the absence of cyclo-oxygenase (COX-2) in platelets, the risk of bleeding in patients who use selective NSAIDs (non-steroidal anti-inflammatory drugs) is thought to be decreased. We studied the influence of lornoxicam and parecoxib on the vitro bleeding time using the platelet function analyzer (PFA-100).
Materials and Methods: A total of 60 consecutive ASA I–II women undergoing elective cesarean section were included in the study. In a randomized fashion, depending on different multimodal approach, they were either allocated to Group A (n = 30): general anesthesia plus 8mg lornoxicam IV or Group 2 (n = 30): general anesthesia plus 40 mg parecoxib IV. In both groups, induction of anesthesia was performed with pentothal 5mg/kg and succinylcholine 1.5 mg/Kg and anesthesia was maintained with sevoflurane 1%, atracurium 0.5 mg/kg, midazolam 2 mg, fentanyl 0.2 mg and meperidine 40 mg. Exclusion criteria included a predisposition to abnormal bleeding, pathological blood cell count and the use of any NSAIDs 2 weeks before. Blood samples were obtained by antecubital vein puncture before, and 2h and 6 h after drug somministration. The platelet investigation was carried out using the PFA-100® (Dade, Behring). SPSS 16.0 (Chicago, USA) was used for statistical analysis. Data were tested for normal distribution by using the Kolmogorov-Smimov test. ANOVA with Bonferron's correction was then used to detect statistical significance (p < 0.05).
Results and Discussion: The basal values were comparable in the two groups. The Group A had significantly increased in vitro closure times (CT) after 2 and 6 h, in collagen-ADP (CADP) cartridge and the group B showed no significant changes (Figure). Similar results were obtained with the collagen-epinephrine cartridge.



Conclusion(s): Lornoxicam had a significant effect on the in vitro closure time, while parecoxib did not show this effect. This could be support the use of COX-2 selective drugs in the perioperative period to minimize the risk of bleeding.
Reference:
1 Hayward CPM, Harrison P, Cattaneo M, Ortel TL, Rao AK. Platelet function analyzer (PFA)-100 closure time in the evaluation of platelet disorders and platelet function. J Thromb Haemost 2006; 4: 312–9.

11AP3-4

Near infrared spectroscopy and preeclampsia. Evidence suggesting its' routine use

A. Pouliou, C. Chapsa, E. Koudouna, E. Karmiri, E. Anastassiou

Anaesthesiology, Thriassio Hospital, Elefsina, Greece

Background and Goal of Study: Preeclampsia is known as one of the leading causes of maternal morbidity and in the Western Societies, following the continuously increasing age of new mothers. Although epidural anaesthesia remains the golden standard, still some mothers ask for general anaesthesia, which, unfortunately does not permit direct monitoring of neurological state. The aim of this study was to determine whether near infrared spectroscopy (NIRS) would replace direct clinical neuromonitoring for women undergoing Cesarean Section under general anaesthesia.
Materials and Methods: Eighty women, undergoing Cesarean Section were included in this study. Forty of them were healthy (ASA I–II), (Group C) and 40 women suffering by preclampsia (Group P). NIRS was attached to all patients, from the arrival of the patient to the operating theater, until its departure to the obstetrics' clinic. Through the whole observation period, changes >20% from baseline were considered as abnormal.
Results and Discussion: No episode of abnormal value was noticed in Group C. In contrast, NIRS values were abnormally decreased at 2 women in Group P. One of these 2 patients, proved to be attacked by a giant ischemic stroke to the right cerebral hemisphere, which had been diagnosed by Computed Tomografy. In addition, the other patient developed multiple episodes of seizures, as confirmed by EEG. Both women were transfered to the ICU. Moreover, no abnormal value of NIRS occured Group P, between the patients without neurological implications of preeclampsia. These results show that NIRS might be a reliable neuromonitoring, as managed to detect all of the neurological implications. However, authors recognize that this study has a significant limitation: the investigators could not be blind, as this would decrease the maternal or fetal safety.
Conclusion(s): Using an easy, non invasive monitoring of regional cerebral oxygenation, neurological implications of preeclampsia can be detected. However, more study on this field must be done, in order to determine whether the study of NIRS values or waveform could guide the treatment of preeclampsia and decrease morbidity.

11AP3-5

Myasthenia gravis and the peripartum period: Retrospective analysis of 15 cases

C. Almeida, E. Coutinho, D. Moreira, A. Martins, J. Aguiar

Anaesthesiology and Neurology, Hospital Santo António, Oporto, Portugal

Background and Goal of Study: Myasthenia gravis (MG) usually affect women in the 2º and 3º decades (1). The aim of study is to analyse retrospectively the anaesthetic management of MG women during delivery (D) and its complications in peripartum period.

Materials and Methods: Retrospective, single center study from clinical files of MG women, who delivered between 1985 and 2007 at Hospital de Santo António, Oporto, Portugal.

Results and Discussion: 15 pregnant women were studied, classified as ASA II–III, with mean age of 28 years. The mean time since diagnosis of MG was 6,9 years. There was progression of the disease in 4 patients. The pregnancy was brought to term in 13 cases. 10 women were submitted to non-urgent caesarean (C). 5 patients had vaginal (V) delivery (all euthocic). About complications during pregnancy, one patient was submitted to an uncomplicated thymectomy under general anaesthesia (GA). In the post partum period, there was a myasthenic crisis in one patient submitted to C under epidural block (EB). The woman required admission in the intensive care unit. The MG symptoms appeared at the 3º trimester in 2 patients but the diagnosis was just established in puerperium:–in one case the woman was submitted to a spinal block (SB), developing respiratory failure requiring mechanical ventilation, ocular symptoms, and muscular weakness;–in the other case the patient was submitted to GA that resulted in delayed emergence, muscular weakness, and respiratory failure.

MG Stage (S) at D and anaesthetic management

S at D (Osserman Classification)	Kind of D	Anaesthetic management (if C)	Analgesic regimens (IF V D)
Diagnosis at puerperium	2 C	SB 1/GA 1	_
Complete remission	1 V D	_	1 EB
Pharmacological remission	2 V D/2 C	1 SB/1 EB	2 EB
S I	1 C	1SB	_
S IIA	4 C	2 SB	2 EB
S IIB	3 C	2 SB/1 EB	_
S III, IV and V	_	_	_

Conclusion(s): MG does not provoke a significant effect in pregnancy, but the course of MG is unpredictable during this period and puerperium(1). MG *per se* do not prevent vaginal delivery(1). The locoregional anaesthesia is preferred, mainly EB. GA may be considered in the presence of bulbar symptoms, mainly if respiratory distress is present(2). In the obstetric population, the differential diagnoses must include MG in the presence of respiratory depression associated to neurological symptoms (mainly ocular disorders associated to bulbar symptoms or muscular weakness).

References:

1 Hoff JM; Daltveit AK; Gilhus NE. Neurology 2003;61:1362–1366.

2 Chabert L, Benhamou D. Annales Françaises d'Anesthésie et de Réanimation 2004; 23:459–464.

11AP3-6

Eight-year institutional experience with epidural analgesia/ anesthesia in parturients with spina bifida

P. Santos, A. Glória, E. Saez, A. Santos

Anesthesiology, Hospital de S. João, Porto, Portugal

Background and Goal of Study: Spina bifida (SB) has an incidence of 1/1000. The provision of labour analgesia/anesthesia is still a challenge. The purpose of this review is to document our experience with regional anesthesia in these patients.

Materials and Methods: A retrospective review of the anesthetic management in parturients with SB who delivered at our hospital between 1998 and 2005 was conducted. We identified 17 women submitted to epidural blockade. Neurologic, surgical, imagiologic and anesthetic data were collected.

Results and Discussion: Of the 17 epidurals, 16 resulted in symmetrical sensory blockade that extended from the sacral to low thoracic dermatomes (T10 maximum). Two dural punctures occurred in patients with SBO, in both the catheter was re-inserted in the space immediately above and the mild headache developed was treated with simple analgesics. Delivery was uneventful (11 delivered vaginally and 6 by caesarean section). No other complications were reported. Considering the increased risk of dural puncture it is recommended that the block should be performed above the level of lesion. In our series, the level was established relying on patient information and previous imagiologic exams. SBO is a benign condition but the possibility of spinal dysraphism should be considered especially if scoliosis or cutaneous stigmata are present. There is a well recognised association between MMC and tethered spinal cord, whose incidence even after surgical correction is significant (4%). In these cases, MRI scan is important for the anesthetic decision.

Table 1. Neurologic Data

Case	Neural tube defect	Neural defict	Other abnormalities	Site of defect	Previous imagiologic exams
1	SOB	No	No	S1/S2	X ray
2	SOB	No	Scoliosis	L4/L5/S1	MRI
3	SOB	No	No	L5	X ray
4	SOB	No	No	L4/L5	X ray
5	SOB	No	No	S1	MRI
6	SOB	No	No	L5/S1	X ray
7	MMC*	Mild dysaesthesia	Scoliosis	S1/S2	MRI
8	SOB	No	No	S2	X ray
9	SOB	No	No	L5/S1	CT scan
10	MMC*	No	Scoliosis	L5/S1/S2	MRI
11	SOB	No	No	S2	X ray
12	SOB	No	No	S1	X ray
13	MMC*	No	No	L5/S1/S2	MRI
14	SOB	No	Scoliosis	L5	MRI
15	SOB	No	No	S2/S3	X ray
16	SOB	No	No	L4/L5	X ray
17	SOB	No	No	L5/S1/S2	X ray

SOB – spina bifida occulta; MMC – meningomyelocoele; MRI – magnetic resonance imaging; CT – computerized tomography; *Previous corrective surgery

Conclusion(s): The anatomical and neurological implications of spinal defects could make regional anesthesia difficult, but not absolutely contraindicated. We consider that the most prudent approach is one of individuality.

11AP3-7

Paresthesias in obstetric regional anesthesia: A retrospective study

A. Chaves, T. Rodrigues, L. Ganchas, L. Saldanha, S. Carvalho

Anesthesiology, São Francisco Xavier Hospital, Occidental Lisbon Hospital Center, Lisbon, Portugal

Background and Goal of Study: Regional techniques have rare complications like paresthesias that are risk factors for neurological deficit. We describe there incidence in 46 parturients, submitted to epidural and combined spinal epidural (CSE), at the moment of the technique and 12 hours later and compare it with the incidence in the literature, evaluating potencial risk factors for having paresthesia.

Materials and Methods: This is a retrospective study of 46 parturients who underwent epidural or CSE for labor. The technique was done by the same year-three resident with supervision. With the patient in the sitting position, the epidural space was identified via a midline approach at L3–L4 interspace. The evaluation at 12 hours was done by an attending anaesthesiologist not involved in the primary technique. Data collected: age, ASA group, body mass index (BMI), type of labor, collaboration of the parturient, anesthetic technique, number of attempts and number of catheter cm in situ. All these parameters were analyzed has risk factors for having paresthesia at 0 hours and 12 hours later. Statistical analysis: simple and comparative exploratory analysis. Mann-Whitney test, Fisher's Exact and Fisher-Freeman-Halton tests with residual analysis.

Results and Discussion: All the parturients were in ASA I and II groups, with median age of 31.0 ± 5.28 and BMI of 29.9 ± 6.43. The techniques used were 32 epidurals and 14 CSE. The incidence of paresthesias at 0 hours was 34.8%. These occurred on the introduction of the epidural needle in 2.2%, of the spinal needle in 8.7% and of the epidural catheter in 23.9% of the parturients. At 12 hours the incidence of paresthesias was 15.2%. There were no evidence that the parturients who had paresthesias on the execution of the technique and at 12 hours were different concerning age or BMI. In the execution of the technique there was an association between multiple attempts and the elicitation of paresthesias ($p = 0.017$). There was an association between the CSE technique and the elicitation of paresthesias at 12 hours ($p = 0.02$). For all the other risk factors analyzed there wasn't any statistical association with paresthesias.

Conclusion(s): We had an incidence of paresthesias in the execution of the technique witch is accordingly to the described in the literature (30–40%). Multiple attempts to perform the block are the major causes of paresthesias in the literature. The greater length of spinal needles can be the explanation to the highest incidence of paresthesias at 12 hours in the CSE technique.

11AP3-9

Profile of cerebral spinal fluid and serum magnesium, calcium, sodium and potassium levels in pre-eclamptic women during administration of magnesium sulfate

A. Apostol, L. Li, S. Jalou, R. Apostol, B. Altura

Department of Anesthesiology, SUNY Downstate Medical Center, Brooklyn, New York, USA

Background and Goal of Study: Pre-eclampsia is a pregnancy complication characterized by new onset hypertension and proteinuria which can progress to the more serious condition, eclampsia and lead to increased morbidity and mortality if left untreated. Magnesium sulfate has long been used clinically to treat pre-eclampsia. This study was designed to compare the levels of serum and CSF magnesium and other ions in pre-eclampsia and normal pregnant women to reveal the homeostasis disturbance occurred during pre-eclamptic state.

Materials and Methods: Data were collected from 16 pre-eclamptic women and 16 healthy women with uncomplicated pregnancy aged from 20 to 34 years. Patients with history of neurological, renal, vascular diseases, hypertension and pre-term labor were excluded. The pre-eclamptic women were treated with IV magnesium sulfate (MgSO4) 6 g bolus followed by 2 g per hour continuous infusion started 4.5–48 hours before delivery. The blood and CSF samples were collected when spinal anesthesia was induced. Levels of magnesium, calcium, sodium and potassium were measured. The data were analyzed with ANOVA, student test and linear regression model.

Results and Discussion: As expected, MgSO4 infusion elevated the serum ionized and total magnesium levels in pre-eclamptic patients, which were significantly higher than those in the control group. However, there was no significant difference of the CSF magnesium levels between two groups. The serum and CSF magnesium fraction (ratio between ionized and total magnesium) in pre-eclamptic women were significantly lower than those in the normal pregnant women (serum: $54.29 \pm 1.74\%$ vs. $80.31 \pm 1.96\%$, $p < 0.001$; CSF: $57.18 \pm 1.84\%$ vs. $63.81 \pm 1.81\%$, $p < 0.01$). Other ions that exhibited significant difference between the two groups included: higher serum and CSF sodium levels in pre-eclamptic women, lower serum calcium level in pre-eclampsia women. In terms of CSF calcium, and potassium levels, there was no significant difference between two groups. In control group, there were significant correlations between serum magnesium levels (both ionized and total) and total CSF magnesium level as well as serum sodium level, while such correlation lacked in the pre-eclamptic patients.

Conclusion(s): 1) elevated serum Mg levels did not alter the CSF Mg levels up to 48 hours post-treatment with MgSO4; 2) significantly lower CSF ionized magnesium ratio and higher CSF sodium level was associated with pre-eclamptic women; 3) correlation between serum Mg levels and other ions lacked in pre-eclamptic patients.

11AP3-10

Impact of platelet function analysis on decision making in preeclampsia and HELLP syndrome

M. Lancé, V. Smit-Fun, V. Timmer, A. Kroese, M. Marcus

Department of Anesthesiology and Pain Treatment, University Hospital Maastricht, Maastricht, Netherlands

Background and Goal of Study: Preeclampsia and HELLP syndrome (PH) complicate about 1–2% of all pregnancies. Both are associated with higher maternal and perinatal mortality and morbidity. In 10–50% thrombocythopenia occurs. Data on platelet function is scarce. This information is crucial for decision making with respect to timing of delivery and choice of anesthesia technique. The aim of the study was to determine platelet function in healthy pregnancies (H) compared to PH by novel platelet function analysis.

Materials and Methods: After local institutional approval, we took written informed consent of 26 pregnant patients (14 H/12 PH). Data on demographics, blood pressure, drug/herbal supplement use and bleeding risks were gathered. For the purpose of this study venous blood was collected in hirudine, citrate and EDTA-tubes. We performed impedance-aggregrometry (multiplate®) with the following activators: ADP at stepwise increasing levels (0,5 mmol/2,5 mmol/7,5 mmol), thrombine receptor test (TRAP) and collagen. We also performed PFA-100® analysis with coll/ADP and coll/EPI, platelet count and mean platelet volume measurement (MPV).

Results and Discussion: The two groups showed no significant differences with respect to age, amenorrhea and bleeding risk. Blood pressure and use of antihypertensive drugs differed significantly. For the H respectively PH groups PFA-100 analysis with coll/ADP vs coll/EPI test showed closure times of $83,8 \pm 25,1$ vs $90,1 \pm 15,0$ seconds respectively $100,8 \pm 26,2$ vs $125,6 \pm 36,4$ seconds. With impedance-aggregometry for ADP the mean AUC at 0,5, 2,5 and 7,5 µmol were $33,0 \pm 24,3$ vs $23,8 \pm 12,1$, $68,0 \pm 29,4$ vs $61,8 \pm 26,2$ and $72,2 \pm 28,7$ vs $80,1 \pm 31,2$. Collagen and TRAP-test resulted in AUC $98,9 \pm 36,4$ vs$100,1 \pm 30,7$ and $76,5 \pm 29,7$ vs $93,4 \pm 27,1$. Platelet count was 218.6 ± 82 vs $266,4 \pm 79,4$ and MPV $8,5 \pm 1,01$ vs $9,4 \pm 1,3$ ($p < 0.05$). Although only MPV differed significantly the other results are interesting. The results of PFA-100 and ADP at lower concentrations suggests lower platelet activity in PH. The other tests indicate more sensitivity towards those stimulators and suggest higher activity. A larger MPV points to higher platelet reactivity. An interpretation of this may be: in PH a lower reactivity of the ADP receptor is compensated by more activity of the other receptors and a higher MPV. Platelet activity finally is in balance.

Conclusion(s): MPV is higher in PH. This could indicate higher activity. To confirm this thesis and its impact on decision making a larger population has to be studied.

Reference:

1 Davies JR A&A 2007 104:416–20.

Intensive Care Medicine

12AP1-1

Ten-year trends in microbiological isolates in a mixed medical-surgical Italian intensive care unit

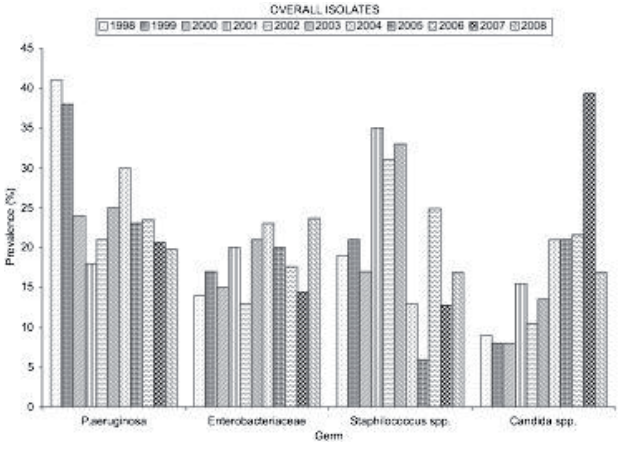
P. Calzavacca, M. Barazzetta, F. Vitali, S. Guidolin, M. Solca

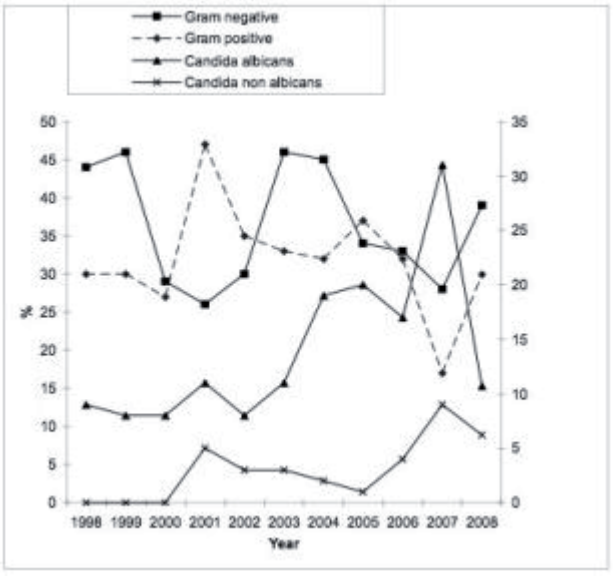
Anaesthesia and Intensive Care Medicine & Laboratory Medicine, Ospedale Uboldo, Cernusco sul Naviglio, MI, Italy

Background and Goal of Study: Sepsis is a common cause of Intensive Care Unit (ICU) admission and carries high morbidity and mortality. World Health Organization guidelines recommend strict epidemiological surveillance to optimize empiric treatment. Accordingly, in our ICU epidemiology about type and characteristics of germs are monitored and prospectively recorded since 1993.

Materials and Methods: Prospective observational study in a single non-teaching hospital. The hospital ethic committee waived the need for informed consent as this study represents monitoring of standard care. Relevant specimens were taken at ICU admission and twice a week for microbiological monitoring, and at any time it is clinically advisable.

Results and Discussion: Yearly average ICU admissions were 136: approximately 60% medical and 40% surgical; 20 to 30% of patients were septic at admission, and 10–15% subsequently developed sepsis. Mean SAPSII was 36, ICU median length of stay were 4 days. ICU mortality approached 20%; hospital mortality was around 26%. Prevalence of most representative germs in over the period 1998–2008 is shown in Fig.1. P. aeruginosa and Staphylococcus spp. were among the most common germs found, but in the past 5 years prevalence of fungi increased from less than 20% to a peak as high as 50% in 2007. Fluctuation in prevalence of Gram + and Gram- bacteria as well as of Candida spp. (albicans and non-albicans) over the study period is reported in Fig. 2: The cyclic pattern shown is similar to findings in other EU countries. After an alternating higher prevalence of Gram- and Gram + isolates, in the past five years both Gram + and Gram- showed a decreasing trend, replaced by fungi: in particular, Candida non-albicans saw a progressive rise. Apparently, this pattern reverted in 2008.





Conclusion(s): Our study confirms other epidemiological studies in EU Countries, about the rise in fungi prevalence in ICU patients.

12AP1-2

Does the coexistence of cancer have an influence on the course of sepsis? – Clinical and laboratory analysis

A. Tarczynska, P. Smuszkiewicz, I. Trojanowska

Department of Anaesthesiology, Intensive Therapy and Pain Treatment, H. Swiecicki University Hospital, Poznan University of Medical Science, Poznan, Poland

Background and Goal of Study: Sepsis is still a difficult clinical problem and its treatment often ends in failure. Hospitalized cancer patients diagnosed with sepsis are especially concerned. The aim of this study was to evaluate and compare cancer- and non-cancer patients diagnosed with sepsis.
Materials and Methods: 56 septic patients were reviewed retrospectively between January 2007 to August 2008. Patients were divided into two groups: I- patients with sepsis and cancer (S + C), II- patients with sepsis without cancer (S). The etiology of sepsis, primary infectious sources, clinical and laboratory parameters and mortality were analysed. Data were entered into Statistica 6.0. and descriptive statistics were calculated (using arithmetic mean with standard deviation and median with range). The survival rate analysis were estimated using Kaplan-Meier method. Statistically significant results were those with $p < 0.05$.
Results and Discussion: The mean age for S + C patients was higher than for S group (61.3 ± 14.2 vs 45.5 ± 17.2 years; p = 0.005). The mean Acute Physiology and Chronic Health Evaluation II score value (Apache II) at the day of admission for the whole population was 22.1 ± 8.8 (8–45), for S + C group 25.3 ± 10.3 (12–41) and for S group 21.2 ± 8.3 (8–45) (p = 0.308). S + C patients required larger infusion of minimal noradrenaline doses than the others (0.08 vs 0.02 µg/kg/min; p = 0.015). The mortality rate was 14.3% and was higher in S + C than in S group (16.7 vs 13.6%; p = 0.562). Mortality was also significantly higher among patients with larger lactate blood concentration (death:4.6 vs survival:1.9 mmol/l; p = 0.020) and greater base deficit (death: – 6.79 vs survival: – 2.34 mmol/l; p = 0.0006). Patients of lower mean arterial pressure (60.8 vs 75.9 mm Hg; p = 0.007) and who required larger noradrenaline infusion (0.514 vs 0.232 µg/kg/min; p = 0,0009) at the day of admission had a significantly higher risk of death.
Conclusion(s): The analysis did not indicate evidently higher risk of more severe sepsis's course in cancer sepsis patients. However, the severity of patients' general condition (Apache II score) and the mortality in this group of patients was higher (statistically insignificant results). Patients in group S + C required larger minimal doses of noradrenaline and larger infusion of colloid at the day of admission. The mortality was determined by the haemodynamic disturbance and the severity of general condition, rather than the cancer diagnosis *per se.*
Acknowledgements: Thanks to Prof. Leon Drobnik, Head of the Department, who provided general support.

12AP1-4

Procalcitonin serum level measurements as a marker of systemic inflammatory response syndrome in critically ill patients

I. Jagmane, J. Avdjukevics, O. Zukova, V. Cera

Toxicology Center, Riga East Clinical University Hospital's Clinic "Gailezers", Riga, Latvia

Background and Goal of Study: To analyse the clinical value of serum procalcitonin level in diagnosis of sepsis and grading its severity.
Materials and Methods: Prospective observational study included patients in adult intensive care unit in year 2008. Patients were stratified into one of six categories (negative, SIRS, localized infection, sepsis, severe sepsis and septic shock) according to the definitions of the American College of Chest Physicians/Society of Critical Care Medicine, when they had a blood test that included C-reactive protein (CRP) and procalcitonin (PCT). Plasma CRP was measured with turbidimetric assay (COBAS INTEGRA, Roche Diagnostics, Germany) and PCT with enzyme linked fluorescence assay (VIDAS®B·R·A·H·M··S PCT, bioMérieux, France). Statistical analysis was performed with SPSS statistical software, using Mann-Whitney *U*-test.
Results and Discussion: Study included 55 patients. A total of 110 patient-day episodes could be analysed. Mortality during intensive care stay was 16.4% (with overall mortality during hospital stay 21.9%). Infection on admission was detected in 78.18% patients. Blood culture was positive in 23.06% patients. Mean APACHE II on admision 14.04 (range 3–34). An increase in SOFA score corresponded closely to higher mean values of procalcitonin ($p < 0.05$). CRP concentrations, however, could be highly elevated also at low SOFA scores. Mean procalcitonin and C-reactive protein level in sepsis group (sepsis, severe sepsis, septic shock) were 33.20 ng/ml (range 0.17–200 ng/ml) and 233.62 mg/dl (range 3.6–600 mg/dl) respectively, vs. 3.22 ng/ml (range 0.05–37 ng/ml) and 116.39 (range 0.5–464 mg/dl) in group without sepsis (negative, systemic inflammatory response syndrome (SIRS), localized infection) ($p < 0.05$).
Conclusion(s): Procalcitonin level shows closer correlation with severity of sepsis and organ dysfunction than traditional laboratory markers. Integrating the serum PCT level in the clinical decision making process of critically ill patient could provide added value in diagnosis of bacterial infection and sepsis, and consequently, early administration of antibiotics and elimination of septic foci.
References:
Harbarth S. et al. Diagnostic value of procalcitonin, interlaukin -6 and interleukin -8 in critically ill admitted with suspected sepsis. Am. J. Resp. Crit. Care. 2001; 164: 396–402.
Simon L. et al. Serum procalcitonin and C-reactive protein levels as markers of bacterial infection: a systematic review and meta-analysis. Clin. Infect. Dis 2004; 39:206–217.

12AP1-5

Reducing abdominal sepsis mortality: A multidisciplinary approach

A. Ferrer, N. Esteve, R. Morales, A. Socias, J. Aguilar

Anestesiología, Reanimación y Terapeútica del Dolor, Hospital Son Llàtzer, Palma de Mallorca, Spain

Background and Goal of Study: Severe sepsis and septic shock are major healthcare problems, affecting millions of individuals around the world each year, presenting a high rate of mortality and increasing in incidence. Abdominal sepsis is involved in 15–20% of cases. A number of international guidelines based on a wide range grade of recommendations have been published to improve management of these patients. An integral and multidisciplinary sepsis management protocol, based on Surviving Sepsis Campaign, has been applied for the last two years in our hospital. The goal of our study is to analyse sepsis-related mortality of abdominal septic patients after applying this protocol at our Institution.
Materials and Methods: In 2005 a multidisciplinary group composed by intensivists, surgeons, anaesthesiologists and nurses elaborated a sepsis management protocol, based on Surviving Sepsis Campaign in our hospital. Since January 2006 until June 2007, 480 consecutive patients were included. We analyze the results corresponding to abdominal sepsis (66 patients). The variables analyzed are depicted in figure 1.
Results and Discussion: Even though not statistically significant, there is a tendency towards decrease in mortality (20.6 versus 31.2%) and a shorter ICU stay (9.8 versus 13.4 days) in the last six months. In spite of the tendency to a better adaptation of the antibiotic therapy, (suitability 65.6% versus 67.7% N.S.), some issues, as early antibiotics administration, needs to be improved.
Conclusion(s): The cornerstone of treatment remains early recognition of the septic process and aggressive goal-directed treatment that includes infection

control of the body. Adequate coordination of treatment measures is crucial to improve survival. The application of a multidisciplinary sepsis management protocol allows us to evaluate the results and analyse the areas that need to be improved.

	Jan/06-Oct/06 N: 32	Nov/06-Jun/07 N:34
Age	69.4 y.o	68.8 y.o
ICU stay	13.4 days	9.8 days
Hospital Stay	28.8 days	28.9 days
-Severe Sepsis -Septic Shock	12/32 (37.5%) 20/32 (62.5%)	10/34 (29.4%) 24/34 (70.6%)
Sepsis-related mortality	10/32 (31.2%)	7/34 (20.6%)
APACHE II at inclusion	20.03 (+/-10.5)	20.6 (+/-10.1)
SOFA at inclusion	6.7 (+/-3.4)	5.9 (+/-3.1)
Organ disfunction	3.2 (+/-1.4)	2.4 (+/-1.1)
Blood culture (+)	19/32 (59.4%)	8/34 (23.5%)
Suitability antibiotic therapy: -Non suitable -Suitable -No *evaluable* data o*Pathogens were no identified* oPatients died within 24 hours	 2/32 (6.2%) 21/32 (65.6) 7/32 (21.8%) 2/32 (6.2%)	 2/34 (5.9%) 23/34 (67.7%) 8/34 (23.5%) 1/34 (2.9%)
Antibiolics therapy starting: -< 6 hours -6 – 12 hours -12 – 24 hours -> 24 hours -Not prescribed -Not known (no registered data)	 27/32 (84.4%) 0 1 (3.1%) 3 (9.4%) 1 (3.1%) 0	 28/34 (82.4%) 1 (2.9%) 1 (2.9%) 0 0 4 (11.8%)

References:

Dellinger RP, Levy MM, Carlet JM, et. al: Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008. *Crit Care Med* 2008; 36:296–327.

F. M. Pieracci, p. S. Barie. Management of severe sepsis of abdominal origin (Review). Scandinavian Journal of Surgery 2007; 96: 184–196,

12AP1-6

Serious bleeding complications in a surgical cohort of patients during Drotrecogin alpha therapy

J. Navarro-Martinez, P. Mas-Serrano, M. Rivera-Cogollos, M. Martinez-Lazcano, M. Bernabeu-Martinez

Anesthesiology – Pharmacy, Hospital General Universitario de Alicante, Alicante, Spain

Background and Goal of Study: Drotrecogin alpha is a drug used in high risk patients with severe sepsis and septic shock. The main side effect is the risk of bleeding due to the inactivation of the V and VIII coagulation factors. After surgery there is a 12 hour window for the initiation of the therapy with drotecogin, even though the risk of bleeding continues during all the treatment. The goal of the study was to evaluate the incidence of serious bleeding complications during the therapy with Drotrecogin alpha.

Materials and Methods: We analyzed retrospectively all the patients (78) admitted to the Surgical Critical Care Unit with surgery in the previous 30 days and that were treated with drotrecogin alpha between June 2003 and November 2008.

Results and Discussion: We found 4/78 serious bleeding complications in our surgical population (5%). This incidence is comparable with the literature published until now in a mixture of medical and surgical patients.

Serious Bleeding Complications

Age/Sex	Surgery	Bleeding site	Coagulation disorder	Exitus
69/Male	Peritonitis	Pulmonar	INR 2.1 aPTT 73 seg	Drotecogin-related
65/Male	Peritonitis	Intraabdominal	No (Drain manipulation)	Alive
79/Female drotecogin-	Peritonitis	Intraabdominal	INR 1.2 aPTT 52 seg	Not related
28/Female	Peritonitis	Intracraneal	Medullar Aplasia	3 days after therapy

Conclusion(s): In this surgical cohort of patients the use of drotrecogin alpha was safe (low incidence of bleeding) if we apply the measures related to the selection of patients, control of abdominal drains and coagulation times.

12AP1-7

Significance of the presence of bacterial/micotic DNA in TNFα levels, in septic surgical patients

M. Baluja González, M. Garea Vázquez, A. Cariñena Amigo, B. Regueiro García, J. Álvarez Escudero

Servicio de Anestesiología y Reanimacion, Hospital Clínico Universitario de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

Background and Goal of Study: The presence of TNFα has been related with inflammatory response due to viable microorganisms. Nevertheless, is not yet known the response caused by bacterial or micotic DNA in blood, in absence of positive microbial cultures. In this study, we pretend to analyse this condition in surgical patients.

Materials and Methods: After obtaining ethics committee approval and informed consent from surgical patients, we studied a series of 508 clinical presentations distributed in five groups: Group 0: Patients undergoing major surgery, without signs of sepsis. Group 1: Surgical patients with clinical manifestations of severe sepsis or septic shock, but with negative microbial cultures and negative microbial DNA in blood analysis. Group 2: Clinical setting as in Group1, with positive microbial cultures and negative microbial DNA in blood analysis. Group 3: Clinical setting as in Group1, with negative microbial cultures and positive microbial DNA in blood analysis. Group 4: Clinical setting as in Group1, with positive microbial cultures and positive microbial DNA in blood analysis. In all cases, when microbial cultures were performed, we obtained blood samples to bacterial/micotic DNA detection and to determine TNFα plasma levels. Microbial DNA identification was made by the LightCycler SeptiFast® test Mgrade (Roche Diagnostics GmbH), a multiplex real-time PCR. Viable microorganisms were detected using conventional cultures (blood, respiratory-tract, urine, drainages, wounds, etc).

Results and Discussion: 507 patients were analysed, distributed as seen in table 1:

Table 1.

	n	TNF Mean (pg/ml) ± SD	p
Group 0	101	10,6 ± 6,1	
Group I	173	16,5 ± 10,0	*
Group II	157	21,6 ± 13,8	*, &
Group III	21	26,96 ± 9,6	*, &
Group IV	55	27,0 ± 13,6	*, &

*p < 0,05 compared with Group 0; & = p < 0,05 compared with Group I.

Conclusion(s): The presence of bacterial/micotic DNA in blood confirms the existence of non-viable microorganisms. Nevertheless, this situation doesn't seem to influence plasma levels of TNFα, being similar in groups with positive DNA and those with viable microorganisms.

12AP1-8

Significance of the presence of bacterial/micotic dna in procalcitonin levels, in septic surgical patients

M. Baluja González, M. Garea Vázquez, P. López Pais, B. Regueiro García, J. Álvarez Escudero

Servicio de Anestesiología y Reanimacion, Hospital Clínico Universitario de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

Background and Goal of Study: Increased procalcitonin (PCT) serum levels have been related with the existence of infection. Nevertheless, is not yet known if we can expect the same correlation when bacterial or micotic DNA is detected in blood, in absence of positive microbial cultures. In this study, we pretend to analyse procalcitonin plasma levels in patients with positive microbial DNA in blood, comparing them with non-infected patients or those with sepsis and viable microorganisms identified.

Materials and Methods: After obtaining ethics committee approval and informed consent from surgical patients, we studied a series of 508 clinical presentations distributed in five groups: Group 0: patients undergoing major surgery, without signs of sepsis. Group 1: surgical patients with clinical manifestations of severe sepsis or septic shock, but with negative microbial cultures and negative microbial DNA in blood analysis. Group 2: Clinical setting as in Group1, with positive microbial cultures and negative microbial DNA in blood analysis. Group 3: Clinical setting as in Group1, with negative microbial cultures and positive microbial DNA in blood analysis. Group 4: Clinical setting as in Group1, with positive microbial cultures and positive microbial DNA in blood analysis. In all cases, when microbial cultures were performed, we obtained blood samples to bacterial/micotic DNA detection and to determine PCT plasma levels. Microbial DNA identification was made by the LightCycler SeptiFast® test Mgrade (Roche Diagnostics GmbH), a multiplex real-time PCR. Viable microorganisms were

detected using conventional cultures (blood, respiratory-tract, urine, drainages, wounds, etc).

Results and Discussion: 507 patients were analysed, distributed as seen in table 1:

Table 1.

	n	PCT Mean (ng/ml) ± Typical Error of Mean	p
Group 0	101	0,5 ± 0,1	
Group I	173	1,4 ± 0,2	*
Group II	157	3,9 ± 0,3	*, &
Group III	21	4,9 ± 1,6	*, &
Group IV	55	5,3 ± 0,7	*, &

* = p < 0,05 compared with Group 0; & = p < 0,05 compared with Group I.

Conclusion(s): PCT levels are correlated with active infection in multiple studies. In our series we demonstrate that the only presence of bacterial/micotic DNA in blood is associated with an increase of PCT similar to that occurred in patients with presence of viable microorganisms.

12AP1-9

Impact on mortality of previous chronic obstructive pulmonary disease in patients with severe sepsis and septic shock

M. Baluja González, M. Garea Vázquez, A. Cariñena Amigo, P. López Pais, J. Álvarez Escudero

Servicio de Anestesiología y Reanimacion, Hospital Clínico Universitario de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

Background and Goal of Study: Severe sepsis and septic shock are two different, but intimately related conditions with high morbidity and mortality. Although any previous pathology is supposed to worsen their prognosis, is there little information related to this situation. In this study, we pretend to analyse the impact of Chronic Obstructive Pulmonary Disease (COPD) on 28-day and 6-month survival in sepsis.

Materials and Methods: A prospective, observational study of surgical patients admitted to our ICU (15 beds) with diagnosis of severe sepsis and septic shock. Sepsis aetiologies were either pneumonia or intra-abdominal infection. We excluded patients with quimio or radiotherapy in the three months before surgery. The COPD diagnosis was collected in all patients at admission and 28-day and six-month mortality were also studied. Treatment of pneumonia, peritonitis, severe sepsis and septic shock was performed in all cases according to good practice current guidelines. To verify the existence of association between mortality and possible predictor variants, Student's t-test was used in parametric data analysis and Mann-Whitney U within non-parametric data. To evaluate distribution normality, Shapiro-Wilk W test, and Kolmogorof-Smirnov test with the Lilliefors correction were performed, and for variance homogeneity Levene test was used. Kaplan Meier method was used to estimate survival curves.

Results and Discussion: We analysed the evolution of 458 patients. 249 (54,4%) with intra-abdominal sepsis, and 209 (45,6%) with sepsis from pneumonia. 224 were men (48,9%) and 234 women (51,9%). 311 (67,9%) were classified as severe sepsis and 147 (32,1%) as septic shock. At the 28th day, the overall mortality was 33% (151 patients), having died 86 from 311 severe sepsis patients (27,7%), and 65 from 147 septic shock patients (44,2%). At the 6th month, the overall mortality was 39,3% (180 patients), having raised to the 34,4% (107/311) in severe sepsis patients and to the 49,7% (73/147) in septic shock patients. 134 patients had the diagnosis of COPD, with a 28-day mortality of 46,5% (65 patients), and a six-month mortality of 55,2% (74 patients).

Conclusion(s): Chronic Obstructive Pulmonary Disease is a risk factor of bad outcome, with impact on both 28-day and six-month survival.

12AP1-10

Meaning of previous congestive heart failure in patients with severe sepsis and septic shock

M. Baluja González, M. Garea Vázquez, A. Cariñena Amigo, P. López Pais, J. Álvarez Escudero

Servicio de Anestesiología y Reanimación, Hospital Clínico Universitario de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

Background and Goal of Study: Severe sepsis and septic shock are two different, but intimately related syndromes with high morbidity and mortality. Although any previous pathology is supposed to worsen their prognosis, is there a lack of information about this issue. In this study, we pretend to analyse the impact of congestive heart failure (CHF) on 28-day and 6-month survival in sepsis.

Materials and Methods: A prospective, observational study of surgical patients admitted to our ICU (15 beds) with diagnosis of severe sepsis and septic shock. Sepsis aetiologies were either pneumonia or intra-abdominal infection. We excluded patients with quimio or radiotherapy in the three months before surgery. The congestive heart failure (CHF) diagnosis was collected among patients that matched either functional classes III or IV, according to the New York Heart Association (NYHA) classification. APACHE II and SOFA at admission, and 28-day and six-month mortality were also studied. Treatment of pneumonia, peritonitis, severe sepsis and septic shock was performed in all cases according to good practice current guidelines. To verify the existence of association between mortality and possible predictor variants, Student's t-test was used in parametric data analysis and Mann-Whitney U within non-parametric data. To evaluate distribution normality, Shapiro-Wilk W test, and Kolmogorof-Smirnov test with the Lilliefors correction were performed, and for variance homogeneity Levene test was used. Kaplan Meier method was used to estimate survival curves.

Results and Discussion: We analysed 458 patients. 54,4% with intra-abdominal sepsis, and 45,6% with sepsis from pneumonia. 48,9% were men and 51,9% women. 311 (67,9%) were classified as severe sepsis and 147 (32,1%) as septic shock. At the 28th day, the overall mortality was 33%, having died 27,7% from 311 severe sepsis patients, and 44,2% from 147 septic shock patients. At the 6th month, the overall mortality was 39,3%, having raised to the 34,4% (107/311) in severe sepsis patients and to the 49,7% (73/147) in septic shock patients. 99 patients had the diagnosis of CHF, with a 28-day mortality of 68,7% (68 patients), and a six-month mortality of 76,8% (76 patients).

Conclusion(s): Congestive heart failure is clearly a predictive factor of bad outcome, with impact on both 28-day and six-month survival. This increase on their mortality can be easily understood, because they are patients with reduced functional reserve who have to face the big functional demand that characterizes ultimately the septic syndrome.

12AP2-1

Inhibition of NF-κB by pyrrolidine dithiocarbamate attenuates sepsis-induced acute renal failure

C. Schmidt, K. Höcherl, M. Bucher

Anaesthesiology, Hospital of the University of Regensburg, Regensburg, Germany

Background and Goal of Study: Sepsis-associated acute renal failure (ARF) is characterized by decreased glomerular filtration rate and tubular dysfunction. The pathogenesis of endotoxemic tubular dysfunction with failure in urine concentration and increaed fractional electrolyt excretion is poorly understood. Here, we investigated the impact of the potent NF-κB inhibitior pyrrolidine dithiocarbamate on the regulation of aquaporin-2 channels and of vasopressin V2 receptors, which are essentiell for adequate fluid and electrolyt-reabsorption in the renal tubulus during severe experimental sepsis.

Materials and Methods: Sepsis induction was performed by lipopolysaccharide injections in C57/BL6 mice after approval of the local animal protection committee. 12 h after treatment, hemodynamic and renal parameters were measured and mRNA and western blot data as well as immunhistochemical analyses of aquaporin-2 channels and of vasopressin V2 receptors were collected. Additionally, the effect of the NF-κB inhibitor pyrrolidine dithiocarbamate on V2 receptor and aquaporin-2 channel expression, on renal nitric oxide synthase-2 mRNA abundance and on renal tissue cytokine concentrations were investigated.

Results and Discussion: Injection of lipopolysaccharide caused a time- and dose-dependent decrease in vasopressin V2 receptor and aquaporin-2 channel expression without alterations in plasma vasopressin levels in mice. Pretreatment with the NF-κB inhibitor pyrrolidine dithiocarbamate prevented the downregulation of vasopressin V2 receptor and aquaporin-2 channel expression on mRNA (rt-PCR) and protein (western blotting) level as well as in immunhistochemical anlayses. In addition, the lipopolysaccharide-induced increase in renal nitric oxide synthase-2 mRNA abundance and in renal tissue tumor necrosis factor-α and interleukin-1β concentration was diminished. Furthermore, pretreatment with pyrrolidine dithiocarbamate also improved the lipopolysaccharide-induced decrease in renal function, demonstrated by increased urine urine osmolarity, urine output and glomerular filtration rate.

Conclusion(s): Our findings indicate that NF-κB activation is of importance for the downregulation of aquaporin-2 channel and vasopressin V2 receptor expression during sepsis. In addition, our data indicate that NF-κB inhibition ameliorates the development of sepsis-induced acute renal failure.

12AP2-2

Caffeic acid phenethyl ester attenuates LPS-induced neutrophil activation

S. Kwak, H. Lee, S. Chung, S. Chung, C. Jeong

Anesthesiology and Pain Medicine, Chonnam National University Medical School, Gwangju, Korea

Background and Goal of Study: Caffeic acid phenethyl ester (CAPE) has been shown to have anti- inflammatory and anti-cancer effects. Neutrophils play a pivotal role in the coordination and regulation of immune responses. We investigated the influence of CAPE on LPS-Induced Neutrophil Activation.
Materials and Methods: Human neutrophils were incubated in 24-well plates (5000000 cells/well) with RPMI medium 1640 contained 5% of serum. To measure the cytokines cells were incubated for 4 hours and to measure the MAP kinases those were incubated for 30mins. Then, we made groups like that control, CAPE (1, 10, 100)ng/mL each well; LPS 100ng/mL and CAPE combination with LPS 100ng/mL each well.
Results and Discussion: CAPE could attenuate activation of neutrophils exposed to LPS. In particular, CAPE decreased LPS-induced activation of intracellular signaling pathways, including p38 and ERK1/2 mitogen-activated protein kinase (MAPK), and expression of pro-inflammatory cytokines, including TNF-α, IL- 6 and IL- 8. There was no effect of CAPE on LPS-induced activation of c-Jun N-terminal kinase (JNK) in neutrophils.
Conclusion(s): CAPE can attenuate LPS-induced neutrophil responses and also suggest that such effects are sufficiently important in vivo to play a major contributory role in neutrophil-mediated inflammatory responses such as sepsis induce acute lung injury.

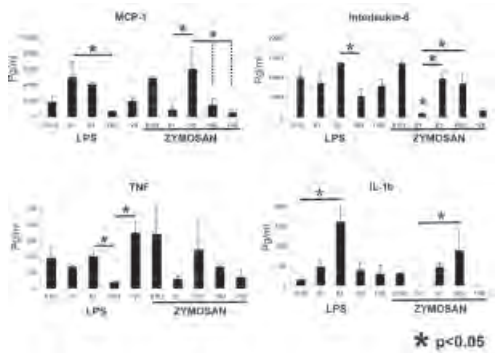
12AP2-3

Inflammatory cytokine responses to zymosan and LPS in transgenic beta-adrenoreceptor mice

G. Ackland, R. Agrawal, A. Patterson

Anesthesia, Stanford University, Stanford, California, USA

Background and Goal of Study: The beta-2-adrenoreceptor subtype may play an important immuno-modulatory role during systemic inflammation. We have explored the role of beta-1 and beta-2 adrenoreceptor subtypes in plasma cytokine release following distinct systemic inflammatory insults induced by zymosan and lipopolysaccharide (LPS).
Materials and Methods: Systemic inflammation was induced in FVB wildtype, beta-1, beta-2, beta-1/2 knockout mice and mice over-expressing the beta-2 adrenoreceptor following intraperitoneal injections of LPS (6mg/kg), zymosan (500mg/kg) or sterile saline. Clinical severity scores were recorded by observers blinded to the injection type. Plasma cytokines (BioRad murine multiplex ELISA assay) were measured from arterial blood 4h after the ip injections.
Results and Discussion: Wild-type and beta-2 adrenoreceptor over-expressor mice appeared less clinically unwell compared to other genotypes after LPS and zymosan. IL-6, MCP-1, TNF-α and IL-1β were lower in over-expressor and wild-type mice compared with beta-2 knockout mice (Fig 1).



Conclusion(s): These data, which are the first from transgenic beta-adrenoreceptor mice exposed to systemic inflammatory insults, support the hypothesis that the beta-2 adrenoreceptor plays an anti-inflammatory, immuno-modulatory role.
Acknowledgements: Supported by NHLBI [AJP], Intensive Care Society UK [GLA].

12AP2-4

Dobutamine pretreatment improves survival after polymicrobial sepsis in rats

E. Reus, A. Mathes, S. Schneider, D. Kubulus, H. Rensing

Department of Anesthesiology and Critical Care Medicine, University of the Saarland, Homburg/Saar, Germany

Background and Goal of Study: Sepsis and septic shock plays a major role in mortality and morbidity worldwide. The current guidelines for management of septic shock describes the preferential beta(1)-adrenoceptor agonist dobutamine as possible inotropic agent for patients with septic shock. Previous data suggest, that pretreatment with dobutamine improves hepatic function and perfusion after hemorrhagic shock[1]. Aim of the present study was to assess the functional significance of dobutamine pretreatment for survival in polymicrobial sepsis in rats.
Materials and Methods: Anesthetized male Sprague-Dawley rats received either Ringer solution (Vehicle/Sepsis), 10 µg/kg/min dobutamine (Dob/Sepsis), or 10 µg/kg/min dobutamine and 500 µg/kg/min beta(1)-adrenoceptor antagonist esmolol (Dob/Esmolol/Sepsis) for 6 hours. Polymicrobial sepsis (Cecal Ligation and Incision, polymicrobial acute onset model[2]) was induced 30 min later. The study endpoint was time of survival. Data are presented as Mean Standard Error (SE). Differences were evaluated using survival analysis as Log Rank-Test of Kaplan-Meier.
Results and Discussion: Pretreatment with dobutamine improved survival time in polymicrobial sepsis significantly (Dob/Sepsis Survival Time; mean 595.000min, SE 43.408 vs. Vehicle/Sepsis survival time; mean 326.071min SE 25.203, $p < 0.005$). Pretreatment with dobutamine and the short acting beta-adrenoceptor antagonist esmolol improved survival time too (Dob/Esmolol/Sepsis survival time; mean 576.071min, SE 41.189 $p < 0.005$ compared to vehicle). There was no significant difference in survival between Dob/Sepsis and Dob/Esmolol/Sepsis ($p = 0.693$).
Conclusion(s): These results suggest a improved survival after septic shock in animals pretreated with dobutamine. The improved survival seems to be a beta(1)-adrenoceptor independent effect. Reason might be an beta(1)-adrenoceptor independent effect of dobutamine on microcirculation in sepsis[3].
References:
1 Raddatz A et al. Dobutamine improves liver function after hemorrhagic shock through induction of heme oxygenase-1. Am J Respir Crit Care Med. 2006 Jul 15;174(2): 198–207.
2 Scheiermann P et al. Cecal Ligation and Incision: An Acute Onset Model of Severe Sepsis in Rats. J Surg Res. 2008 Mar 18.
3 De Backer D et al. The effects of dobutamine on microcirculatory alterations in patients with septic schock are independent of its systemic effect. Crit Care Med. 2006 Feb;34(2): 561–2.

12AP2-5

Effect of sivelestat sodium hydrate, a neutrophil elastase inhibitor, on intestinal microcirculation during endotoxemia in mouse mode

Y. Kojima, Y. Nakajima, S. Sato

Department of Anesthesiology and Intensive Care, Hamamatsu University School of Medicine, Hamamatsu, Shizuoka, Japan

Background and Goal of Study: We formerly reported that endotoxin injection disturbed intestinal microcirculation even if systemic blood pressure was maintained with vasopressors1. Recently several investigators reported the effect of sivelestat sodium hydrate (sivelestat), a neutrophil elastase inhibitor, on not only lung function but other organs2. We investigated effect of sivelestat on intestinal microcirculation after endotoxin injection in mouse model.
Materials and Methods: Female balb/c mice were anesthetized and mechanically ventilated. Ileum was exteriorized for intestinal mucosal intravital videoscopy. Fluorescein-labelled red blood cells (RBC) were injected for measuring RBC flux into villi and mucosal perfused villous density3. Mice were divided into two groups. In a control group (group C), E. coli endotoxin (1 mg/kg) was intravenously injected with normal saline infusion. In another group (group S), sivelestat (10mg/kg) was given intravenously 5min before the endotoxin injection, followed by continuous infusion (10 mg/kg/h). After 1 hour from endotoxin injection, blood pressure, RBC flux, mucosal perfused villous density were calculated by off-line analysis. Data was statistically analysed with t-tests and ANOVA.
Results and Discussion: After 1 hour from the endotoxin injection, systemic blood pressure was maintained within normal range (71.0 ± 2.4 mm Hg in group C, 70.9 ± 1.9 in group S). RBC flux was disturbed in group C in comparison with that in group S (260.2 ± 48.2 counts/sec vs 373.4 ± 69.3 respectively). Furthermore, we observed significant decrese in perfused villous density in group C, but in group S, the density was well maintained ($80.3 \pm 2.4\%$ vs 93.7 ± 1.8, respectively). We demonstrated that siveleatat ameliorated intestinal mucosal perfusion during endotoxemia. Neutrophil elastase is released by various stimulation, and excessive release of elastase might be harmful for lung structure and other vital organs. We assumed sivelestat had a favorable effect by suppressing elastase activity during endotoxemia.
Conclusion(s): Administration of sivelestat attenuated disturbance by endotoxin injection on intestinal microcirculation in mouse model.
References:
1 Nakajima Y, Baudry N, Duranteau J et al. Crit Care Med. 2006 Jun;34(6):1752–7.
2 Harada N, Okajima K, Isobe H. Shock. 2008 Oct;30(4):379–87.
3 Sarelius IH, Duling BR. Am J Physiol 1982;243:H1018–26.

12AP2-6

Distribution and regulation of hepatic melatonin receptors after hemorrhagic shock in rat

A. Mathes, C. Ruf, B. Wolf, M. Abend, H. Rensing

Department of Anesthesiology, Critical Care and Pain Management, Saarland University Hospital, Homburg, Germany

Background and Goal of Study: In the liver, the beneficial effect of melatonin therapy after hemorrhagic shock appears to rely primarily on melatonin receptor activation. However, neither spatial distribution of hepatic melatonin receptors, nor regulatory changes following hemorrhagic shock and exogenous melatonin receptor agonist exposure have been evaluated yet. Therefore, we investigated gene expression, as well as protein pattern and amount of hepatic melatonin receptor type 1 and 2 (MT_1 and MT_2) in a rat model of hemorrhagic shock and resuscitation.
Materials and Methods: After approval of the institutional review board and in accordance with the institutional guidelines for animal care, male Sprague-Dawley rats (200–250 grams) underwent hemorrhagic shock (mean arterial pressure 35 ± 5 mm Hg for 90 minutes) and resuscitation with shed blood and Ringers (n = 5 per group). At the end of shock, animals were treated either with vehicle, melatonin or ramelteon (each 1.0 mg/kg intravenously). Sham operated animals were treated likewise but did not undergo hemorrhage. After two hours of resuscitation, livers were harvested, and gene expression and corresponding protein of hepatic MT_1 and MT_2 were evaluated utilizing RTQ-PCR, western blot analysis and immunohistochemistry.
Results and Discussion: Only MT_1, but not MT_2 mRNA and protein was detected in rat liver. MT_1 protein was located in a dense composition in pericentral fields of liver lobules in sham operated animals, while hardly any MT_1 protein was detected in periportal areas. After hemorrhagic shock and administration of melatonin or ramelteon, hepatic MT_1 protein amount was significantly attenuated in all groups, compared to sham operated controls (42.0–66.0 percent reduction; for each group $p < 0.001$ vs. sham control). Further, a disseminated arrangement of MT_1 was detected within pericentral fields in all treatment groups, compared to a dense pattern in sham controls. With respect to MT_1 mRNA, no significant changes were observed between groups.
Conclusion(s): Our results indicate that hemorrhagic shock and melatonin receptor agonist exposure may significantly attenuate melatonin receptor type 1 protein in rat hepatocytes. Since no changes were observed regarding melatonin receptor mRNA, this suggests that our findings may be attributable to processes of receptor desensitization.
Acknowledgements: This study was in part supported by a research grant of the European Society of Anesthesiology.

12AP2-7

Severe haemorrhagic shock induces lipid peroxidation and the production of superoxide radical in the gut, liver and lungs

E. Panteli, C. Papamichael, F. Fligou, C. Georgiou, K. Filos

Anaesthesiology and Intensive Care Medicine, School of Medicine, Patras University, Patras, Greece

Background and Goal of Study: Many studies have shown that haemorrhagic shock (H/S) is associated with increased oxidative stress. Up to date, only indirect methods have been used to monitor in vivo oxidative stress. These comprise of the determination of antioxidants and total antioxidant capacity, as well as the detection of oxidized biological markers. The direct, in vivo quantitative measurement of the production of superoxide radical, an important parameter of the oxidative load, is difficult due to its low concentration and a short half life. In this study, the effect of H/S and resuscitation on the oxidative state in 4 vital organs (gut, liver, lungs, kidneys) was estimated for the first time by measurement of the production of superoxide radical in vivo, using a new superoxide assay.
Materials and Methods: 16 male Wistar rats were divided in two groups (n = 8): sham and H/S group. H/S was induced by withdrawal of blood targeting to a mean arterial blood pressure of 30–40 mm Hg, which was maintained for 60 minutes. At the end of the shock period, rats were resuscitated with re-injection of the removed shed blood volume. Tissue samples were collected 3 hours after resuscitation and the oxidative load was assessed by a new superoxide assay which directly measures the production of superoxide radical and an established lipid peroxidation assay which measures the production of organic hydroperoxides. Statistical analysis was performed using ANOVA.
Results and Discussion: Animals that underwent H/S exhibited a statistically significant increase in the production of organic hydroperoxides in the gut ($P < 0.001$), liver ($P < 0.001$) and lung ($P < 0.001$) tissues, whereas no change was observed in the kidneys. The rate of production of superoxide radical increased more in the gut and the liver ($P < 0.001$ respectively) and to a lesser extent in the lungs ($P < 0.05$), while kidneys were not affected as well.
Conclusion(s): This study demonstrates an increase in oxidative load in the gut, the liver and the lungs after H/S-resuscitation, which was estimated by two different methods. Moreover, and for the first time in a model of H/S, the new superoxide assay directly and more precisely estimates oxidative stress in vivo, since the formation of superoxide radical seems to play a pivotal role in the cataract of reactions that lead to the oxidation of biological structures. These results suggest that predominantly the gut and the liver, and to a lesser extent the lungs, but not the kidneys are the organs primarily affected by H/S in this model.

12AP2-8

Tissue-related differences of caspase-3 activation under treatment with activated protein C in a murine model of sepsis

T. Schuerholz, H. Mueckenheim, T. Simon, G. Marx

Surgical Intensive Care, University Hospital Aachen, Aachen, Germany

Background and Goal of Study: The mechanisms of Drotrecogin alfa (activated) (DAA; recombinant activated Protein C) in the therapy of severe sepsis are still discussed. Recently, anti-apoptotic effects of DAA were shown on circulating mononuclear cells of septic shock patients. The ratio of cytosolic and mitochondrial pools of pro-caspase-3 varies between different tissues. The aim of the study was to investigate whether there is an organ-specific effect of DAA on caspase-3 in liver and heart tissue in a murine model of sepsis.
Materials and Methods: Male NMRI-mice (n = 21, body weight 30 ± 3g) were randomized to sham-treatment, sepsis by cecal ligation and puncture (CLP) and vehicle infusion, or CLP sepsis with DAA infusion (24µg/kg/hr). 48 hrs prior to CLP all mice were given a permanent i.v.-line and an arterial transmitter to measure heart rate (HR) and mean arterial pressure (MAP). Activity was recorded by scoring from 1 (healthy) to 5 (agony). CLP was adjusted to survive 24 hrs. All mice were killed 12 hrs after CLP after scoring, and recording of vital data. Heart and liver samples were fixed in formalin and embedded in paraffin. Immunohistochemical analysis of the paraffin sections was performed using the avidin-biotin-peroxidase-complex (ABC) method. For caspase-3 analysis a rabbit polyclonal anti-caspase-3 Cleaved antibody (CPP32, Zytomed, Berlin, Germany) was used (dilution 1:100) after heat pretreatment. The average of anti-caspase-3 positive cells were counted in 10 fields in light microscopy (original magnification x625) of each heart or liver were recorded.
Results and Discussion: 12 hrs after CLP scoring showed higher activity in sham- (score 1.0 ± 0; p = 0.001) and DAA-treated mice (score 1.8 ± 0.7; p = 0.015) compared to control (score 3.1 ± 0.9). HR was non-significantly higher in sham and in DAA mice (Sham 650 ± 38/min; DAA 547 ± 175/min; Control 530 ± 143/min). MAP was significantly higher in sham group (p = 0.031) and non-significantly higher in DAA group compared to control (Sham 137 ± 15mm Hg; DAA 111 ± 26mm Hg; Control 97 ± 4mm Hg). Anti caspase-3 positive cells in heart tissue were significantly lower in sham-treated mice (2.1 ± 0.6 cells; p = 0.001) and DAA mice (4.9 ± 2.7 cells, p = 0.01) compared to controls (9.6 ± 4.0 cells). In liver tissue there were no significant differences between the groups (Sham 10.8 ± 8.2, DAA 12.4 ± 6.2, Control 16.2 ± 4.5).
Conclusion(s): Treatment with DAA affects active caspase-3 in the heart but not in the liver in murine sepsis. This may be a sign of an organ-related, anti-apoptotic effect of DAA in sepsis.

12AP2-9

Clonidine pretreatment exerts antioxidant effect in the gut after severe haemorrhagic shock

E. Panteli, F. Fligou, C. Papamichael, C. Georgiou, K. Filos

Anaesthesiology and Intensive Care Medicine, School of Medicine, University of Patras, Patras, Greece

Background and Goal of Study: The pathophysiology of haemorrhagic shock (H/S) includes ischaemia/hypoxia, reperfusion injury through the formation of free radicals, and subsequent inflammation that can lead to multiple organ dysfunction syndrome (MODS). Moreover, the sedation regimen for the intensive care unit (ICU) patients affects the morbidity and mortality during the ICU stay. Clonidine has been used for sedation in the ICU. This study tested the effect of clonidine pre-treatment on the production of free radicals in the gut (terminal ileum) of rats subjected to severe H/S and subsequent resuscitation. For this purpose, lipid peroxidation was estimated by measurement of the production of organic hydroperoxides (O-HP), while the rate of production of superoxide radical (SO-R) in vivo was measured with the new superoxide assay.
Materials and Methods: Male Wistar rats (n = 32), divided in four experimental groups (n = 8) were used: sham, H/S and two clonidine pre-treatment groups: sham-CL and H/S-CL. In sham-CL and H/S-CL groups, clonidine was injected subcutaneously (150µg/kg twice daily for two days), while a last dose was given one hour before the start of the experiment. Under anaesthesia, blood was

removed to a mean arterial pressure of 30 mm Hg for 60min, after which the rats were resuscitated by re-infusion of the removed shed blood volume. Three hours later, a segment of the ileum was harvested for determination of the production of O-HP (indirect method) and SO-R (direct method). Statistical analysis was performed using ANOVA.

Results and Discussion: The oxididative load of the gut (O-HP, SO-R) was statistically significantly reduced in the H/S-CL group, as compared to H/S.

O-HP and SO-R production in the gut

Group	n	O-HP (nmoles/mg tissue protein)	SO-R (fmoles/min/mg tissue protein)
Sham	8	0.035 ± 0.05	0.118 ± 0.016
HS	8	0.07 ± 0.011*	0.184 ± 0.028*
Sham-CL	8	0.034 ± 0.002	0.106 ± 0.08
H/S-CL	8	0.034 ± 0.001**	0.108 ± 0.008**

* P < 0.001 H/S versus Sham and ** P < 0.001 H/S-CL versus H/S

Conclusion(s): Clonidine pre-treatment reduces the oxidative stress in the gut following severe H/S as detected by both direct and indirect methods. This antioxidant, protective effect of the drug might be important in ICU patients, since the gut is considered to play a pivotal role in the pathogenesis of systemic inflammation and MODS observed after H/S.

12AP2-10

Hyperoxia in extreme normovolemic anemia and hyperdynamic endotoxemia

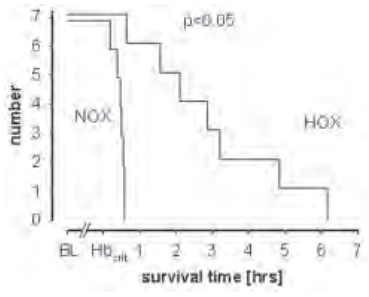
P. Lauscher, H. Kertscho, L. Raab, O. Habler, J. Meier

Department of Anesthesiology, Intensive Care Medicine and Pain Management, Johann Wolfgang Goethe University Hospital, Frankfurt am Main, Germany

Background and Goal of Study: Microcirculatory dysfunction resulting in tissue hypoxia despite adequate oxygen supply is one of the major causes of organ-failure in acute sepsis (1). Concomitant acute anemia furthermore aggravates cellular oxygen supply and by that jeopardizes organ integrity. Ventilation with pure oxygen (hyperoxic ventilation, HV) enables survival in extreme acute anemia (2), however it is unknown, whether HV can also improve tissue oxygenation and by that survival in acute, extreme anemia and concomitant andotoxemia. Therefore we investigated the effects of HV on oxygen transport, tissue oxygenation and survival in a model of endotoxemia and normovolemic anemia.

Materials and Methods: Endotoxemia was induced in 14 anesthetized pigs ventilated with room air (FIO_2 = 0.21). Simultaneously the animals were hemodiluted by exchange of whole blood for 6% hydroxyethyl starch (200.000:0.5) until the individual critical hemoglobin concentration (Hb_{crit}) was reached. Hb_{crit} was defined as the onset of oxygen supply dependency of oxygen consumption and was identified with indirect calorimetry. Subsequently animals were either ventilated with an FIO_2 of 0.21 (n = 7) or an FIO_2 of 1.0 (n = 7), and thereafter observed for 6 hours.

Results and Discussion: HV significantly prolonged survival time at Hb_{crit} (NOX, 30 [27/35] min; HOX, 172 [111/241] min, p < 0.05). In contrast to the NOX group, HV improved MAP (NOX – 41% vs. HOX + 14%), DO_2 (NOX – 5% vs. HOX + 52%), SvO_2 (NOX, – 38% vs. HOX, + 79%) and tissue oxygenation (NOX, – 33% vs. HOX, + 547%) during the first 15 minutes of the observation period in the HOX group. *Figure1: Survival time in both groups during the 6h-observation period. NOX = FIO_2 0.21; HOX = FIO_2 1.0; BL = Baseline; Hb_{crit} = critical hemoglobin concentration.*



Conclusion(s): Ventilation with pure oxygen improved survival time, hemodynamics, oxygen transport and tissue oxygenation in a model of endotoxemia and concomitant extreme acute anemia. High bioavaiability of physically dissolved oxygen might be responsible for this amelioration of organ function and survival.

References:

1 Sakr Y, Dubois M, De Backer D, et al. Crit Care Med 2004; 32: pp. 1825–1831.
2 Meier J, Kemming GI, Kisch-Wedel H, et al. Anesthesiology 2004; 100: pp. 70–76.

12AP3-1

Short term evaluation of Hospital Anxiety Depression Scale (HADS) in the ICU patients after major abdominal surgery

I. Filipovic-Grcic, I. Šegotic, D. Tonkovic, J. Grubišin, V. Majeric Kogler

Anesthesiology and Intensive Care, Department of Psychiatry, Clinical Hospital Center Zagreb, Zagreb, Croatia

Background and Goal of Study: The surgical stress is an important factor that influence on the psychological and the physical condition. Patients (pts) in the ICU require the great adjustment-mentally, physically and emotionally. They can experience exaggerated symptoms of anxiety or depression. The aim of this study was to analyze the impact of the clinical picture (APACHE II) and pain control (visual analog pain scale- VAPS) on the anxiety and depression symptoms (HADS) in the surgical pts in the ICU.

Materials and Methods: With ethics approval and written consent, in this prospective study, to data, are reported 33 pts. They all were discharged from the ICU after 1 day. VAPS and APACHE II were evaulated on the admission and on the discharge from the ICU, HADS scale was evaulated on the discharge. Time required to complete rating of HADS scale was 5–10 minutes. The components of it, anxiety and depression, were rated from 0–3, scores are totalled for each component. Score of <= 7 is normal result, 8–10 indicates mild symptoms, 11–14 moderate symptoms and >= 15 indicates severe symptoms. Mann-Whitney U-test, T- test, Correlations were used in statistical analysis due to small number of pts. Values p < 0.05 were statistically significant.

Results and Discussion: There were 14 male and 19 female pts, average age was 57.51 ± 15.01, range 24-78. On admission average VAPS was 3.42 ± 2.56, APACHE II 10.00 ± 4.76, and on the discharge average VAPS was 1.00 ± 1.17 and APACHE II 5.21 ± 3.03. In evaulation of HADS, 28 pts have normal results of anxiety symptoms, 4 pts have mild symptoms and 1 pts has moderate symptoms of anxiety; 29 pts have normal results of depression symptoms, 3 pts have mild symptoms and 1 pts has moderate symptoms of depression. Statistical significance was observed for the VAPS on the discharge and HADS.

Conclusion(s): Due to small number of patients in this ongoing trial, patients with higher VAPS on the discharge have more exaggerated symptoms of anxiety and depression.

References:

1 Bjelland I. et al.: J Psychosom Res 2002; 52(2): 69–77.
2 P Scragg et al.: Anaesthesia 2001; 56(1): 9–14.
3 JE Rattray et al.: Anaesthesia 2005; 60(11): 1081–92.

12AP3-2

Agreement in prescriptions between the anesthesiologist's ICU discharge and the surgeon's ward admission

M. Soler, E. Moret, E. López, L. Santos, M. Homs

Anesthesiology, University Hospital Germans Trias i Pujol, Badalona, Spain

Background and Goal of Study: Continuation of care instructions, including drug prescription, is an important issue on patient discharge from the intensive care unit to the ward. The aim of this study was to assess the degree of agreement between the anesthesiologist's prescriptions at the patient's discharge from the postoperative ICU and the surgeon's admitting prescriptions on the ward.

Materials and Methods: This retrospective, descriptive study included all consecutive discharge reports from the ICU, and the corresponding prescriptions on the ward, over a period of 2 months (September–October 2007). The level of agreement on prescription of the following 15 drug types was recorded: diuretics (D), corticosteroids (CST), antibiotics (ATB), gastric protectors (GP), bronchodilators (BD), anticoagulation/antiplatelet-drugs (AA), central-nerve-system drugs (CNS), antihypertensive drugs (antiHTA), nutrition (N), vitamin K (K), antiemetics (AE), analgesics (A), fluids (F), KCl, insulin therapy (IT). All surgical departments were included. All data were analyzed by the same investigators and are presented as percentages.

Results and Discussion: One hundred discharge reports were analyzed. Agreement on each variable was as follows: D 95.8%, CST 94.7%, ATB 92.8%, GP 90.8%, BD 86.3%, AA 85.5%, CNS 83.3%, antiHTA 80%, N 77.4%, K 75%, AE 69.5%, A 65.6%, F 48.4%, KCl 48%, IT 43.8%. Pain treatment was changed in 32.3% of the cases. General surgeons and urologists agreed with the anesthesiologist over 75% of the time.

Conclusion(s): The surgeon changed pain treatment for 1 out of 3 patients even though there were pain treatment protocols in our hospital. Among diabetics, 7% did not receive any IT prescription or instructions for glucose monitoring on the ward. It is necessary to pay more attention to continuity in providing

excellent postoperative ward care for patients with coexisting diseases and complex medication needs.

12AP3-3

Quality of life after postoperative major cardiac complication

V. Fernandes, M. Botelho, F. Abelha

Anaesthesiology, Hospital de São João, Porto, Portugal

Background and Goal of Study: Cardiovascular complications are associated with increased mortality and morbidity during the postoperative period resulting in longer hospital stay and higher treatment costs. Few studies have examined the dependency of patients and how they perceive their own health changes. The aim of the study was to evaluate quality of life in patients with postoperative major cardiac events and to study its determinants.
Materials and Methods: Observational, prospective study conducted in a post-anesthesia care unit (PACU) with 5 intensive care beds from March 2006 to March 2008. Patients were followed for the occurrence of major cardiac events (MCE). Data collected included patients demographics, intra and post-operative information, PACU and hospital length of stay and mortality. Patients were contacted 6 months after discharge to complete a Short Form-36 questionnaire (SF-36) and to have their dependency in Activities of Daily Living (ADL) evaluated. Chi-square or Fischer's exact test were used to compare proportions between groups. A't test' and a paired 't test'for independent groups was used for comparisons.
Results and Discussion: One thousand sixty five patients were admitted to the PACU after major non cardiac surgery. Twenty-six developed MCE. Among the 16 survivors at the 6 months follow-up, 12 completed the questionnaires. There were no differences when comparing ADL dependency before surgery and 6 months after PACU discharge. Thirty-one percent of patients reported that their general level of health was better on the day they answered the questionnaire than 6 months earlier. Patients had significantly worse SF-36 scores for all SF-36 domains except for role emotional and mental health when compared to a general urban population. These patients showed better SF-36 scores for physical function and role physical and worse scores for role emotional domain when compared to PACU patients that didn't develop MCE.
Conclusion(s): Six months after PACU discharge few patients that develop MCE consider that their general level of health improved after surgery although they are not more dependent in ADL activities than before. Patients that developed MCE showed worse scores in role emotional domain when compared with PACU population and general population but showed better scores in physical function and role physical than other PACU patients.

12AP3-4

Quality-of-life of patients that develop acute renal failure after major surgery

M. Botelho, V. Fernandes, F. Abelha

Anaesthesiology, Hospital de São João, Porto, Portugal

Background and Goal of Study: Recent data suggest that around 6% of patients in the ICU develop acute renal failure (ARF). This is a common problem occurring in about 1–5% after surgery and is known to be an independent predictor of poor in-hospital outcome. Most studies documenting beneficial outcomes after surgery are limited to mortality and morbidity rates, costs, and length of hospital stay (LOS). Only few studies have examined the dependency of patients and how they perceive their own health changes. The aim of the study was to evaluate quality of life in patients that develop ARF after major surgery and to study its determinants.
Materials and Methods: Observational, prospective study conducted in a post-anaesthesia care unit (PACU) with 5 intensive care beds from March 2006 to March 2008. All patients, admitted after major surgery, were followed for the development of ARF defined as creatinine blood levels higher than 20mgL-1 after PACU admission. Six months after discharge, these patients were contacted to complete a Short Form-36 questionnaire (SF-36) and to have their dependency in ADL evaluated. Chi-square or Fischer's exact test were used to compare proportions between groups. A't test' and a paired 't test'for independent groups was used for comparisons.
Results and Discussion: One thousand sixty five patients were enrolled to the study. Forty-four patients developed ARF (3.5%). Among 31 hospital survivors at 6 months follow-up, 21 completed the questionnaires. Fifty-two percent of patients reported that their general level of health was better on the day they answered the questionnaire than 12 months earlier. These patients had worse SF-36 scores for physical function, role physical and social functioning domains when compared to PACU patients that didn't develop ARF. Patients had worse SF-36 scores for all domains compared to a general urban population. Six months after PACU discharge, the Lawton Instrumental Activities of ADL Scale and the Katz Index of ADL did not demonstrate higher dependency scores. Eighty-one percent and 38% were dependent in at least one activity in instrumental and personal ADL, respectively ($P < 0.001$).
Conclusion(s): Patients that develop ARF improved self-perception of quality of life despite being more dependent. Their SF-36 scores were worse than those in an urban population. For physical and social domains they had worse scores than PACU patients that did not develop ARF.

12AP3-5

A mnemonic device to improve the completeness of admitting prescriptions in a postoperative intensive care unit

E. Moret, J. Giménez-Crouseilles, R. Castillo, L. Martínez-Gimeno, C. Llubià

Anaesthesiology, University Hospital Germans Trias i Pujol, Badalona, Barcelona, Spain

Background and Goal of Study: Treatment omission in intensive care units (ICU) is a major reason for malpractice suits and has a direct influence on quality of care. The aims of this study were to assess the completeness of prescriptions by the anaesthesiologist at patient admission to our postoperative ICU, to design and apply a mnemonic device for preventing treatment omissions and to find out if this device would be suitable for improving the quality of care.
Materials and Methods: Prospective, blinded, observational study in 3 phases: 1. June–December 2007: All consecutive patients staying at least one night in our ICU were included. We assessed the level of prescription completeness of the following 11 variables: **T**hrombosis prophylaxis, visual analogical scal**E** (VAS) score in awake patients or sedation-agitation-scale (SAS) score in intubated patients, **A**nalgesia, **M**onitoring, **F**luids, **A**ntibiotics, **S**tress ulcer prophylaxis, **H**ead position, **I**nsulin therapy and glucose level control, **O**xygen/ventilation, **N**utrition. 2. April 2008: A mnemonic device (including all variables) was created (**TEAMFASHION**) and distributed throughout our department. 3. June–December 2008: The results of implementing the device were evaluated. All data were analyzed and are presented as percentage of completeness. The Chi-squared test was used. Only significant p-values (<0.05) are presented.
Results and Discussion: We included 600 consecutive patients (300 patients in each phase). The levels of completeness for each variable in each phase are presented in the following table.

LEVELS OF COMPLETENESS (%)

	VARIABLES	FIRST PHASE	THIRD PHASE	p-value
T	hrombosis prophylaxis	79.7	92.5	<0.001
E	valuation of pain/sedation scale score	31.4	58.7	<0.001
A	nalgesia	94.1	97.8	0.019
M	onitoring	97.4	98.9	ns
F	luids	98.7	99.7	ns
A	ntibiotics	88.9	91.9	ns
S	tress ulcer prophylaxis	96.7	97.9	ns
H	ead	73.5	82.6	0.004
I	nsulin therapy and glucose control	86.6	93.3	0.003
O	xygen/ventilation	82.0	85.5	ns
N	utrition	59.6	71.8	0.001

ns = non significant

Conclusion(s): The use of pain and sedation monitoring scale scores in critical ill patients is still an important issue that should be improved. In the daily admitting instructions in our postoperative ICU our mnemonic device was useful for remembering and preventing treatment omissions, encouraging teamwork and improving the quality of critical care.
Reference:
1 Vincent JL. Give your patient a fast hug (at least) once a day. Crit Care Med 2005; 33: 1225–1230.

12AP3-6

Insomnia analysis of patients admitted in a postoperative care unit. Prevalence, evolution and associated risk factors

P. Hernández-Puiggròs, S. Beltran de Heredia, C. Garcia Bernedo, M. Sadurní Sarda, X. Santiveri Papiol

Anesthesiology, Reanimation and Pain Therapy, Hospital del Mar-Esperanza, Barcelona, Spain

Background and Goal of Study: In general population 30% of them have episodes of insomnia, being a chronic feature in 10% of them. It is associated with an increased postoperative morbidity and mortality, especially in old aged. It is also associated with an increase in oxygen consumption (VO2), cerebral metabolism, heart rate and cortisol levels.(1,2). The aim of the study is to review the prevalence, risk factors (environmental, somatic and psychological) and progression of insomnia in patients who stay in the postoperative care unit (POCU).
Materials and Methods: Prospective cohort study, that included 34 patients admitted for more than 24 hours in the POCU during a one month period.

Patients with psychiatric illness, cognitive deficits or who needed mechanical ventilation were excluded. Demographic and ambient data as well as the numeric visual scale for pain (NVS) were recorded. Two questionnaires (the Athens scale for insomnia (ATHENS) and the State-Trait-Anxiety-Inventory (STAIs)) were also filled in for each patient in the POCU and on day 4 post-surgery on the ward. Statistical analysis was performed with a Student's T test for paired data and with a Pearson's correlation. P values < 0.05.

Results and Discussion: 41,2% were women and 58,8% men. Mean age was 59 ± 16 years. Length of surgery was 159 ± 73 minutes. Pain management in 50% of patients was intravenous and 50% epidural. The reasons for disturbed sleep in the POCU were: noise 41,2%, nurse interventions 32%, pain 11,8%, anxiety 8,8%, position 2,9%, and excessive light 2,9%. The insomnia (ATHENS) was reduced from 9,6 ± 4,5 in the POCU to a 4,1 ± 2,7 in the ward, the last value being similar to the general population. STAI was also reduced significantly in the ward from 17,5 ± 10 to 10,2 ± 6,2, and the NVS was reduced from 2,5 ± 1,5 to 1,4 ± 1. Insomnia was correlated with anxiety presentation (RR 0,7) and pain (RR 0,4) in the POCU and in the ward too.

Conclusion(s): Patients admitted for more than 24 hours in a POCU present a higher level of insomnia, mostly due to a high anxiety levels, which could result in other somatic or environmental factors, especially noise, and pain have a huge effect on the occurrence of insomnia. A focus on pharmacological and psychological anxiolysis and also a good control of pain and environmental factors would be recommended.

References:

1 Rattray JE et al. Predictors of emotional outcomes of intensive care. Anaesthesia 2005 Nov; 60(11): 1085–92.
2 Roth T. Insomnia: definition, prevalence, etiology, and consequences. J Clin Sleep Med 2007 Aug 15;3 (5 Suppl): S7–10.

12AP3-7

Burnout syndrome in intensive care unit – Determinants and associated factors

V. Gherghina, G. Nicolae, I. Cindea, A. Balcan

Anesthesiology and Intensive Care, Emergency County Hospital, Constanta, Romania

Background and Goal of Study: Professional burnout is a psychological syndrome arising in response to chronic interpersonal stressors on the job. Burnot syndrome (BOS) has been described as an inability to cope with emotional stress at work or as excessive use of energy and resources leading to feelings of failure and exhaustion. The goal of our study is to assess the determinants and associated factors of burnout among physicians working in intensive care units (ICUs).

Materials and Methods: We conducted a postal questionnaire survey. The level of burnout was evaluated using validated instruments on the basis of the Maslach Burnout Inventory (MBI). Among 252 doctors contacted for the study, 239 returned questionnaires with complete Maslach Burnout Inventory data (90.48% response rate). We use a self – administered questionnaire for each physician working in the ICU. A covering letter outlining the purpose of the study along with a three-page questionnaire was sent to each participant. The covering letter stated that the purpose of the study was to better understand the feeling of intensivists and also explained that the responses would be anonymous. All statistics were performed with SPSS software. Data are expressed as means ± SD or as median with interquartile range (IQR) according to the distribution of the data. A p value less than 0.05 indicated significance.

Results and Discussion: Using the MBI, a high level of burnout was identified in 56.5% of the respondents. Depersonalization was observed in 37% of the responding intensivists. A high level of emotional exhaustion was present in 19% of the respondents. A low level of personal accomplishment was found in 39% of the respondents. In all, 39.5% of the respondents wanted to leave their jobs. This percentage was higher (51.4%) for the intensivists exhibiting a high level of burnout. Organizational factors were strongly associated with a higher MBI score. Workload and impaired relationships such as conflict with another colleague intensivist and conflict with a nurse were independently associated with a higher MBI score.

Conclusion(s): Approximately one-half of the intensivists presented a high level of burnout. Organizational factors, but not factors related to the patients, appeared to be associated with burnout. Areas for improvement identified in our study include conflict prevention and better management of end-of-life care. Interventional studies are needed to investigate these potentially preventive strategies.

12AP3-8

Interests of devices against noise and light to improve quality of sleep in Post-Operative Care Unit (POCU)

C. Lebard, M. Le Guen, I. Arnulf, O. Langeron

Anesthesiology and Critical Care Medicine, Hôpital Pitié-Salpêtrière – APHP, University Pierre et Marie Curie, Paris, France

Background and Goal of Study: Post-Operative Care Units are characterized by an important noisy level and bright stimulus during day and night due to its specific mission: to guarantee postoperative safety and analgesia with a very short length of stay. (1) This environment quite similar to an intensive care unit may disturb patients'rest, particularly in the case where they had to prolong their stay the night after the operation for medical reasons. (2). The aim of this study was to assess benefit of systematic use of devices against noise (earplug) and light (ocular mask) during the first postoperative night in POCU.

Materials and Methods: After ethical board approval, patients without any neurological or respiratory failure but that required an intensive medical supervision were prospectively included in this randomized study to compare postoperative sleep with or without specific devices. Sleep's assessment (quality and quantity) was conducted by three different methods: use of a subjective scale of sleep (Spiegel and MOSS), use of an objective but discontinuous measure of sleep by a nurse and use of an Actiwatch® that continuously (every 5 seconds) collected arm movements during night. (3). Data are expressed as mean ± SD and percentage ± CI95 and comparison between groups or between nights were given by T-Test or Chi2 and by ANOVA for repeated measures as appropriated (SPSS 10.0). p < 0.05 was statistically different.

Results and Discussion: 45 patients were included, mainly following an aortic surgery (85%). Significant differences were observed for subjective scale but not for actimetry as showed the following table. Every patient left the PACU at day 1 without any complication.

Postoperative quality of sleep.

	Control group (n = 23)	Ear/mask group (n = 22)
Spiegel (Night before surgery)	20,4 ± 4,6	19,9 ± 3,9
Spiegel (Night after surgery)	15,5 ± 5,3	20 ± 3,5*
Total sleep duration (min)	253 ± 129	319 ± 147
Wake-up numbers	8,1 ± 6,3	4,3 ± 4*
Need for a rest >15 min	95,2% [85–100>	55,6% [30–81]*
Fragmentation Index (actiwatch)	39 ± 15	36 ± 20

*for p < 0.05 in comparison with the control group.

Conclusion(s): A simple, non invasive and cheap measure as the systematic proposal of ear-plug and ocular mask revealed a significant increase in the quality of post-operative sleep. These devices should be worth generalizing in intensive care units.

References:

1 Allaouchiche B. et al. BJA. 2002;88:369–73.
2 Freedman NS. et al. AJRCCM. 2001;163:451–7.
3 Hays RD. et al. Sleep Med. 2005;6:41–44.

12AP3-9

Does hypoglycemia cause neurocognitive impairment after surviving critical illness?

B. Ellger, A. Dickmann, J. Reinholz, I. van den Heuvel, T. Duning

Anesthesiology and Intensive Care Medicine, University Hospital of Münster, Münster, Germany

Background and Goal of Study: Strict glycemic control in the critically ill is associated with a risk of hypoglycemia in daily clinical practice, even though sophisticated control-algorithms have been developed. The fear that subsequent neuroglycopenia might cause increased mortality and irreversible neurological deficits, discourages clinicians from implementing the concept and has let to preliminary cessation of clinical trials. However, scientific evidence is scarce since post-hoc multivariate analyses solely suggest a relation between hypoglycemia and increased mortality, no data exist for neurocognitive outcome.

Materials and Methods: In our case-control study we investigated whether hypoglycemia occuring during ICU-treatment accounts for neurocognitive impairment after discharge from hospital. With approval of the local ethical committee we identified patients between 18 and 80 years of age who developed hypoglycemia (glycemia below 40 mg/dl) on ICU in our university hospital between June 2003 and December 2007. Using predefined criteria (see http://clinicaltrials.gov) we identified a matching partner for each hypoglycemia-patient with comparable pathology but without an episode of hypoglycemia. Patients with documented preexisting cognitive impairment, psychiatric disorders, neurosurgical interventions, stroke and drug abuse were excluded. We performed a battery of standardized tests investigating several neuropsychological testing domains.

Results and Discussion: 4635 patients were screened. 193 patients developed hypoglycemia (4.2%), 38 of whom met inclusion criteria and were eligable for testing. Mortality after hospital discharge did not differ significantly between groups and no severe neurological handicap was detected in hypoglycemic patients surviving ICU. On neuropsychological testing, the results of both groups did not differ significantly in all but the visual-spatial-memory testing domain. Hypoglycemia-patients performed inferior in this test compared to

patients without hypoglycemic episode. Duration of hypoglycemia correlated with the severity of the deficit.

Conclusion(s): Our results point out that hypoglycemia during ICU treatment might cause, if any, a minor impairment of a specific neurocognitive domain. However, a persistend impairment of a complex cortical function might be triggered especially by prolonged episodes of hypoglycemia. Hence accurate control algorithms to avoid hypoglycemia should be ensued when strict glycemic control is implemented in ICU.

12AP3-10

Deprivation and admission to critical care after self-poisoning

K. Gallagher, G. Allum, D. Watson, M. MacDougall, D. Bateman

Medical School, University of Edinburgh, Edinburgh, Scotland, United Kingdom

Background and Goal of Study: A significant proportion of patients are admitted to critical care (CC) after self-poisoning. The association of socio-economic status and risk of admission to CC after self-poisoning (SP) is uncertain. This study assesses links between socio-economic status and SP using a continuous deprivation score and asks if socio-economic status predicts admission to CC after SP [1]. We also aimed to identify differences between deprivation groups in poisoned CC patients.

Materials and Methods: 4-year data (2004–2007) on SP hospital presentations in a defined geographical area were obtained from the National Poisons Information Service database (n = 8009). The gender standardised deprivation ratio (SDR) of this group to the general population of this area was determined. 272 of the SP hospital presentations were admitted to CC. The SDR of CC admissions for SP was calculated. A high or low deprivation group was defined as falling in the lower or upper two SIMD rank quintiles respectively. Data were also collected on SP patients from the CC WardWatcher database (1999–2007) (n = 337). In these patients agents taken were compared between high and low deprivation groups using chi-squared tests of association.

Results and Discussion: The SDR of total hospital admissions for SP to the general population was 358%. The SDR of patients in this group that were admitted to CC was 389%. In the WardWatcher database, patients from the high deprivation group were more than twice as likely to self-poison with sedatives as the low deprivation group (Odds Ratio = 2.29, 95% CI (1.091, 4.787), p = 0.03). 42.2% of poisoned CC patients took anti-depressants which tended to be used more often in the two most deprived quintiles (Odds ratio = 1.57, 95% CI (0.89, 2.76) p = 0.13).

Conclusion(s): High deprivation is 3.58 times more common in total SP patients and 3.89 times more common in those that require admission to CC than the general population. In poisoned CC patients, sedative use was significantly more common in the high deprivation group. Agents taken may account for the increased incidence of CC admission in high deprivation groups. Multivariate analysis will be required to confirm the reasons why deprivation predisposes to CC admission after SP.

Acknowledgements: SPIB. Scottish Poisons Information Bureau. Scottish Intensive Care Society Audit Group: WardWatcher database. Critical Care Unit, Royal Infirmary of Edinburgh.

Reference:

1 Scottish Index of Multiple Deprivation. Summary Technical Report. Edinburgh: Scottish Executive, 2006.

12AP3-11

Role of psychosocial factors in the long-term follow up after cardiac surgery

A. Szekely, A. Tóth, T. Breuer, Z. Cserép, R. Tóth

Department of Anesthesia and Intensive Care, Gottsegen György Hungarian Institute of Cardiology, Budapest, Hungary

Background and Goal of Study: In the last decade, psychosocial factors showed independent predictive value in the development of cardiovascular diseases. The role of these factors is also emphasized in the long-term result after cardiac surgery.

Materials and Methods: After informed patient consent and Institutional Review Board Approval, 180 patients undergoing cardiac surgery between July, 2000 and May, 2001 were prospectively followed. During the follow-up period patients were contacted annually by mail. Anxiety (Spielberger State-Trait Anxiety Inventory, STAI-S/STAI-T), depression (Beck Depression Inventory, BDI), number and reason of rehospitalization were assessed each year. Those patients who did not respond were contacted by telephone; national registries were searched in case of mortality. Univariate and multivariate logistic regression were used in the statistical analysis.

Results and Discussion: Seven patients died (3.8%) in the hospital and 35 patients (19.4%) died in the 7 year follow-up period. Among the medical and demographic factors, age, length of Intensive Care Unit (ICU) stay and need for reoperation showed independent relationship with mortality. After inclusion of psychosocial variables, ICU days (Odds ratio [OR] 1.22; 95% Confidence Interval [CI] 1.03–1.44), preoperative STAI-T (points; OR:1.09; 95%CI: 1.04–1.14) and school years (years, OR: 0.81; 95%CI: 0.64–0.95) remained in the model. The c-index increased from 0.74 to 0.86.

Conclusion(s): Our long-term follow up data suggests that assessment of psychosocial factors, particularly anxiety and education could further help in identifying patients at high risk after cardiac surgery.

Reference:

1 Thombs BD, de Jonge P, Coyne JC, Whooley MA, Frasure-Smith N, Mitchell AJ, Zuidersma M, Eze-Nliam C, Lima BB, Smith CG, Soderlund K, Ziegelstein RC. Depression screening and patient outcomes in cardiovascular care: a systematic review. JAMA. 2008;300:2161–71.

12AP4-1

Antibiotic prophylaxis for percutaneous tracheostomy: A survey of current practice in the United Kingdom

S. Hanna-Jumma, D. Higgins, J. Kinnear, M. Wright

Critical Care, Southend University Hospital NHS Foundation Trust, Westcliff on Sea, Essex, United Kingdom

Background and Goal of Study: Percutaneous tracheostomy (PT) has been reported to result in infective complications including bacteraemia[1] and nosocomial pneumonia[2]. Recently published National guidelines[3] do not, however, advise whether or not antibiotic prophylaxis (AP) should be given when PT is performed. We have undertaken this study to elucidate current practice in the United Kingdom.

Materials and Methods: The lead clinicians of 65 UK intensive care units responded to our on-line questionnaire. We asked: if their unit performed PTs, if they had antibiotic guidelines for PT, and if they gave antibiotics in 3 different PT scenarios (routine cases, if the patient was colonised with MRSA, and if the patient had respiratory tract colonisation as shown by positive sputum culture). We also asked if they were aware of patients developing infectious complications following PT and whether they would support giving AP routinely for PT.

Results and Discussion: 64 (98%) units performed PT but only 3 (5%) had a policy for AP. None routinely gave antibiotics but in the the presence of colonisation some units did prescribe antibiotic cover (Table 1). 26 units (40%) were aware of situations where their patients had developed infectious complications following PT but only 3 centres were in favour of routinely giving AP. Bacteraemia is a common complication of PT and the causative organisms come from the patients' colonised trachea or skin[1]. Nosocomial pneumonia is a second infective complication of PT and is associated with positive tracheal cultures[2]. On the basis of these reports it would seem prudent to administer AP but our survey has shown that this is not routine practice in the UK although some units do cover PT if bacterial colonisation is present.

Table 1. Response to: Would you give prophylactic antibiotics for PT in the following clinical situations?

Clinical situation	YES	NO
Routine PT	0 (0%)	65 (100%)
Patient colonised with MRSA	6 (9%)	59 (91%)
Positive sputum cultures	13 (20%)	52 (80%)

Conclusion(s): Despite reports documenting bacteraemia and pneumonia occuring after PT antibiotic prophylaxis is rarely used in UK centres.

References:

1 Bacteraemia following PT. Teoh N, Parr M, Finfer SR. Anaesthesia and Intensive Care 1997;25:354–7.
2 Incidence, etiology, and outcome of nosocomial pneumonia in ICU patients requiring PT for mechanical ventilation. Rello J et al. Chest 2003;124:2239–43.
3 Intensive Care Standards document, Care of adult tracheostomies, 2008.

12AP4-2

Effect of the bevel direction of puncture needle on complications during internal jugular vein catheterization

T. Lim, D. Hong, Y. Jeon, J. Bahk

Anesthesiology and Pain Medicine, Seoul National University Hospital, Seoul, Republic of Korea

Background and Goal of Study: Arterial puncture or hematoma formation are the most common immediate complications during the internal jugular vein (IJV) catheterization. If posterior wall puncture of IJV could be prevented, we intuitively thought that probability of common carotid artery puncture would

be reduced. This prospective randomized study was performed to assess if bevel-down approach of the puncture needle may decrease the incidence of hematoma and posterior wall puncture during the IJV catheterization.
Materials and Methods: 153 Patients requiring central venous catheterization were enrolled. They were randomized either to bevel-down group or bevel-up group. The patient was placed in the Trendelenburg position with the head turned to the left. A double-lumen central venous catheter was inserted by a modified Seldinger technique. Venous entry of the needle was recognized by return of venous blood: On advance (anterior wall puncture), or on withdrawal (posterior wall puncture). The cross-sectional and longitudinal views of the IJV were recorded to assess any complication. A *t*-test was used for comparison of continuous variables. A *chi*-square test was used for comparison of incidence of posterior wall puncture and complications. A *P*-value of < 0.05 was considered to be statistically significant.
Results and Discussion: In the bevel-down group, hematoma and posterior wall puncture (puncture on withdrawal) occurred in 1 of 75 subjects and in 16 of 75 subjects, respectively. In the bevel-up group, hematoma and posterior wall puncture occurred in 8 of 78 subjects and 11 of 78 subjects, respectively. The incidence of hematoma significantly decreased in the bevel-down group ($P = 0.045$). No significant difference was observed in the occurrence of posterior wall puncture ($P = 0.337$).
Conclusion(s): This study demonstrates that bevel-down approach may decrease the incidence of hematoma during the IJV catheterization than bevel-up approach.

12AP4-3

An index of clinical utility of fiberoptic bronchoscopy in an intensive care unit

L. Amado, L. Miranda

UCIP-Intensive Care Unit, Hospital dos Capuchos-Centro Hospitalar de Lisboa Central, Lisboa, Portugal

Background and Goal of Study: Fiberoptic Bronchoscopy (FOB) is a useful technique for the management of respiratory disease in the Intensive Care Unit (ICU). The aim of this study concerns the preliminary results of a FOB medical-surgical ICU registry with emphasis on clinical usefulness criteria.
Materials and Methods: A rectrospective analysis of 67 parameters registered in the clinical records of all patients submitted to FOB during their ICU stay from 2002 to 2007. Excluded were patients admitted in the ICU exclusively for short-term procedures. Demographic, diagnostic, therapeutic and follow-up data from each FOB patient were collected. The main indications for FOB patients were Pneumonia and Atelectasis (62 and 33% respectively). Mechanical ventilation was present in 79% of patients, with a 80% introduction by an endotracheal tube. Other factors, such as kind of anesthesia, complications and mortality were also studied. The clinical usefulness of the procedure was assessed by the interaction of four kinds of parameters: ***Indication***s (therapeutic; diagnostic; airway control); ***procedures*** (bronchial lavage (BL); broncho-alveolar lavage (BAL); biopsy; etc); ***results*** (atelectasis resolution; bleeding control; microbiological isolation; etc); ***clinical decisions*** (e.g. influence on antibiotic therapy). A Global Utility Index (GUI) was developed, with positive points given by positive results and positive influences on clinical decisions, and negative points given by complications. An interim consistency analysis demonstrated GUI fiability.

Annual Distribution of FOB

Year	2002	2003	2004	2005	2006	2007
Number	30	21	30	49	70	37
Clinical Utility (GUI ≥ 0)	22	18	22	40	47	26

Results and Discussion: GUI mean was 0.32, with a median 1, a minimum value of – 3 and a maximum value of 3; SD was 1.06. APACHE, TISSS, SAPS Scores were not related to GUI on univariate analysis; the same was true with age, ICU and Hospital mortality, year of study, anesthesia, and type of complication. GUI Score was positively correlated with atelectasis, BL, BAL ($p < 0,005$), Propofol use, and hematological malignancy ($p < 0,05$). It was inversely correlated with opioid and midazolam use ($p < 0,05$). It also pointed with a borderline significance to less clinical utility on 2006, which was the year with the largest number of procedures.
Conclusion(s): GUI is a simple method to track the clinical usefulness of FOB in ICU setting; it also allows quality control for this procedure.

12AP4-4

Early tracheotomy results in politraumatic patients on ICU

M. Kerci, M. Bajraktari, D. Muzha, B. Kurti, S. Horeshka

Anaesthesia & Intensive Care Unit, Military University Hospital – National Trauma Center, Tirana, Albania

Background and Goal of Study: Patients in intensive therapy, in subdivision to Pathology, yield in many invasive manipulations; from venous catheters, peripheral, central, intubation of oro/nasal-tracheal until repetitive tracheotomy or late tracheotomy for long mechanical ventilation (MV) or for difficult cases in the support of respiration of maxillary-facial trauma patients.
Materials and Methods: In the study of 503 tracheotomised patients during 2004–2008, I-st group 258 and II-nd group 245. 17 are maxillary-facial traumas. Report M/F as 5:1, average age of 29 years old. The tracheotomy is done in the intensive therapy setting and the procedure was done by anaesthetists-Intensivists care doctors. The tracheotomy was done on the 2nd to 3rd ring of the trachea. 258 patients were tracheotomised and the procedure used is the one used in Surgery.
Results and Discussion: From 4,626 patients admitted to the ICU, 3,197 or 69.1% are traumatic patients and 1,552 from these had a need for a MV where 32.4% were tracheotomysed. 17 patients were tracheotomysed directly when their oxygen was being supported with the use of Cricotirotomis. For I-st group the tracheotomies were accomplished by the 7th day, however for II-nd group it was accomplished after the 8th–14th day. The incidence of nosocomial pneumonia in I-st group was 40%; in II-nd group 72%, ($p = 0.037$), days lasting in MV; I-st group was 9–13 days (11 ± 5), II-nd group was 12–32 days (19 ± 6) ($p = 0.004$), days staying in the ICU; I-st group 12–26 days, II-nd group 14–42 days, mortality; I-st group 10% less than II-nd group. The trachea stricture 4 or 0.79%; 1 in I-st group and 3 in II-nd group.
Conclusion(s): The tracheotomy is recommended until the 7th day for damages in the maxillary-facial from the beginning, in coma with 3–4 GCS within 72 hours. A part of the complication has to do with the amount of time that the tracheotomy was done in. From this study, due to restriction, there are the intubation staying in too long, not being able to do the right amount of exercise to the ballon, or the ballons that are filled more than needed, the quality of tubes and tracheal canula, tracheal fragments and violent tracheal aspirations. Also value the formation of individual of conjunctive tissue, and formation of cicatrices.
Reference:

1 Blot F. et al. Early tracheotomy versus prolonged endotracheal intubation in unselected severely ill ICU patients. Intensive Care Med (2008) 34:1779–1787.

12AP4-5

Elective tracheostomy in patients undergoing transoral and transmaxillar approach to the skull base: Technique and impact on outcome

M. de Nadal, M. Argañaraz, A. Rodríguez, J. Serra, M. Noguer

Department of Anesthesiology and Intensive Care, Vall d'Hebron University Hospital, Barcelona, Spain

Background and Goal of Study: Airway protective reflexes after skull base surgery may not be optimal due to brain stem and cranial nerve deficits or because of tongue swelling. Tracheostomy provides an early alternative for airway protection and alleviates the need for mechanical ventilatory support in these patients. Although percutaneous dilatational tracheostomy (PDT) may be the procedure of choice compared to surgical tracheostomy, tube change to a fenestrated tracheostomy may be difficult in the first days before the stoma is well formed. The aim of this study was to review the elective PDT performed preoperatively in skull base surgical patients with regards to major and long term outcomes.
Materials and Methods: Orotracheal intubation (or awake fiberoptic intubation) followed by percutaneous dilatational tracheostomy (PDT) was performed in 7 patients undergoing elective skull base surgery, four of them with cervical immobilization by halo device. Preoperative PDT was performed using a with a 7.00 or 8.00 mm cuffed Portex tracheostomy tube and changed postoperatively to a 6.0 mm or 7.00 mm uncuffed fenestrated Shilley tube. We registered the incidences in tracheostomy, timing and incidences of tracheostomy tube change, and times of ICU discharge, decanulation, and hospitalization, as well as ward complications related to tracheostomy.
Results and Discussion: In spite of cervical immobilization, no incidences were recorded at tracheostomy placement. Mean time of tracheostomy tube change was of $2,1 \pm 0,7$ days (range 2–6). In all patients, the same skilled physician that performed the initial placement performed the procedure using a tube changer, being difficult in three patients (43%) and one of them required endotracheal intubation. Mean ICU stay was of $2,5 \pm 1,4$ days. Decanulation was accomplished at a median of 11 days (range 7–79), the incidence of cannula-related deaths was nul and the ward morbility was attributable to underlying conditions.
Conclusion(s): In patients undergoing skull base surgery, the tracheostomy technique represents a challenge because of cervical immobilization. In these patients, prophylactic preoperative tracheostomy is recommended mainly for airway protection and ICU discharge can be usually accomplished at the third

to fourth day after surgery, that is before tracheostomy stoma formation. We implemented a protocol that included preoperative insertion of a dual-cannula tracheostomy tube, which may be an advantage for long-term use outside the ICU and avoids tube exchange before stoma formation.

12AP4-6

Point-of-care monitoring of anticoagulation with rotational thrombelastometry (Rotem®) during continuous renal replacement therapy

E. Schaden, T. Benesch, D. Hoerburger, C. Spiss, S. Kozek-Langenecker

Anesthesiology, General Intensive Care, Pain Management, Medical University of Vienna, Vienna, Austria

Background and Goal of Study: Rotational thrombelastometry (ROTEM®) has not been used for monitoring heparinization during continuous renal replacement therapy (CRRT) in intensive care patients so far. Aim of this prospective observational study was to determine the correlation between ROTEM® test results, anticoagulant dose, aPTT and haemofilter lifespan in critically ill patients requiring CRRT.
Materials and Methods: Patients requiring renal replacement therapy at 5–8 bed intensive care units in the General Hospital of Vienna were included in the study. Anticoagulation was performed with unfractionated heparin and prostacyclin. Twice daily, blood was examined with routine coagulation tests in the central laboratory and with ROTEM® in the laboratory settings of the ICU. Heparin and prostacyclin dosages at the time of each blood collection and lifespan of each haemofilter were recorded. According to lifespan, haemofilters were retrospectively allocated into one of three groups: very short lifespan (1–12 hours), intermediate lifespan (12 to 24 hours) and long lifespan (24 to 72 hours).
Results and Discussion: 158 haemofilters in 31 patients were included in the study. There was a significant correlation between CT delta (CT INTEM–CT HEPTEM) and the heparin dose ($p = 0.04$). Regarding haemofilter lifespan aPTT, CT delta, and fibrinogen concentration were not different between the three groups. MCF delta (MCF EXTEM-MCF FIBTEM) was different between group 1 and 2 ($p = 0.02$) and group 2 and 3 ($p = 0.05$), but not between group 1 and 3 ($p = 0.18$). A significant indirect correlation between haemofilter lifespan and FIBTEM MCF was observed (group 1 and 2 $p < 0.0001$; group 2 and 3 $p < 0.0007$; group 2 and 3 $p = 0.04$).
Conclusion(s): Monitoring of heparinization during CRRT in critically ill patients is feasible with ROTEM®. With FIBTEM MCF ROTEM® also offers a value correlating with haemofilter lifespan. Future studies in intensive care patients should employ multiple testing in the ROTEM® using INTEM, HEPTEM, FIBTEM, and EXTEM.

12AP5-1

Quantifying the intensive care workload associated with the introduction of a bariatric surgical service to a UK hospital

G. Abuella, H. Murray, G. Slater, A. Kendall, M. Margarson

Bariatric Surgical Service, St Richard's Hospital, Chichester, West Sussex, United Kingdom

Background and Goal of Study: Bariatric surgery is an expanding speciality with resource allocation issues, especially in provision of critical care beds. We assessed the ICU workload implications during the first three years following the transfer of a bariatric service into our hospital.
Materials and Methods: A bariatric surgical database was cross-referenced to an ICU database (Ward-Watcher) to identify all admissions to our 10-bedded Critical Care Unit between May 06 and Dec 08, who had undergone any bariatric procedure in our hospital. For each patient identified, demographics, level of support, duration of stay and outcome were recorded.
Results and Discussion: 790 patients were operated on during this period (22% male). 767 patients underwent elective surgical procedures (425 gastric bypass, 298 banding procedures, 51 revisions and 6 hernia/apronectomy procedures). Two patients operations were not performed due to bronchospasm on induction. 21 patients (2.7%) underwent urgent or emergency procedures (14 endoscopies, 7 re-operations). The median BMI of all 790 patients was 51 (range 24–100), the median weight was 147kg (range 71–295). 105 patients (13.3%) received Critical Care Unit support following bariatric surgery. 79 (75%) of these patients were discharged within 24 hours. Ten patients required more than 48 hours of critical care support and utilised 56 of a total of 139 days of critical care (40%), only 3 of these patients were elective admissions. As a proportion of the total ICU workload during this 2.8 year period, the 139 days was 1.5% of total Critical Care Bed days. Eight patients were admitted ventilated, a further six were non-invasively ventilated. Two patients required haemofiltration and nine required inotropic support following admission. Two patients died on the ICU, both males with cardiogenic shock and multiple-organ failure, one at four days post-operatively, the other following re-admission to hospital. One further patient died of Thrombo-embolism at 26 days. All had undergone Gastric Bypass, giving a procedural 30-day mortality of 0.7%. There were no other deaths.
Conclusion(s): Unexpected ICU admission following bariatric surgery is rare. The highest risk patients were males with a centripetal (apple) shape and previous cardiac history. Most cases requiring critical care support can be identified from pre assessment clinic. The additional workload is around 1.5% of ICU bed days. Re-operation (usually for anastomotic leakage with associated peritoneal sepsis) was the highest single cause of emergency admission.

12AP5-2

Elective pre-cardiac surgical patients have greater levels of anti-staphylococcal antibodies compared with healthy volunteers

S. Giannaris, E. Bertoja, J. Holton, O. Nicholas, C. Hamilton-Davies

Department of Anaesthesia, The Heart Hospital (University College London Hospitals, NHS Foundation Trust), London, United Kingdom

Background and Goal of Study: Staphylococcal deep sternal wound infection or sepsis presents a significant increase in mortality and morbidity post-cardiac surgery (1). The objective of this prospective study was to determine whether the immunological profile of cardiac surgical patients differed from that of the general population.
Materials and Methods: Twenty five healthy volunteers were venesected 7ml blood. The clotted sample was centrifuged and the serum frozen at – 25°C for later measurement by ELISA assay of α-toxin and teichoic acid, two well recognised epitopes of the staphylococcus organism. Twenty one patients scheduled for routine cardiac surgery were venesected for similar analysis. A statistical analysis using the Bayes test was performed on the assumption the sample groups were representative.
Results and Discussion: From the results no healthy volunteer showed raised levels of α-toxin antibodies, which was significant different to 9 of 21 pre-operative cardiac surgical patients demonstrating high levels of α-toxin antibodies. Only 2 of 25 healthy volunteers showed high levels of antibodies to teichoic acid without statistical difference compared to 5 of 21 pre-operative cardiac surgical patients demonstrating high levels of teichoic acid antibodies. None of the pre-cardiac surgery group developed any evidence of post-operative wound infection or sepsis.

	α – – TOXIN			TEICHOIC ACID		
	negative	weakly positive	positive	negative	weakly positive	positive
HV	25/25	0/25	0/25	16/25	7/25	2/25
PS	9/21	3/21	9/21*	11/21	5/21	5/21

HV = Healthy Volunteers, PS = Pre-cardiac Surgery; * = significant difference HV vs PS (Bayes test, 99.99% confidence level)

Conclusion(s): The elevated levels of antibodies to α-toxin and teichoic acid in the pre-cardiac surgical group may imply a recent exposure to staphylococcus which may have occurred at the time of cardiac catheterisation. This may indicate inadequate aseptic procedures at catheterisation but equally may confer protection from post cardiac surgery staphylococcal infection.
Reference:
1 Jonkers, D., T. Elenbaas, et al. (2003). "Prevalence of 90-days postoperative wound infections after cardiac surgery." Eur J Cardiothorac Surg 23(1): 97–102.

12AP5-3

Alterations in determination of potassium in extreme thrombocytosis

B. Martinez Tasis, B. Fernandez Torres, E. Ramos Martinez, D. Toro Ibañez, M. De las Mulas Bejar

Anesthesia, Virgen Macarena Hospital, Seville, Spain

Background and Goal of Study: Pseudohyperkalemia is defined as an elevation of the seric potassium without human or technical mistakes in the extraction or manipulation of the sample, but that does not reflect the real condition of the patient. Seric potassium can be artificially high when the blood sample contains a high number of platelets, because of a liberation of potassium is produced during the formation of the clot.
Materials and Methods: Retrospective study comparing the numbers of seric and plasmatic potassium in three cases of reactive extreme thrombocytosis, which have taken place in the last year in our Postoperative Recovery Unit. We realize a comparison between the numbers of seric potassium in laboratory with the values determined in plasma by gasometric extraction, valuing the influence of the different levels of platelets. We established three groups: normal

(150.000–450.000/μL), thrombocytosis (450000–999000/μL) and extreme thrombocytosis (>1000000/μL), using ANOVA for the comparison between them.

Results and Discussion: 45 simultaneous determinations of seric and plasmatic potassium were evaluated; in 7 of them the numbers of platelets were normal, in 22 there was thrombocytosis and in 16, extreme thrombocytosis. Although differences between seric and plasmatic potassium increases progressively in relation to the number of platelets (0.24 ± 0.18 when they were normal, 0.35 ± 0.38 in thrombocytosis and 0.58 ± 0.46 in extreme thrombocytosis), there is not exist significant difference between the groups. In the group of extreme thrombocytosis the gasometrics extractions showed 4 determinations of pseudohyperkalemia and 3 cases of hypopokalemia not detected by the analytical conventional one. DISCUSSION. The hyperkalemia that takes place during the extraction and manipulation of the sample for technical or human mistakes is easily identifiable on having repeated the determination. Nevertheless, in the pseudohyperkalemia, the numbers of seric potassium will be falsely high though they repeat themselves of correct form. In normal conditions, the seric concentration of potassium is 0.2 mEq/L higher than the plasmatic one. The diagnosis of pseudohyperkalemia is confirmed when the difference is higher than 0.4 mEq/L in presence of a high level of potassium. If we don't know the possibility of a pseudohyperkalemia we can begin wrong treatments which lead to a real hypokalemia.

Conclusion(s): It is recomendable to confirm the numbers of seric potassium from the laboratory when there is thrombocytosis, overall in extreme thrombocytosis.

12AP5-4

Poor initial graft function combined with high levels of tacrolimus results as an independent risk factor for acute renal failure after liver transplantation

R. Ortego, L. Gajate, B. Alonso, J. Garcia, A. Moreno

Anesthesiology, Puerta de Hierro Majadahonda Hospital, Majadahonda, Madrid, Spain

Background and Goal of Study: Acute Renal Failure (ARF) is a common complication in the postoperative period after Orthotropic Liver Transplantation (OLT). It usually appears early after transplant and most of the patients recover from it, but it has significant implications in patient outcomes. The etiology of ARF post-OLT is multi-factorial. Our study focuses on two postoperative risk factors: tacrolimus blood levels (TBL) and poor initial graft function (PIGF).

Materials and Methods: Retrospective analysis of the prospective database of the Department of Anesthesia of a third level hospital in Madrid (Spain) of all liver grafts transplanted between 2002 and 2007. We analyzed 173 of 212 patients (39 patients were excluded: retransplantations, previous hemodialysis, fulminant hepatitis and hepatorenal Syndrome). Our patients were divided in 2 groups: ARF and non-ARF. We took ARF definition according to RIFLE criteria. PIGF is defined as 48h Prothrombin Activity (PA) < 75%. We analyzed preoperative, intraoperative and postoperative variables, including comorbidities. In order to combine PIGF and TBL, patients were divided in 4 groups: Group 1 (PA < 75%, TBL > 15ng/dL), Group 2 (PA < 75%, TBL < 15ng/dL), Group 3 (PA > 75%, TBL > 15ng/dL, Group 4 (PA > 75%, TBL < 15ng/dL)

Results and Discussion: We analyzed 173: those with ARF (37%) more frequently presented ($p < 0.05$): Cirrhosis, > MELD, < levels of albumin, Child–Pugh C, Hepatic Encephalopathy, Reperfusion Syndrome, Reintervention, Primary graft failure, PIGF, Group 1, Group 2. In the multivariate analysis, 4 independent risk factors for ARF were found: preoperative > MELD (OR 1.05 (1.04–1.16)), PIGF (OR 3.79 (1.77–8.14)), reintervention (OR 2.7 (1.16–6.26)), Group 1 (OR 5.4 (1.7–17.29)). Discussion: We evaluated perioperative factors that may predict ARF after OLT. We focused on TBL and PIGF because besides the physiological mechanism, there are already many studies showing close relationship between immunosuppressive therapies and renal injury, as well as the well known hepatorenal syndrome. Our study clearly confirms that relationship. We also found higher 1 month and 1 year survival in non-AFR patients ($p < 0.0001$).

Conclusion(s): In our experience we identified that PIGF combined with high BLT results as an independent risk factor for ARF after liver transplantation. This conclusion may allow us to take any measure to improve graft care and, if PIGF occurs, try to avoid high levels of anticalcineurinics.

12AP5-5

Postoperative major cardiac events

M. Botelho, V. Fernandes, F. Abelha

Anaesthesiology, Hospital de São João, Porto, Portugal

Background and Goal of Study: Cardiovascular complications are associated with increased mortality and morbidity during the postoperative period resulting in longer hospital stay and higher treatment costs. The aim of the study was to identify predictors of major cardiac complications after major noncardiac surgery.

Materials and Methods: Observational, prospective study conducted in a post-anaesthesia care unit (PACU) with 5 intensive care beds from March 2006 to March 2008. All patients admitted after major sugery, were followed for the occurrence of major cardiac events. We have also recorded PACU and hospital length of stay (LOS) and mortality. Assessment of the relation between each variable and major cardiac event was made by univariate analysis performed by simple logistic regression. Outcome was compared between patients with MCE and without MCE.

Results and Discussion: One thousand sixty five patients were enrolled in the study. Twenty-six developed MCE. Age (OR 2.65, 95%CI 1.11–6.35, $p = 0.029$ for age ≥ 65 years), ASA physical status (OR 4.24, 95%CI 1.74–10.34, $p = 0.001$ for ASA IV/V patients), high-risk surgery (OR 4.24 95%CI 1.74–10.34, $p = 0.009$), coronary heart disease (OR 7.17, 95%CI 3.09–16.65, $p < 0.001$), congestive heart failure (OR 13.39, 95%CI 5.32–33.69, $p < 0.001$), total RCRI score (OR 2.78, 95%CI 2.01–3.83, $p < 0.001$), hypertension (OR 12.28, 95%CI 2.88–52.32, $p = 0.001$), dyslipidemia (OR 2.46, 95%CI 1.09–5.52, $p = 0.030$), intraoperative amount of erythrocytes and fresh frozen plasma administered (OR 1.230, 95%CI 1.13–1.49, $p < 0.001$ for erythrocytes and OR 1.24, 95%CI 1.03–1.50, $p = 0.023$ for fresh frozen plasma) and SAPS II scores (OR 1.05 95%CI 1.03–1.07, $p < 0.001$) were considered independent predictors for development of MCE. For MCE group of patients, PACU and hospital mortality was 11% (3 patients) and 23% (6 patients) respectively. These patients had higher PACU LOS (OR 1.08, 95%CI 1.03–1.14, $p = 0.005$), higher PACU mortality (OR 5.6, 95%CI 1.50–18.47, $p = 0.01$) and higher hospital mortality (OR 5.51, 95%CI 2.14–14.19, $p < 0.001$).

Conclusion(s): This study shows that age, ASA physical status, severity of disease, presence of comorbidities, RCRI scores and some RCRI factors, intraoperative erythrocytes and fresh frozen plasma administered are risk factors for the development of MCE. Patients that develop MCE had higher PACU LOS and higher mortality.

12AP5-6

Elective abdominal aortic aneurysm repair – Do we need ICU care postoperatively?

B. Misztal, A. Makowski

Anaesthetics, Critical Care and Pain Medicine, Medway NHS Foundation Trust, Gillingham, Kent, United Kingdom

Background and Goal of Study: In UK hospitals almost 56% patients are treated on ICU after elective Abdominal Aneurysm Repair (AAA). In our hospital a number of operations are still cancelled due to insufficient ICU bed availability prior to surgery.

Materials and Methods: We investigated AAA repairs performed at our hospital in 2007. Demographics, co-existing diseases, aneurysmal diameter (AD) and level, and predicted peri-operative risk (ASA and POSSUM) were recorded. We also measured blood loss during surgery and requirement for blood products transfused (BPT) and analysed Hb, PLT, PT, APTT before (B) and after surgery (AS). We also recorded duration of ICU stay, post operative treatment and complications.

Results and Discussion: We performed 40 operations (37 males and 3 females), mean age 70.67 ± 7.75. Relevant co-morbidities included: hypertension 68%, smokers 68%, raised cholesterol 58%, IHD 30%, previous MI 20%, CABG 10%, COPD 18%, CVA 12%, NIDDM 8%, CRF 8%. AD was 5.4–10 cm (6.66 ± 1.26). All AAAs were infra-renal. Mean ASA score was 2 and V-POSSUM score was 20 (predicted morbidity 67 ± 15.77%, mortality 7.61 ± 6.08%). Blood loss 1.87 ± 1.82 ltrs. Blood product transfused: PRC 1.57 ± 3.1 U, FFP 0.45 ± 1.22U, Cell Saver 784.28 ± 289.13mls. Thirty two pts were extubated immediately. Post operatively 35 pts (87.5%) were transferred to ICU and 3 (7.5%) to HDU. Complications: Pneumonia 12%, ARF 6%, MI 3%, LVF 3%, AF 2%. Six pts (15%) were ventilated for 2.72 ± 8.48hrs. Three pts (7.5%) required inotropic support. Two pts (5%) required hemofiltration. Mean ICU stay was 2.27 ± 8.48days.

Blood result are shown as mean ± SE

	Before operation	After operation
Hb	13.95 ± 1.32	11.06 ± 1.31
PLT	243.175 ± 61.54	183.23 ± 69.19
PT	14.86 ± 2.81	18.19 ± 5.85
APTT	28.19 ± 5.91	33.49 ± 11.95

Conclusion(s): Complication rate was high but lower than predicted using V POSSUM score. Blood loss and transfusions did not impair coagulation in our

group of patients. Most of the patients did not require mechanical ventilation and could be treated on HDU post operatively.

Reference:

Abdominal Aortic Aneurysm: A service in need of surgery?–A report of the NCEPOD 2005

12AP5-7

Determinants of postoperative acute renal failure

M. Botelho, V. Fernandes, F. Abelha

Hospital de São João, Department of Anaesthesiology, Porto, Portugal

Background and Goal of Study: Development of Acute Renal Failure (ARF) during perioperative period is associated with increases in morbidity and mortality. The aim of the study was to investigate the incidence and risk factors for postoperative acute renal failure after major noncardiac surgery among patients with previously normal renal function.

Materials and Methods: Observational, prospective study conducted in a post-anaesthesia care unit (PACU) with 5 intensive care beds from March 2006 to December 2008. All patients, admitted after major surgery, were followed for the development of ARF defined as creatinine blood levels higher than 20mgL–1 after PACU admission. Patients' demographics, intra and postoperative data were collected. We have recorded PACU and hospital length of stay (LOS) and mortality. Patient preoperative characteristics, intraoperative management and outcome were evaluated for associations with ARF using univariate analysis with a logistic regression model.

Results and Discussion: One thousand sixty five patients were enrolled to the study. Forty-four patients developed ARF (3.5%). Age (OR 2.22, 95%CI 1.22–4.53, $p = 0.011$ for ≥ 65 years), type of surgery (OR 2.34, 95%CI 1.26–4.36 $p = 0.007$ for emergency surgery), high risk surgery (OR 3.18, 95%CI 1.62–6.23, $p = 0.001$), ischemic heart disease (OR 2.16, 95%CI 1.17–4.00, $p = 0.014$), congestive heart disease (OR 4.39, 95%CI 2.39–8.06, $p < 0.001$), ASA physical status (OR 2.98, 95%CI 1.39–6.38, $p = 0.005$ for ASA IV/V patients), RCRI score (OR 1.74, 95%CI 1.36–2.21, $p < 0.001$), amount of perioperative crystalloids and colloids administered (OR 1.21, 95%CI 1.06–1.38, $p = 0.004$ for crystalloids and OR 1.98, 95%CI 1.09–3.61 $p = 0.026$ for colloids) were considered independent predictors for development of ARF. Patients that developed ARF had higher SAPS II scores (OR 1.07, 95%CI 1.05–1.09, $p < 0.001$), higher PACU LOS (OR 1.07, 95%CI 1.02–1.13, $p = 0.009$), higher PACU mortality (OR 8.70, 95%CI 3.55–21.31, $p < 0.001$), higher hospital mortality (OR 4.15, 95%CI 1.85–9.32, $p = 0.001$ and higher mortality at 6 months follow-up (OR 2.40, 95%CI 1.13–5.12, $p = 0.023$).

Conclusion(s): This study shows that age, high risk surgery, ischemic heart disease, congestive heart disease, ASA physical status, RCRI score and amount of fluids administered during surgery are risk factors for the development of ARF in the first 24 hours in patients needing intensive care after surgery. ARF has serious impact in PACU length of stay and in hospital and PACU mortality.

Reference:

Kheterpal S, et al. Anesthesiology. 2007 Dec;107(6):892–902.

12AP5-9

Anaesthetic management of brain dead for organ donation: Impact on delayed graft function after kidney transplantation

L. Muller, C. Boutin, F. Vachiery-Lahaye, P. Perrigaut, J. Lefrant

Anesthesia and Intensive Care, University of Medicine Nîmes Montpellier, Nîmes, Gard, France

Background and Goal of Study: Few data are available on anaesthetic practices during organ retrieval in brain dead donors. The aim of this study was to describe current anaesthetic management of the brain dead donor for organ donation and to assess its impact on delayed kidney graft function (DGF).

Materials and Methods: To achieve this retrospective multicenter study, each donor files were reviewed in Languedoc-Roussillon, France, between 01/01/2005 and 31/12/2007. Donor demographic characteristics, expanded donor criteria, length of stay in the intensive care unit, duration of brain death, respect of recommended cold ischemia time, preoperative and intraoperative management, type of anaesthesia, hemodynamic and respiratory parameters during organ retrieval, and impact of anaesthetic drugs on DGF were analysed.

Results and Discussion: On 165 files, 149 were available. There were no differences in demographic characteristics, IGS score, expanded donor criteria, calculated creatinine clearance on admission between the anaesthesia group (group A) and the no-anaesthesia group (group NA). During the preoperative period, group NA received more blood transfusion ($p = 0.03$), adrenal and thyroid hormone replacement therapy, and antibiotics ($p < 0.01$). During organ retrieval, 62% of donors received anaesthetics drugs. In patients who received anaesthetic drugs, 72% of donors received only opioids. The number of organs retrieved, blood transfusions, catecholamine, desmopressin and corticoid use was similar in both groups. In group A, donors received significantly more colloids and neuromuscular blocking agents ($p < 0.01$), duration of brain death was significantly shorter ($p = 0.01$), maximal heart rate ($p = 0.02$), and heart rate at surgical incision ($p = 0.03$) were higher. In group NA, the mean arterial pressure (MAP) was more frequently maintained > 65mm Hg ($p < 0.01$). There were no difference in maximal MAP. Univariate analysis showed BMI ($p = 0.03$) and low organ retrieval ($p = 0.04$) as risk factors. Independent risk factors of DGF included absence of HES infusion during the preoperative period and mechanical ventilation without PEEP. Neither univariate analysis nor multivariate analysis showed that anaesthesia influences DGF.

Conclusion(s): Two thirds of organ donors received anaesthetics drugs during organ retrieval, most frequently consisting of a single opioid dose. Administration of opiods leaded to lower intra operative MAP without lowering maximal MAP. Use of anaesthetic agents in brain-dead donors for organ retrieval do not favourably influence DGF.

12AP5-10

Relation between sequential organ failure assessment score and outcome after cardiac surgery

D. Filipescu, M. Luchian, A. Calugareanu, O. Ghenu, I. Marinica

Cardiac Anesthesia and Intensive Care Unit, Institute of Cardiovascular Diseases "Prof. Dr. C. C. Iliescu", Bucharest, Romania

Background and Goal of Study: Preoperative risk algorithms are widely used in the practice of cardiac surgery. However, there is a lack of well validated, widely accepted postoperative intensive care unit (ICU) outcome prediction scores for cardiac surgical patients (1). After the operation, certain factors affecting the patient might be downgraded and new issues raised. The aim of our study was to examine the Sequential Organ Failure Assessment (SOFA) score as a predictor of in-hospital mortality and ICU length of stay (LOS) after cardiac surgery.

Materials and Methods: A prospective study of 302 consecutive patients entering a single cardiac postoperative ICU was conducted during the year 2007. The European System for Cardiac Operative Risk Evaluation (EuroSCORE) of each patient was assessed preoperatively. SOFA was calculated at admission in ICU and daily for a maximum of 7 days or until ICU discharge. Maximum SOFA during the first 3 days and maximum SOFA were calculated. In-hospital mortality and ICU-LOS were registered. Predictive power regarding in-hospital mortality was assessed by receiver operating characteristic (ROC) curve analysis. Correlation between SOFA scores, the EuroSCORE and ICU-LOS were assessed using the Spearman nonparametric test.

Results and Discussion: The correlation coefficient between the EuroSCORE and maximum SOFA during the first 3 days and maximum SOFA were low ($r = 0.373$ and 0.379 respectively, $p < 0.01$ and $p < 0.01$). Maximum SOFA during the first 3 days and maximum SOFA predicted in-hospital mortality (area under the curve, 0.967 and 0.965 respectively). Maximum SOFA during the first 3 days and maximum SOFA correlated with the ICU-LOS ($r = 0.618$ and 0.624 respectively, $p < 0.01$ and $p < 0.01$). Additive EuroSCORE was a low predictor for in-hospital mortality (area under the curve, 0.711) and ICU-LOS ($r = 0.457$, $p < 0.01$).

Conclusion(s): In our single cardiac postoperative ICU study, the SOFA score system demonstrated a significant correlation with the in-hospital mortality and ICU-LOS. The predictive power of the additive EuroSCORE for in-hospital mortality and ICU-LOS was lower than SOFA score. For optimal postoperative scoring system in the evaluation of cardiac surgical patients, larger studies should be performed.

Reference:

1 Patila T. et all, Relation of the Sequential Organ Failure Assessment Score to Morbidity and Mortality After Cardiac Surgery, Ann Thorac Surg 2006;82:2072.

12AP6-2

Preoperative and postoperative enteral immunonutrition in patients with gastrointestinal cancer

S. Vukosavljevic, T. Randjelovic, D. Pavlovic, J. Danojlic

ICU, KBC Bezanijska Kosa, Belgrade, Serbia

Background and Goal of Study: The study investigates the effect of preoperative and postoperative immunonutrition diet (glutamine granule preoperative and Reconvan postoperative) (IN) versus standard enteral nutrition (EN) on the nutritional status and immunity of patients with gastrointestinal (GI) cancer and incidence of postoperative complication.

Materials and Methods: 40 patients with GI cancer were randomly divided into 2 groups, IN and EN. Diet started 5 days before surgical procedures and continue the first postoperative day through percutaneus jejunostomy in IN group with immunonutrition and in EN group with standard enteral nutrition.

Preoperative every patient was measured in body weight, body height and body mass index (BMI), and using laboratory tests we established the levels of albumine, transferine, blood urea nitrogen (BUN) and creatinine. On the 3 and 9 postoperative day we repeated the same laboratory tests.

Results and Discussion: There were no significant differences in the immunological and nutritional variables between the 2 groups preoperatively. Patient recovery is faster in IN group. Average patient stay in ICU was 5 ± 1 days (IN) vs. 7 ± 2 days (EN). Average hospital stay was 16 ± 3 days (IN) vs. 22 ± 3 days (EN). Peristalsis was detected on the third day average (IN) vs. 4.5 days (EN). Decrease in pulmonary complications was achieved in IN group (1 pleural effusion) vs. EN group (5 pleural effusions). Laboratory tests show that patients in IN group are in lower catabolism compared to EN group Serum concentrations of both albumin and transferin to be significantly lower in the EN group than in the IN group between day 3 and day 9 ($p < 0.05$).

Conclusion(s): Preoperative immunonutrition diet (glutamine granule) and postoperative immunonutrition through jejunostomy in patients with GI cancer improves nutritional status and immunity, and decrease the incidence of postoperative complications and infections.

Acknowledgements: Enteral immunonutrition is efficient and safe method of patient nutrition with less postoperative complications, and also accounts for hospital costs decrease significantly.

References:

1 Delaney HM, Carenevale NH, Garvey JW. Jejunostomy by a needle catheter technique. Surgery 1973;73:786–945.
2 Moore EE, Jones TN. Benefits of immediate jejunostomy feeding after major abdominal trauma: a prospective randomized study. J Trauma 1986;26:874–81.
3 Braga M, Giannoti L, Radaelli G et al. Perioperative immunonutrition in patients undergoing cancer surgery: results of a randomized double-blinded phase 3 trial. Arch Surg 1999;134:428–433.

12AP6-3

Gastric emptying in critically ill trauma patients using a novel motility capsule

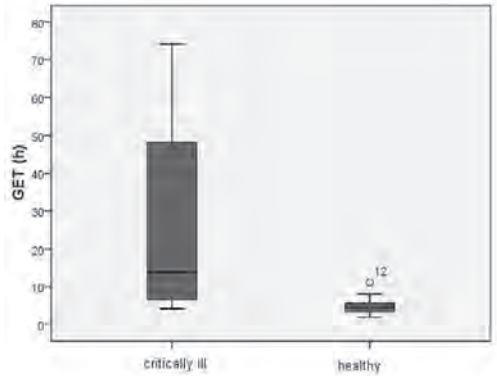
S. Rauch, K. Krueger, A. Turan, N. Roewer

Anesthesiology, University of Wuerzburg, Wuerzburg, Germany

Background and Goal of Study: The aim of this study was to investigate the gastric emptying time (GET) using a novel wireless motility capsule in trauma patients with intracranial hemorrhage. We hypothesized that gastric emptying is delayed.

Materials and Methods: We recruited 8 trauma patients with intracranial hemorrhage (6M/2F, mean age 40 yrs, APACHE III score 41 ± 7, GCS 8 ± 2) who were intubated, mechanically ventilated, sedated, older than 18 years in this prospective, controlled, IRB-approved trial. The historical control group consisted of 81 healthy volunteers studied in a separate trial (1). A pH, pressure and temperature sensing capsule (SmartPill™) was positioned with a capsule delivery device (AdvanCE™, US Endoscopy) into the patients stomach. The data were transmitted to a recorder attached to the patient's abdomen. The data were analyzed by two independent observers.

Results and Discussion: There was a significant difference ($p < 0.05$) in gastric emptying time for ICU patients 28.8 ± 31.3 hours (mean ± SD) and healthy volunteers 3.3 ± 1.1 hours (Fig. 1). There was no difference in sedation and analgesia consumption between the ICU patients. None of the patients received any prokinetic medication.



Conclusion(s): Gastric emptying is significantly delayed in major trauma patients compared to healthy volunteers.

Reference:

1 Protocol #122205 – "Assessment of Whole Gut Transit Time Using The SmartPill Capsule: A Multicenter Study".

12AP6-4

Tight glucose control in post-operative intensive care unit. Strategy for easy and quick implementation

F. Semeraro, N. Cilloni, A. Giovannitti, A. Franchini, E. Cerchiari

Anaesthesia and Intensive Care, Ospedale Maggiore, Bologna, Italy

Background and Goal of Study: Several recent studies identify the development of hyperglycemia as an important risk factor in terms of mortality and morbidity of critically ill patients[1].

Materials and Methods: In 2006 we implemented a tight glucose control strategy in our postoperative intensive care. We revised international literature and we choose to test two pubblished protocol. We selected protocol A[2] with a target range of 4–7 mmol/L and protocol B[3] with a target range of 5.5–7.7 mmol/L and we tested in november 2006 and december 2006. We collected 513 glucose sample for protocol A and 242 glucose sample for protocol B. We analysed patients data and nurses work. Finally we decided to use protocol A. Morover We organized distance control of application of algorithm in november 2006, febraury and July 2007 and September 2008 without informed nurses about it.

Results and Discussion: We compared the data that were collected in table 1.

Table 1. Protocol A: November 2006, Febraury and July 2007

	Nov 2006	Feb 2007	Jul 2007
Patients Enrolled	15	56	62
Age (average)	66,13	70	67
SAPS (average ± sd)	32.73 ± 11.87	42 ± 15.70	37.38 ± 16
BMI	1.80 ± 0.21	1.81 ± 0.21	1.78 ± 0.22
Correct alg. application	70%	74%	73%
Diabetic patients (%)	26%	25%	51%
Rilevations number	513	959	1289
BG (average ± sd)	6.2 ± 2.1	6.1 ± 2	6 ± 1.9
BG (median)	5.8	5.8	5.7
Range 4.4–6.1 mmol/L	40,54%	44,24%	41.93%
BG > 11.1 mmol/L	4,28%	2,8%	2%
BG < 2.2 mmol/L	0,58% (3)	0,41% (4)	1% (13)
BG < 3.3 mmol/L	3,31% (17)	2,9% (28)	4,88 (63)

Conclusion(s): We implemented tight glucose control with progressive involvement of all intensive care personell. Afterwards we decided to implement actual protocol with computer-assisted glucose control protocol to ameliorate nurses work.

References:

1 Krinsley JS: Effect of an intensive glucose management protocol on the mortality of critically ill adult patients. *Mayo Clin Proc* 2004, 79:992–1000.
2 Laver S, Preston S, Turner D, McKinstry C, Padkin A. Implementing intensive insulin therapy: development and audit of the Bath insulin protocol. Anaesth Intensive Care. 2004 Jun;32(3):311–6.
3 Goldberg PA, Siegel MD, Sherwin RS, Halickman JI, Lee M, Bailey VA, Lee SL, Dziura JD, Inzucchi SE. Implementation of a safe and effective insulin infusion protocol in a medical intensive care unit. Diabetes Care. 2004 Feb;27(2):461–7.

12AP6-5

Selective decontamination of digestive tract: Meta-analysis

B. Milicic, B. Milakovic, M. Dostanic, J. Mijic, L. Soskic

Institute of Anaesthesia, Clinical Center of Serbia, Belgrade, Serbia

Background and Goal of Study: Selective decontamination of the digestive tract (SDD) is an antibiotic prophylaxis developed in order to control infection in mechanically ventilated patients. A meta-analysis study of SDD was undertaken to evaluate the impact of this procedure on pneumonia, mortality, duration of mechanical ventilation (MV) and intensive care unit (ICU) stay.

Materials and Methods: Variability among the studies in calculation of the aggregate value of the effect size is achieved by choosing a model with a random effect (for odds ratio (OR) and standardised mean difference (SMD)) in meta-analysis for the observed outcomes. The assessment of result consistency is done by introducing the I^2 statistic value. Funnel plot was used to evaluate bias among studies in this meta-analysis. Because of its limits, it is supplemented by linear regression models that are also used to estimate asymmetry and bias. An estimated treatment effect may be biased if some randomised participants are excluded from the analysis. We checked that using intetion-to-treate analysis.

Results and Discussion: Obtained results show that SDD is efficient in prevention of nosocomial pneumonia (OR = 0,36; 95% confidence interval (CI) 0,26–0,49; I^2 = 69,4%) and reduction of mortality (OR = 0,79; 95%CI 0,69–0,89; I^2 = 2,7). A positive effect of SDD was not observed with parameters such as duration of mechanical ventilation (SMD = – 0,10; 95%CI – 0,22–0,01; I^2 = 39,3%) and ICU stay (SMD = – 0,10; 95%CI – 0,21–0,01; I^2 = 66,2%). We

don't found statically significant funnel plot asymmetry. In all study, there we have not avaliable casses, participitans are excluded before randomisation.

Conclusion(s): Existing findings about efficiency of SDD use are confirmed by this meta-analysis as well. Interpretation of the results of this meta-analysis has to take into consideration its clinical use, as well as already identified degree of inconsistency among studies, which is a result of contradictory results incorporated in the study, inconsistent methodologically quality, varying subject-specific characteristics and present risk factors, different SDD protocols, as well as incomplete variable description.

References:

1 de Smet A.M., Bonten M.J. Selective decontamination of the digestive tract. Current Opinion in Infectious Diseases. 2008; 21(2): 179–183.
2 Akobeng A.K. Understanding systematic reviews and meta-analysis. Archives of disease in Childhood. 2005; 90(8): 845–8.

12AP6-6

The interaction of direct current potentials with traditional diagnostic criteria of water balance disorders

I. Zabolotskikh, T. Musaeva, E. Bogdanov, S. Grigoriev

Anesthesiology, Intensive Care and Transfusiology, Kuban State Medical University, Krasnodar, Russian Federation

Background and Goal of Study: There are some literary data specifying close interaction of a cell excitation level with a degree of its hydration. So, depolarization of cell membrane is accompanied by hyperhydration of a cell and relative dehydration of a extracellular space, and hyperpolarization leads to opposite changes (Britsch, S., 1994). Thus, there are theoretical prerequisite for research of diagnostic efficiency of direct current potentials (DCP) in an estimation water homeostasis, both at acute and chronic disorders.

Materials and Methods: The study was performed on 56 ICU patients. The registration of (DCP) and superslow oscillations (SSO) was made in a forehead-palm lead. Also we assessed central hemodynamics, gas exchange, temperature and nutrition state, parameters of red blood, biochemical research of blood and urine and the analysis of water daily balance. In addition to standard monitoring we defined blood and urine osmolality by a hardware method (The Advanced Osmometer, model 3D3). Depending on the level of the DC potential, each group was divided into three groups: 1–subcompensated, 2–compensated, and 3–decompensated functional state.

Results and Discussion: From positions of already available literary data, subcompensated level of direct current potential (the group 1) is observed in conditions of dehydration. That has been caused, by the received data, excessive loss of water together with major determinants of plasma osmolality (urea, sodium). It led to hypotonic dehydration. In group 3 decompensated functional state caused by hypertonic hyperhydration in consequence of diuresis decrease.

Parameters	Group 1	Group 2	Group 3
Blood osmolality (mOsm/kg)	275 (268–289,5)	280 (276–292)	339 (331–354)
Urine osmolality (mOsm/kg)	530 (341–563)	512,5 (490–536)	419 (416–431)
Serum sodium concentration (mEq/L)	131,6 (123–136)	131 (128–132)	146 (143–149)
Urine sodium concentration (mEq/L)	108* (62–142)	70,6* (26–99)	17,9* (14–73)
Blood urea nitrogen (mg/dL)	8,4* (6,5–10,5)	16,7* (8,3–19,2)	29,5* (9,4–39,7)
Diuresis (ml/day)	1850 (1700–1900)	1700 (1300–1800)	500* (475–575)
Direct current potential (mV)	–34,3* (–30–39)	–22* (–22–20)	–5,8* (–8–2)
Super slow oscillations	15,6* (14–17)	9 (6–10)	20* (18–21)

* - $p < 0,05$ by Kruskall-Wallis test.

Conclusion(s): In this study the interaction of direct current potentials with traditional diagnostic criteria of water balance disorders has been revealed.

12AP6-8

Analgesia based sedation of the critically ill patients with remifentanil versus intermittent boluses of midazolam/tramadol

V. Malenkovic, S. Bojic, O. Marinkovic, V. Vojnovic-Golubovic, L. Soskic

Anaesthesiology and Intensive Care Unit, KBC Bezanijska Kosa, Belgrade, New Belgrade, Serbia

Background and Goal of Study: Sedation of the critically ill patient has several components including hypnosis and analgesia. The invention of remifentanil has allowed greater use of analgesia-based sedation (ABS) with relief of discomfort from the tracheal tube or pain. The study was compared the safety and efficiency of an ABS regime using remifentanil with a conventional hypnotic-based sedation regime in critically ill patients requiring mechanical ventilation for up to 72 hours.

Materials and Methods: In this prospective, randomised, single-centered study, a total of 60 patients, who had undergone abdominal surgery following six months, were postoperatively assigned to one of two treatment regiments for sedation in the ICU for 12 to 72 hours. Patients in the ABS group (n = 30) received remifentanil (6 mcg–9 mcg/kg/h). Patients in the HBS group (n = 30) received midazolam (0.02 to 0.2 mg kg/h) and tramadol (100mg/6h). Patients were sedated to an optimal Riker Sedation Agitation Scale (RSAS) score of – 1 or 1, Remsy score (RS) of 1 to 3 and a pain intensity (PI) score of 0 or 2. Heart rate (HR) and mean arterial pressure (MAP), APACHE II and SOFA score were monitored throughout the treatment period. Adverse events were recorded too.

Results and Discussion: 30 patients received ABS, 29 of the patients receiving remifentanil without the use of supplementary hypnotic agents. In the HBS 20/30 of patients either morphine or fentanyl was used as the analgesic agent, titrated to obtain adequate pain control. The variation in the mean RSAS over 24 hours was – 1 to +1 for remifentanil group and – 2.7 to +3.0 in the comparator group. The variation in the mean PI over 24 hours was 1.5 to 1.6 for the remifentanil group and 1 to 3.7 for the comparator group. Variation of MAP, HR, pCO_2 was less in remifentanil than in control group.

Conclusion(s): Analgesia-based sedation with remifentanil was well tolerated. No significant statistical difference in duration of mechanical ventilation of critically ill patients and total mortality rate is noticed, but it is decided that it definitely improves the healing process in comparison to standard hypnotic-based sedation regimes in ICU patients requiring ventilation for up to 72 hours.

Reference:

1 De Bellis, P; Gerbi, G; Pacigalupo, P; Buscaglia, G; Massobrio, B; Montagnani, L; Servirei, L. Experience with remifentanil in the intensive care unit. Minerva Anestesiol. 2002;68:765–773.

12AP6-9

Evaluation of the Surgical Stress Index (SSI) in critically ill patients

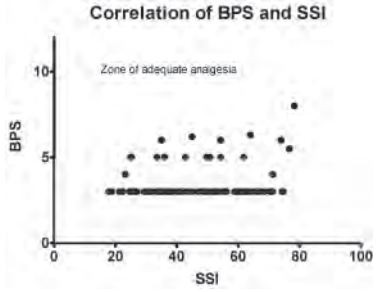
C. Ilies, R. Hanss, M. Grünewald, J. Scholz, B. Bein

Institut für Anästhesiologie und Operative Intensivmedizin, Universitätsklinikum Schleswig-Holstein, Kiel, Germany

Background and Goal of Study: Guidelines for sedation and analgesia in critically ill patients (1) emphasise the need for adequate sedation and analgesia regime and its impact on patients' outcome. Real time monitoring of analgesia would allow to quicker react to changes of the patients' need for analgesia. The Surgical Stress Index (SSI) showed to reflect painful stimuli during general anaesthesia (2). The SSI was never evaluated in critically ill or in moderately sedated patients. We studied the use of the SSI for assessment of stress and/or analgesia in critically ill and assisted ventilated patients.

Materials and Methods: After IRB approval, 35 critically ill and mechanically ventilated patients were enrolled into this study. In 20 patients a baseline measurement was performed. 15 patients were measured without baseline awake during their stay at the ICU. We measured SSI and then assessed the Ramsay Sedation Scale (RSS), Richmond Agitation Sedation Scale (RASS) and the Behavioral Pain Scale (BPS). Haemodynamic data and SSI were noted every three minutes, the scales three times in the study period of 60 minutes.

Results and Discussion: SSI (31 vs. 48) and heart rate (71 vs. 86 bpm) showed significant differences between baseline and assessment on the ICU indicating a higher stress or pain level in ICU patients. At baseline SSI showed a good correlation to heart rate ($r = 0.677$, $p < 0.004$) which was no longer present on the ICU. There was no correlation between SSI and the established scales (BPS, RSS and RASS) with a wide range of the SSI values (18–78) even in patients with adequate scale values.



Conclusion(s): There was no meaningful correlation between SSI and clinical sedation and pain scales. Further studies are warranted to define if SSI is suitable to detect increased stress levels in patients with adequate clinical scales.

Acknowledgements: SSI software was gratefully supplied by GE Healthcare, Helsinki, Finland.

References:

1 Jacobi J et al.: Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. *Crit Care Med* 2002, 30:119–141.

2 Huiku M et al.: Assessment of surgical stress during general anaesthesia. Br J Anaesth 2007; 98: 447–55.

12AP7-1

Changes of cytokine levels in burned patients. The prognostic value of IL-10

C. Csontos, V. Földi, L. Pálinkás, L. Bogár, J. Lantos

Department of Anaesthesia and Intensive Therapy, University of Pécs Medical School, Pécs, Hungary

Background and Goal of Study: Elevated level of circulating cytokines has already been observed suggesting their important role in the pathophysiological responses following burn injury. However, the dynamism and the prognostic role of these cytokines are controversial. The purpose of this study was to determine the time course of pro- and anti-inflammatory cytokine levels, and their prognostic value in patients with burn injury.

Materials and Methods: This prospective descriptive study with control group consisted 26 patients (21 male, 5 female, mean age 48 ± 19 years). Blood samples were collected at the time of hospital admission and 5 consecutive days thereafter. Concentrations of IL-1ß, IL-6, IL-8, IL-10, IL-12p70, and TNF-α were concurrently measured in plasma from EDTA anticoagulated, and non-stimulated blood by a sensitive technique (flow cytometric bead array).

Results and Discussion: Total burn surface area was significantly higher in non-survivors (n = 12) compared to survivors (n = 14) (36.7 ± 18.0%, vs. 20.1 ± 6.3% $p < 0.001$). IL-6, IL-8, IL-10 presented elevated concentrations in both groups comparing to healthy volunteers. IL-6 and IL-8 was moderately elevated on admission and started to increase markedly from the day 2, with a peak value on the day 4 after injury. IL-10 concentration was elevated at the time of hospital admission and gradually decreased thereafter. Reciever Operating Characteristic analysis of data on admission showed that at a level of 14 pg/ml IL-10 indicated the lethality with 83.3% sensitivity and 100% specificity. Significant differences ($p < 0.05$) between survivors and non-survivors in concentration of IL-6 was observed on day 4, in IL-8 on days 5 and 6, and in IL-10 on days 1, 2 and 3 post injury, all with higher levels in non-survivors. IL-6/IL10 and IL8/IL10 ratios elevated in both groups of patients until day 3, but decreased thereafter in survivors. No significant changes could be found in the circulating level of IL-1ß, IL-12p70, and TNF-α during the study period compared to the healthy volunteers.

Conclusion(s): Our results confirmed that cytokines play an important role in the post burn pathophysiological processes. Burn injury was accompanied by an acute anti-inflammatory response measured on admission that was significantly higher in non-survivor patients. The IL-10 level on admission had prognostic value. Pro-inflammatory cytokine levels overwhelmed the anti-inflammatory processes from the day after trauma but started to normalize earlier in surviving patients.

Acknowledgements: This work was supported by OTKA T060227 grant.

12AP7-2

Burn trauma induces early HMGB1 release in patients

V. Földi, C. Csontos, L. Bogár, E. Roth, J. Lantos

Department of Anaesthesia and Intensive Care, University of Pécs Medical School, Pécs, Hungary

Background and Goal of Study: The aim of the study was to follow up the time course and the prognostic value of plasma high mobility group box protein 1 (HMGB1) concentration in patients with severe burn injury.

Materials and Methods: Twenty-six patients were involved in the study (21 males, 5 females, mean age was 48 ± 19 years). Inclusion criteria were the presence of flame burn injury affecting more than 20% of body surface area and in-hospital fluid resuscitation started within 3 hours after injury. Blood samples were taken from the patients on admission and on the mornings of the following 5 days.±±

Results and Discussion: HMGB1 concentration was elevated at the time of hospital admission and gradually decreased thereafter. Significant difference ($p < 0.05$) was observed between survivors and non-survivors in HMGB1 concentration on admission with higher level in non-survivors. A positive correlation was found between burned body surface and HMGB1 concentration on admission. ROC analysis of data on admission showed that at a level of 16 ng/ml HMGB1 indicated the lethality with 75.0% sensitivity and 85.7% specificity.

Conclusion(s): A very early HMGB1 release caused by rather necrosis than inflammation was observed in burned patients that correlated well with the extent of burn injury.

Acknowledgements: This work was supported by OTKA T060227 grant.

12AP7-3

Mortality-associated factors in patients with intra-abdominal infection and severe sepsis

S. Pallancher, J. Lavigne, P. Bousquet, S. Jaber, J. Lefrant

Division Anesthésie Réanimation Douleur Urgence GHU Carémeau, CHU Nimes, Faculté de Médecine Montpellier-Nimes Université Montpellier I, Nimes, France

Background and Goal of Study: To examine prognostic factors of death in patients with severe sepsis and/or septic shock in intensive care units secondary to intra-abdominal infection (IAI).

Materials and Methods: From a data base including 445 patients in severe sepsis and/or septic shock during 2006, patients with IAI (biliary track infection or peritonitis) were studied. Clinical, microbiological and therapeutic characteristics are collected. To isolate predictive factors of death at day 28, an univariate analysis was performed followed by a multivariate analysis using a step by step ascending logistic regression ($p < 0.05$ is significant).

Results and Discussion: 103 patients were included. The overall mortality rate was 41.8% (n = 43). Comparisons between survivors and non-survivors patients at day 28 are shown in table 1. In multivariate analysis, SAPS II is the only predictive mortality factor at day 28. Microbiology results are reported in table 2.

Table 1. Univariate analysis of factors present at admission associated with death within 28 days.

	Non survivors	Survivors	p
N	43 (41.8%)	60 (58.2%)	
Age (yrs)	73.7 (64.1–80.8)	64 (54.9–75.4)	0.014
Height (cm)	169 (160–175)	170 (164–175)	0.5
Weight (kgs)	69 (60–84)	70 (63–85)	0.38
Male sex	26 (61.9%)	36 (60%)	0.85
Number of comorbidities	3 (2–4)	2 (1–3)	0.09
Mac Cabe score > 1	15 (37.5%)	11 (20%)	0.06
Nosocomial infections	17 (39.5%)	21 (35%)	0.64
Biliary track infections rate	5 (11.6%)	10 (16.7%)	0.47
SAPSII	54 (47–65)	46 (38–52)	< 0.05
SOFA	8 (6–12)	6 (4–9)	< 0.05
Number of organe failures	5 (4–6)	4 (3–5)	0.06
Respiratory failure	40 (93%)	56 (93.3%)	1
Hemodynamic failure	42 (97.7%)	53 (88.3%)	0.13
Renal failure	30 (69.8%)	38 (63.3%)	0.5
Neurologic failure	13 (30.2%)	15 (25%)	0.56
Hepatic failure	19 (44.2%)	20 (33.3%)	0.26
Hematologic failure	32 (74.4%)	36 (60%)	0.13
Antimicrobial adequation adequacy to recommandations	17 (39.5%)	27 (45.8%)	0.53

Table 2. Microorganisms isolated from bacteriological samples.

Organisms	n	%
Escherichia Coli	42	45.2
Enterobacteriaceae	30	32.3
Pseudomonas	11	11.8
Anaerobes	37	39,8
Enterococci	22	23.7
Streptococci	12	
Staphylococci	8	
Others	3	
Fungi (Candida)	7	7.5
Total of patients	93	
Number of microorganisms per patient	2 (1–3)	

Conclusion(s): In patients with severe sepsis and/or septic shock secondary to IAA, SAPSII at admission is the main predictive factor of mortality at day 28.

12AP7-4

Mortality in elderly patients admitted to the ICU (intensive care unit) after severe upper gastrointestinal tract haemorrhage

M. Zajac, K. Zajac

Anesthesiology and Intensive Care, University Hospital, Kraków, Poland

Background and Goal of Study: Analysis of severity-of-illness scores and risk factors affecting mortality in elderly patients after severe upper gastrointestinal (GI) tract haemorrhage.

Materials and Methods: 67 patients aged >65 yrs in hypovolemic shock caused by life-threatening upper GI tract haemorrhage were admitted to the ICU in 2 yrs 2006 – 07. The evaluation was performed at the admittance (before the surgery) and 12 hrs following the surgical procedure. There were used 6 prediction models (MPMII, SAPS, MODS, SOFA LODS, Portsmouth-POSSUM), and TISS-28 for assessment of probability of death and efficiency of treatment. The patients were into 2 groups 1) survivors, 2) non-survivors. Statistics included mean scoring values computing, calculation of positive prediction values and OR (odds ratio) of death occurrence with and without 8 significant risk factors (acute physiology parameters) identified by logistic regression analysis.

Results and Discussion: Demography: number of patients; n = 67; mean age = 77,6yrs (± 9,0); gender: males 35 (52,2%); non-survivors = 27 (40,3%) including 12 deaths that occured on the day of surgery (44,4%of deaths).

Table 1. Mean scores computed for the severity-of-illness or predictive scales.

	Group 1	(survivors)	Group 2	(non-survivors)	p-value
	before surgery	after surgery	before surgery	after surgery	
MPM II	16,8 ± 9,6	26,2 ± 18,0	27,7 ± 20,9	55,4 ± 23,3	p < 0,001
SAPS 1	22,3 ± 15,7	25,1 ± 17,7	32,4 ± 25,2	61,0 ± 27,7	p < 0,001
LODS	17,3 ± 13,8	20,8 ± 15,1	27,4 ± 23,5	55,7 ± 28,7	p < 0,001
POSSUM	61,61 ± 28,68		84,12 ± 25,03		p < 0,001

Table 2. Significant risk factors at admittance, identified after logistic regression analysis:

	Group 1	(survivors)	Group 2	(non-survivors)	OR
	before surgery	after surgery	before surgery	after surgery	
SBP < 90mm Hg	27,5%	20,5%	51,8%	74,0%	8,15
GCS < 13p	52,5%	60,0%	51,9%	81,4%	6,15
P02 < 60mm Hg	54,1%	25,5%	58,8%	77,7%	8,10
HC03 < 18mEq/l	38,9%	43,4%	46,5%	89,4%	6,46
Creatinine	34,8%	44,2%	39,7%	81,5%	13,02

Conclusion(s): 1. Neither ICU admittance for early goal-directed therapy nor surgical intervention affected significantly mortality. 2. Mortality rate stayed high and identified acute physiology parameters (risk factors) at the ICU admittance did not significantly change after resuscitation and following aimed surgical intervention, was probably affected by the age and poor physiology state before the acute haemorhage.

12AP7-6

A new method for early diagnosis of lung dysfunction in patients with sepsis

A. Tolkach, V. Dolgih, Y. Tolkach

Pathophysiology Department, Omsk State Medical Academy, Omsk, Russian Federation

Background and Goal of Study: The aim of the study was to investigate a new relevant method for early prediction of the lung dysfunction in patients with sepsis based on laboratory detection of the low and medium molecular mass substances (LaMMMS), most of them being the endotoxins, in arterial and venous blood plasma.

Materials and Methods: The coefficient of metabolic lung dysfunction (CMLD) was discovered as the ratio of LaMMMS in arterial blood plasma (LaMMMSart) to LaMMMS (LaMMMSven) in venous blood plasma. The conception is based on the ability of the lungs to allocate LaMMMS into arterial blood being dysfunctional. This fact is the consequence of the lung detoxication function lack. The detection of plasma LaMMMS is based on spectrophotometry ("Genesis", Japan) of plasma with the wave length from 238 to 310 nanometers (with interval 4 nanometers) after preceeding sedimentation of macromolecular substances with trichloracetic acid (150 g per l). The final result–the amount of LaMMMS–is the area under curve for the results recieved on the aforementioned wave lengths. The CMLD (LaMMMSart to LaMMMSven ratio) more the 1 (one) was defined as predictive for lung dysfunction.

Results and Discussion: We have examined 80 patients with sepsis due to the abdominal bacterial infection. On admittance to ICU CMLD was evaluated. All of them underwent surgical sanation further. In the early postoperative period CMLD was highly predictive for the development of lung dysfuntion (acute respiratory distress syndrom, lung oedema, prolonged mechanical lung ventilation). Of 80 patients fifty six had CMLD more that 1 (one) with median 1.13 (SD 0.03). 91.1% of them (51 patients) developed lung dysfunction in postoperative period. Of the other 24 patients with mean CMLD 0.93 (SD 0.04) only 2 patients had signs of lung dysfunction in clinical picture.

Conclusion(s): Coefficient of metabolic lung dysfunstion allows to predict developing lung dysfunction in clinical course of patients with sepsis with high sensitivity (91.1%) and specificity (91.6%). Necessary preventive clinical decisions could be made for patients with based on this laboratory marker.

12AP7-7

Yentl syndrome and outcomes in intensive care unit

M. Zasa, M. Mergoni, S. Lunardi, P. Stefanini, A. Vezzani

I Servizio di Anestesia e Rianimazione, Azienda Ospedaliero Universitaria, Parma, Italy

Background and Goal of Study: The concept of Yentl syndrome was first introduced by Helay[1], with regard to the impact of gender on medical diagnosis and treatment. Further studies suggested a possible influence of gender on several clinical issues, included mortality and morbidity in intensive care unit (ICU) patients. The aim of this retrospective, observational study was to evaluate the association between gender and clinical outcome in critically ill patients.

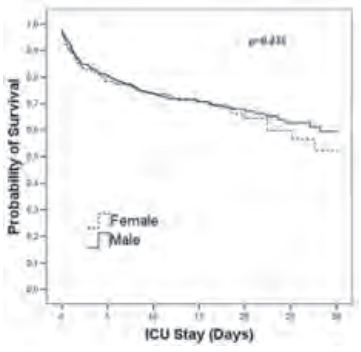
Materials and Methods: Data on 1807 patients admitted to ICU were collected during a 3-year period, between January 1 2005 and December 31 2007. For each patient the following parameters were recorded: sex, age, length of ICU stay, length of mechanical ventilation (VAM), ICU and hospital mortality. Severity of illness was measured with Simplified Acute Physiology Score (SAPSS) II, together with Injury Severity Score (ISS) in patients admitted for trauma.

Results and Discussion: Statistical differences between men and women were found in terms of age, length of ICU stay and length of VAM. Neither ICU mortality rate nor hospital mortality rate were statistically different. ISS was not statistically different between groups (26 ± 13 in Male group, 26 ± 12 in Female group; $p = 0.770$). A Kaplan-Meier 30-day ICU survival analysis showed no statistically significant differences between men and women in the study population.

ICU gender differences

	Male	Female	p
ICU Survivors	919/1157 (79%)	519/650 (80%)	.855
Hospital Survivors	830/1157 (72%)	472/650 (73%)	.703
Age	57 (± 19)	61 (± 18)	< .001
Length of ICU Stay	6.9 (± 8.8)	5.7 (± 7.7)	< .001
SAPSS II	41 (± 20)	41 (± 20)	.813
Length of VAM	6.5 (± 8.3)	5.6 (± 7.7)	< .001

Data reported as mean (± SD) or number of cases (% of group total)



Conclusion(s): According to our results mortality among critically ill patients was not influenced by gender, while ICU stay variables showed gender related differences. However, these were most likely due to group inequality rather than treatment iniquity.

Reference:

1 Healy B. The Yentl syndrome. N Engl J Med. 1991; 325(4):274–6.

12AP7-8

Risk factors for readmission to a cardiac surgical intensive care unit

Z. Lozano, E. Claros, M. Cabellos, R. Casas, A. Candela-Toha

Anestesia y Reanimación, Hospital Ramón y Cajal, Universidad de Alcalá de Henares, Madrid, Spain

Background and Goal of Study: Readmission of surgical patients to the intensive care unit impacts on short term morbidity and mortality. This is specially true for cardiac surgical patients [1]. This fact and the growing shortage of intensive care beds, mandate an analysis of the factors which contribute to readmission. The aim of this study was to analyze risk factors for readmission to a cardiac surgical intensive care unit.

Materials and Methods: Data were extracted from a prospectively maintained database. Patients operated of major cardiac surgery and readmitted to our 10-bed intensive care unit (ICU) before hospital discharge during a 6-year period (2002–2007) were identified and compared with patients discharged alive from the ICU without return. Variables compare include: demographics (age, gender and body mass index), comorbidities and patient-related (arterial hypertension, previous history of congestive heart failure, diabetes mellitus, endocarditis, ejection fraction, basal hemoglobin and creatinine values and Euroscore), surgical (type, priority, previous cardiac surgery, need for intraoperative (IO) transfusion, number of IO packed red blood cells (PRBC) transfused, crossclamp time, perfusion time) and postoperative (PO) (hours on mechanical ventilation (MV), length of ICU stay, need for renal replacement therapy, antibiotic treatment, enteral or parenteral nutrition, new neurolgical deficits and thracheostomy at discharge). Statistical analysis: univariate comparison between groups followed by logistic regression with readmission to ICU before discharge as the main outcome variable. A $p < 0,05$ was considered significant.

Results and Discussion: During this 6-year period 100 patients were readmitted to the ICU among 2017 cases (5%). Variables showing independent association with readmission were (odds ratio (OR) : 95% confidence interval (CI)), male gender (2,1: 1,3–3,3), age (0,97: 0,95–0,99), new major neurological deficitis (2,86: 1,3–6,4), active endocarditis before surgery (4,1: 1,7–9,9), and days of ICU stay (0,97: 0,95–0,98).

Conclusion(s): In the cohort studied, we found active endocarditis at surgery and new major neurogical deficits after surgery as two important predictive factors for readmission. Special care after ICU discharge should be emphasized in both these groups of patients.

Reference:

1 Eur J Cardiothoracic Surg 2002; 22: 282–286.

12AP7-9

Impact of corrected plasma creatinine, measured by Jaffe reaction, on ICU severity scores (APACHE II, SOFA, SAPS III) and on kidney injury classifications (RIFLE, AKIN)

T. El Hor, M. Ngirabacu, A. Georgala, M. Claus, A. Roman

Intensive Care, CHU Saint-Pierre, Brussels, Belgium

Background and Goal of Study: Jaffe chemical reaction is the most commonly used laboratory technique to measure plasma creatinine (PC). The inconvenient of the method is the overestimation of PC because of interfering plasma substances. The International Federation of Clinical Chemistry recommended correction of PC measured by the Jaffe reaction in 2005. Our laboratory uses the Roche/Hitachi Modular which corrects each measured creatinine (MC) value by subtracting 0.3 mg/dL (references given by constructor). Our purpose is to evaluate the impact of this new corrected creatinine (CC) on ICU scores and on kidney injury classifications (RIFLE, AKIN) which have been established prior to this recommended correction.

Materials and Methods: Over a period of one month, we prospectively included every new patient admitted in our ICU. A total of 106 patients were included. For each patient, at second day of admission, we calculated twice the following scores: APACHE II, SOFA, SAPS III, AKIN and RIFLE; once with the MC and once with CC. To evaluate the impact of CC values on scores, we conducted quantitative analyses using the Wilcoxon signed-rank test for paired variables.

Results and Discussion: Our results show that CC values implicates frequent (19–46%) variations in ICU severity scores (APACHE II, SOFA, SAPS III) for individual patients. The mean values of SOFA and SAPS III scores are significantly lower (1–3.8%) with CC. Only the mean value of APACHE II does not significantly change with CC. This is explained by the system of points given for both superior and inferior limits of creatinine.

Conclusion(s): Adjustments (1–4%) are necessary when mean values of SOFA and SAPS III are used in comparative studies. The CC values do not deteriorate sensibility of kidney injury classification (AKIN and RIFLE) to detect acute renal insufficiency.

Comparison of scores for measured and corrected creatinine

Scores	Mean [95%CI] with MC	Mean [95%CI] with CC	% positive changement	% negative changement	P value
APACHE II	16.72 [14,96–18,49]	16.78 [15,1–18,46]	26.4	19.8	0.72
SOFA	5.74 [4,98–6,50]	5.50 [4,75–6,26]	0	23.6	<0.01
SAPS III	52.3 [48,34–56,26]	51.73 [47,86–55,59]	0	18.9	<0.01
RIFLE	0.72	0.74	7.5	0	<0.01
AKIN	0.65	0.73	2	0	NS

MC = Measured creatinine; CC = Corrected creatinine (MC-0.3mg/dl);
NS = Non Significatif

Acknowledgements: Many thanks, to our great colleague Dr. Etienne Stevens.

Reference:

Myers GL and al. Recommendations for improving serum creatinine measurement. Clinical Chemistry. 2006; 52:5–18.

12AP7-10

NT-proBNP for risk stratification of patients in the intensive care unit

S. De Napoli, M. Reggi, A. Manzi, D. Albanese, F. Petrini

Anaesthesiology and Intensive Care, University of Chieti, Chieti, Italy

Background and Goal of Study: Plasma N-terminal brain natriuretic propeptide (NT-proBNP) is synthesised in the ventricular myocardium and released in response to ventricular wall stress. Recently, studies have shown that in the critically ill patient Nt-proBNP does not necessarily reflect just ventricular dysfunction. Its prognostic value in predicting these patients mortality and morbidity remains controversial. The aim of the study was to evaluate the relationship between NT-proBNP plasma concentrations and prognosis of critically ill patients.

Materials and Methods: This was a prospective observational study in a 8-bed mixed ICU in a university-affiliated teaching hospital. All adult medical patients admitted to the ICU were eligible if the patient did not have an acute cardiac condition. Blood serum NT-proBNP concentrations were determined in each patient on admission in the ICU. The analyzed variables were demographic characteristics, the Acute Physiologic Score Age Chronic Health Evaluation (APACHE) II, Simplified Acute Physiologic Scale (SAPS) II, laboratory data, ICU length of stay, mortality.

Results and Discussion: We evaluated 81 consecutive ICU patients admitted, 45 men (55,5%) and 36 women (44,5%) with a mean age of 64,8 (26 to 91). Mortality rate was 25,9%, the Acute Physiologic Score Age Chronic Health Evaluation (APACHE) II was 19,3 (from 6 to 35) and Simplified Acute Physiologic Scale (SAPS) II was 41,8 (6–77). In the study population NT-proBNP serum concentrations were elevated (mean 2724 pg/ml) with a broad range: from 3 to 14222 pg/ml; 74% of patients had an NT-proBNP level > 150 pg/ml. Nonsurvivors (n = 21) had higher NT-pro-BNP levels than survivors (n = 60) on admission in the ICU (4968 vs. 1938 pg/ml).

Conclusion(s): NT-proBNP serun concentrations were elevated in critically ill patients, even without acute heart disease. NT-proBNP levels were correlate with the severity of organ dysfunction and with increased mortality.

12AP8-1

Cytokine dynamics in treatment of pneumonias of various etiologies

T. Smelaya, A. Goloubev, V. Moroz, G. Azarov, Y. Tikhonov

Anesthesia and Intensive Care Center, Ministry of Home Affairs Main Hospital, Balashikha, Russian Federation

Background and Goal of Study: Community-acquired pneumonia incidence is 1–11,6% among young and middle-aged people, and is 25–44% in elderly people (older than 65 y.o.). Mortality is nearly 5%, but rises up to 21,9% in hospitalized patients. The goal of the investigation was to determine the diagnostic and prognostic significance of cytokine levels detection in pneumonia patients.

Materials and Methods: 115 patients aged 18–60 y.o. (mean age $39,20 \pm 15,05$ y.o.) with pneumonias were enrolled in the study. There were 47,8% of acute community-acquired pneumonias (CAP) and 52,2% of hospital-acquired pneumonias (HAP). The HAP group involved 4 patients with general peritonitis, 8 patients with severe combined trauma and 6 patients with mine-explosure trauma. 100 healthy people aged $31,08 \pm 12,9$ y.o. made up the control group. Cytokines TNF-α, IL-β, IL-1α, IL-6 were detected in venous blood and bronchoalveolar fluid by means of immune-enzyme assay (Stat Fax photometry (USA), BioSonroeInternational (France) kits) on the days 1–14. The results were analyzed by means of STATISTICA 6,0. $M \pm \sigma\sigma$, Student's t-criterion, Fisher's method were used. $p \leq 0,05$ was used as significant.α

Results and Discussion: statistically significant increases of TNF-α and IL-6 ($p \leq 0,05$) were detected in all critically ill pneumonia patients on the 1st and 8th days in comparison with the controls. Two subgroups were divided in the study group–they presented with differently directed cytokine dynamics within days 1–14. Comparison of cytokine dynamics in patients with primary and secondary pneumonias shows significant differences in the cytokine levels–TNF-α and IL-6 ($p \leq 0,05$) on days 1 and 14, and only TNF-α on day 3. Significant differences in the cytokines levels were found in the patients who died and lived through pneumonia. IL-1β ($p \leq 0,01$) was elevated in unfavourable outcome cases on days 3 and 10, TNF-α and IL-6 ($p \leq 0,05$) on days 3, 7 and 14. 16 patients presented with the progression of respiratory insufficiency. Direct correlation was obtained between the outcome and TNF-α venous concentration ($r = 0,8$, $p \leq 0,05$).
Conclusion(s): Pneumonia patients present with statistically significant TNF-α and IL-6 elevations in venous blood. Acute CAP and HAP present with TNF-α and IL-6 elevations on the 1st ICU-day and TNF-α elevation on the 3d ICU-day. Two subgroups were divided in the study group – they presented with differently directed cytokine dynamics within days 1-3. IL-1ββ on day 1 and TNF-α with IL-6 elevation was detected in unfarourable outcome.

12AP8-3

Epigallocatechin 3 gallate attenuate LPS induced acute lung injury in murine model

S. Kwak, H. Bae, M. Lee, S. Chung, S. Kim

Anesthesiology and Pain Medicine, Chonnam National University Medical School, Gwangju, Korea

Background and Goal of Study: This study was performed to clarify the effects of epigallocatechin 3 gallate (EGCG) on lipopolysaccharide (LPS)-induced acute lung injury in murine model.
Materials and Methods: The murine macrophage cell line RAW 264.7 was cultured in Dulbecco's modified Eagle's medium supplemented with 10% fetal bovine serum. Cells in 24 well plate (10×10^4/well) were incubated with or without the indicated concentration of EGCG (10, 50, 100 uM/L) for 2 hours and then incubated with LPS (100ng/ml) for 6 hours at 37°C in a humidified atmosphere containing 5% CO_2. TNF-α, MIP-2 and IL-1b protein were measured in cell culture supernatants. Mice were anesthetized with 3% enflurane in oxygen and LPS (E-coli 055:B5, 1mg/kg) was instilled intratracheally 30 min after EGCG administration (10 mg/kg, I.P.). To assess the effects of EGCG on acute lung injury of mouse treated with LPS, We measured W/D ratio, lung injury score, percent of neutrophil and the concentration of TNF-α, MIP-2 and IL-1b in BALF 24 hours after LPS administration.
Results and Discussion: EGCG decreased expression of TNF-α, MIP-2 and IL-1b in LPS stimulated macrophage. Mice treated by EGCG were protected from LPS induced acute lung injury as determined by development of lung edema, lung injury score, and inflammatory cytokines in BALF levels.
Conclusion(s): EGCG can attenuate LPS-induced acute lung injury via the attenuation of proinflammatory cytokine expression. So, EGCG appears to be a potential therapeutic agent for treating LPS – induced acute lung injury.

12AP8-4

A new indicator of lung edema: Lung supernatant-to-pellet ratio correlates well to wet-to-dry weight ratio

H. Wang, B. Duenges, C. Otto, J. Baumgardner, K. Markstaller

National Beijing Center for Drug Safety Evaluation and Research, Beijing Institute of Pharmacology and Toxicology, Beijing, China

Background and Goal of Study: Measurements of lung wet-to-dry weight ratio (w/d) and cytokines are often performed in the studies of acute lung injury (ALI). Due to limited amount of lung tissue in small animals, it is cumbersome to acquire both parameters in one subject. This study is to explore whether supernatant-to-pellet ratio (s/p), as a by- product of lung cytokine measurement, could be used instead of w/d to score lung edema.
Materials and Methods: After IRB approval, pigs (20–25 kg) were anesthetized, ventilated by pressure controlled ventilation and randomized to the group of CTR (n = 7), SHAM (n = 10), Lavage-ALI (n = 10), Oleic acid-ALI (n = 10) or shock/reperfusion-ALI (n = 10). Pigs were exsanguinated immediately after catheterization (CTR group) or after 5 h of ventilation (other 4 groups). Samples were collected from different injured lung areas to acquire a wide range of lung edema. Paired homogeneous samples, divided in a de-humidificated freezer-box from a pulverized sample by Freezer/Mill, were used for the measurements of w/d and s/p, respectively. Sample for s/p was added Tissue Protein Extraction Reagent (T-PER, piercenet) or PBS at a ratio of 1:4 (g:ml). After 3 cycles of freeze/thrawing, sample was ultracentrifuged and supernatant was collected for total protein and cytokine measurements. Pellet was weighed and s/p was calculated. Correlation analysis was done by SPSS. Paired t-test was used for comparing between T-PER and PBS.
Results and Discussion: S/p ratio showed a high correlation to w/d ratio, no matter whether it was measured in T-PER or in PBS (Fig. 1). T-PER buffer is more powerful to extract total protein and cytokines in the lung tissue than PBS and satisfies both measurements of s/p and cytokines (Tab. 1).

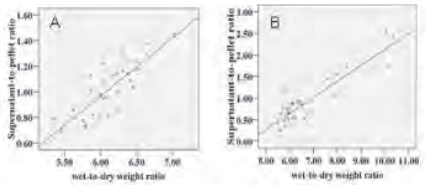


Fig 1. Correlation between w/d and s/p measured in T-PER. (A, n=29, r=0.800, p<0.001) or in PBS (B, n=31, r=0.904, p<0.001)

Table 1. Comparison of extraction power between T-PER and PBS

Parameters	T-PER	PBS
Total protein (μg/ml)	8069.478 ± 1326.770*	7588.480 ± 1256.987
IL-6 (pg/mg protein)	26.524 ± 25.963**	21.728 ± 24.824
IL-8 (pg/mg protein)	388.377 ± 289.452**	344.257 ± 273.749
TNF-α (pg/mg protein)	137.511 ± 65.177**	79.417 ± 46.229

*p < 0.05 and **p < 0.01 versus PBS by paired t-test. n = 7.

Conclusion(s): As a by-product of lung cytokine measurement, s/p can be used as a new indicator of lung edema.

12AP8-5

Elevated ELWI values are predictors of NonInvasive Mechanical Ventilation (NIMV) failure

F. Redondo, M. Madrazo, A. Mendiola, V. Baladrón, G. Bernal

Anesthesia, Hospital General de Ciudad Real, Ciudad Real, Spain

Background and Goal of Study: Different methods have been used to evaluate the intensity of pulmonary edema. Some techniques are simple, such as arterial blood gases or thoracic radiography, although unreliable and less sensible to the intensity of pulmonary edema, others, moderately complex, as the method of double heat indicator and coloring, and others highly sophisticated, as magnetic nuclear resonance and computed tomography. The use of possitive airway pressure could stimulate the clearance of pulmonary edema by several mechanims. The most obvious would be the reduction in dead alveolar space to increase the residual functional capacity and with it increases the oalveolar-capillary exchange surface too, which would contribute to the ability to reduce the edema. Quantify the ELWI and PVPI (index of vascular permeability) by transpulmonary thermodilution with "a Pulse Contour Cardiac Output Monitor (PiCCO ™, Medical System, Munich, Germany) based on the thermodilution technique with a single thermal indicator provides information of the edema magnitude, its evolution and the response to treatment, which could be a great help in the management of critically ill patients with pulmonary edema of different aetiologies.
Materials and Methods: The aim of this prospective observational study is evaluate ELWI and PVPI evolution in patients with acute respiratory failure in major abdominal surgery during the postoperative period, once it has been used noninvasive mechanical ventilation (VMNI) with CPAP mode as first intention. The patients are classified into two groups: non-intubated and intubated, as the success or failure of NIMV. The PiCCO ® monitoring was made on 30 of the 99 patients with NIMV with Helmet.
Results and Discussion: In 66% of patients the intubation was avoided. We observed that respiratory rate after the first hour of NIMV decreases significantly in the non-intubated group (25.33 ± 3.5 versus 17.38 ± 6.8, $p < 0.01$). The PaO_2/FIO_2 relationship after this first hour increases significantly in the group of non-intubated (305.46 ± 77.6 versus 140.7 ± 18.5, $p < 0.01$). There were differences between both groups in the ELWI (8.6 ± 1.4 versus 11.9 ± 3.9, $p < 0.01$) and in the PVPI (1.7 ± 0.56 versus $3.0 \pm 0,88$, $p < 0.01$) before the begining of the NIMV.
Conclusion(s): We can conclude that in this patients the physiological parameters which predict with most precision the NIMV failure are PaO_2/FIO_2 relationship, respiratory rate and initial values of ELWI and PVPI.

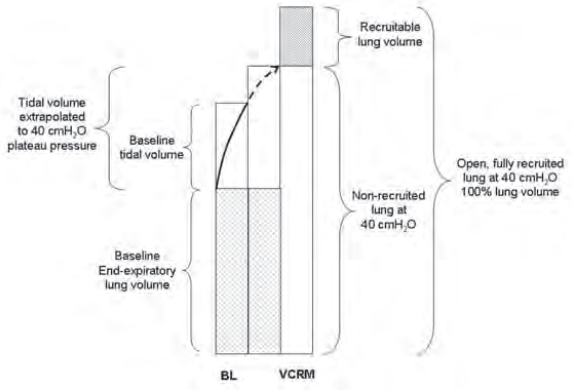
12AP8-6

Potentially recruitable lung volume assessed by end-expiratory lung volume, volume dependent compliance and electric impedance tomography

K. Lowhagen, H. Odenstedt, S. Lindgren, S. Lundin, O. Stenqvist

Anaesthesia and Intensive Care Medicine, Institution of Clinical Sciences, Gothenburg, Sweden

Background and Goal of Study: Potentially recruitable lung (PRL) has been assessed by CT-scan in ARDS. PRL% was defined as difference in non-areated lung tissue at 5 and 45 cm H_2O. PRL varied widely and correlated to severity of lung injury and effect of PEEP. In a pilot study a bedside method to determine potentially recruitable lung volume (PRLV) was evaluated.
Materials and Methods: 16 ALI patients were studied. Breath-by-breath alveolar pressure from direct tracheal pressure measurement and volume dependent compliance was calculated at initial (Cini), mid (Cmid) and final (Cfin) parts of the tidal volume. Endexpiratory lung volume (EELV) was measured at baseline by N2-washin/washout and followed by electric impedance tomography (Dräger/GoeMFII). From PEEP 6 cm H_2O two vital capacity RMs for 20 sec to 40 cm H_2O was performed followed by stepwise decrease in PEEP from 16 to 6 cm H_2O. PRLV: Lung volume at 40 cm H_2O pressure was regarded as fully recruited lung volume. Non-recruited lung volume at this pressure is calculated as baseline EELV plus tidal volume and extra volume obtained by graphical extrapolation of the alveolar pressure/volume curve to 40 cm H_2O.



Results and Discussion: Patients were divided into PRLV% higher than median value; 35% (29–47%) and low PRLV%; 13% (– 4–24%). Percentage response to RM in P/F ratio, shunt, EELV, conventional compliance and Cini for the high and low PRLV% groups see table 1. Using non-invasive methods without radiation it may be possible to subdivide ALI/ARDS patients according to potential recruitability. Patients with high PRLV% had a significantly higher increase in EELV and conventional compliance compared to the low PRLV% group. Similar trends were observed in P/F ratio, shunt and initial compliance (ns).

Remental PEEP-trial both concerning gas exchange and lung mechanic indices than patients with a low PRLV%.

	P/F (% change)	Shunt (% change)	EELV (% change)	Compl conv (% change)	Compl ini (% change)
Low PRLV%	17 ± 19	– 23 ± 14	68 ± 19	12 ± 16	49 ± 60
High PRLV%	55 ± 64	– 34 ± 20	99 ± 31*	40 ± 19*	111 ± 120

* $p < 0.05$ vs Low PRLV%

Conclusion(s): In accordance with a previous CT-study it appears that patients with high PRLV% have greater response to a recruitment manoeuvre and decremental PEEP-trial both concerning gas exchange and lung mechanic indices than patients with a low PRLV%.

12AP8-7

Volume dependent, breath by breath compliance for assessment of recruitment manouevres and PEEP titration

K. Lowhagen, H. Odenstedt, S. Lindgren, O. Stenqvist, S. Lundin

Anaesthesia and Intensive Care Medicine, Institution of Clinical Sciences, Göteborg, Sweden

Background and Goal of Study: Optimal mode of recruitment manoeuvres (RM) in ALI/ARDS patients is still controversial. The goal of the present study was to investigate whether a RM using lower more "protective pressure levels" during a prolonged time period could be equally effective as a high pressure RM in ALI/ARDS patients.
Materials and Methods: 16 ALI patients were studied. Breath by breath alveolar pressure was obtained from direct tracheal pressure measurement. Volume dependent compliance was calculated at the initial (Cini), mid (Cmid) and final (Cfin) part of each tidal volume. From a PEEP level of 6 cm H_2O two vital capacity RMs during 20 sec to 40 cm H_2O (ViCM) and a PEEP increase to 16 cm H_2O during 30 minutes with two end inspiratory pauses/min (SLRM) was performed in random order, each RM followed by a stepwise decrease in PEEP to 6 cm H_2O. EELV was measured at baseline with a nitrogen washin/washout technique and then followed with electric impedance tomography (Dräger/GoeMFII). A change of ≥ 25% in lung mechanic and gas exchange indices following an RM was regarded as a positive response.
Results and Discussion: Twice as many patients were responders in terms of lung mechanics indices compared to gas exchange indices (see table 1 & 2). The PEEP level where the best response for P/F ratio, shunt, and Cini was obtained was lower ($p < 0.05$) after the SLRM as compared to the VICM. Both RMs resulted in a nearly two-fold increase in EELV. Cini, the compliance below a plausible lower inflection point, increased in 13 vs 10 patients after the SLRM and at a PEEP-level 2 cm H_2O lower than after the VICM. This may be a result of the prolonged, low pressure RM recruiting lung but also shifting interstitial fluid and improving lung mechanic properties. If a RM is used to improve and stabilize lung mechanics, pressure level of the RM doesn't need to be higher than the upper limit for the plateau pressure during protective ventilation.

Gas exchange response

	P/F		Shunt	
	% increase (n)	PEEP cm H_2O	% decrease (n)	PEEP cm H_2O
VICM	77 (6)	13.6	–38 (10)	14.8
SLRM	59 (3)	10.9	–31 (7)	12.6

Lung mechanics response

	EELV		Compliance conv		Compliance ini	
	% increase (n)	PEEP cm H_2O	% increase) (n	PEEP cm H_2O	% increase (n)	PEEP cm H_2O
VICM	83 (16)	16	42 (8)	11.8	121 (10)	14.8
SLRM	98 (15)	16	43 (8)	10.0	84 (13)	12

Conclusion(s): Improved lung mechanic properties can be achieved using protective lung ventilation pressure levels. Prolonging a moderate pressure RM results in a significantly lower optimal PEEP level.

12AP8-8

Evaluation of respiratory measures and pulmonary edema measures in an overhydration animal model

A. Gómez, F. Ramasco, A. Planas, M. Santos, A. Ruiz

Anesthesiology Department, La Princesa Hospital, Madrid, Spain

Background and Goal of Study: Alterations in conventional respiratory measures are found in different conditions, apart from pulmonary edema. The thermodilution derived extravascular lung water index (ELWI) is a useful adjunct to assess lung edema and overhydration.(1) Ultrasound lung comets are an ecographic sign of extravascular lung water, originated from thickened interlobular septa.(2) The goal of this study was to detect the change of conventional respiratory measures (po2, compliance and Plateau pressure), and pulmonary edema measures (ELWI and number of ultrasound lung comets) in an animal model of overhydration
Materials and Methods: 8 pigs were anesthesized, ventilated in volume control (FIO_2 0.5)and monitored with the PICCO system. Overhydration was induced through fluid challenges in two phases: a first phase, an euvolemic phase, where fluid boluses of 200 ml of Ringer were administered until the cardiac index did not increase > 10%. After, the overhydration phase started, where pigs were administered 10 boluses of Ringer (45ml/kg each bolus, over 30 minutes). Before and after each fluid bolus the following data were recorded: number of ultrasound lung comets, ELWI, po2, compliance and Plateau pressure. The ecographic lung measures were obtained in both the right and left hemithorax, from the third to the fifth intercostal space, in 18 sites. Statistics were analyzed with Kormogorov analysis and a Student's t test for paired data and a repeated measures analysis of variance.
Results and Discussion: All respiratory measures were significantly changed during the experiment. ELWI values (basal mean values 12,3 ± 4,6) and the number of ultrasound lung comets (basal mean values 4 ± 1,4), compared to basal values, changed significantly at the same time, when pigs were administered the 4th bolus. (ELWI: 15,88 ± 4, number of lung comets 43 ± 29,3). Po2 (basal median values 209 ± 42,3) also showed significant changes compared to basal values with the 4th bolus. (174,5 ± 40). Compliance values (basal mean values 29,9 ± 2,6) were significantly altered with the 1st bolus (27,4 ± 1,9); and Plateau pressure values (basal median 9,88 ± 1,7) with the 2nd bolus (11,25 ± 1,16). Although compliance and Plateau pressure are altered earlier than pulmonary

edema measures, they are parameters than can be modified in many other conditions apart from pulmonary edema.

Conclusion(s): Both conventional respiratory measures and lung edema measures change early in an overhydration animal model.

References:

1 Curr Opin Crit Care 2007; 13: 303–307
2 Crit Care Med 2007; 35: 11: 126–132.

12AP8-9

Timing of extravascular lung water index and ultrasound lung comets in an overhydration animal model

A. Gómez, F. Ramasco, A. Planas, E. Maseda, F. Tendillo

Anesthesiology Department, La Princesa Hospital, Madrid, Spain

Background and Goal of Study: Pulmonary edema is a serious possible complication of fluid infusion. An early detection of lung edema is necessary to prevent complications and provide an adequate treatment. Ultrasound lung comets are an ecographic sign of extravascular lung water, originated from thickened interlobular septa.(1) The thermodilution derived extravascular lung water index (ELWI) is a useful adjunct to assess lung edema and overhydration.(2) The goal of this study was to evaluate the timing between the number of ultrasound lung comets and ELWI and also to assess the relationship between ELWI and ultrasound lung comets in an overhydration animal model.

Materials and Methods: After approval of the local comitee for animal research, 8 pigs were anesthesized and monitored with the PICCO system. Pigs were ventilated in volumen control mode, with a tidal volume of 10 ml/kg, a rate of 12 breaths/min and a FIO_2 of 0.5. Overhydration was induced through fluid challenges in two phases: a first phase, an euvolemic phase, where fluid boluses of 200 ml of Ringer were administered until the cardiac index did not increase > 10%. After, the overhydration phase started, where pigs were administered 8 boluses of Ringer (45 ml/kg each bolus, over 30 minutes). Before and after each fluid bolus the the number of ultrasound lung comets and the ELWI were recorded. The ecographic lung meausures were obtained in both the right and left hemithorax, from the third to the fifth intercostal space, in 18 scanning sites. Statistical calculations were performed with ANOVA for repeated measures, Greenhouse-Heiser, Bonferroni (post-hoc test) and Spearman's correlation test.

Results and Discussion: There was a statistically significant change over time of both respiratory measures. Unlike other studies (3), ELWI did not show correlation with the number of ultrasound lung comets. ELWI (mean basal values of the overhydration phase 12,87 ± 1,8) showed a significant change over time in the 5th fluid bolus (mean difference – 5,37 ± 0,9 p 0,02) earlier than the number of ultrasound lung comets, that changed in the 7th bolus (basal values 4 ± 1,4; mean difference – 183,6 ± 33,5 p 0,03).

Conclusion(s): In this overhydration animal model, ELWI shows changes before ultrasound lung comets.

References:

1 Gargani L et al. Crit Care Med 2007; 35: 11: 126–132.
2 Khan S et al. Curr Opin Crit Care 2007; 13: 303–307.
3 Agricola et al. Chest 2005; 127; 1690–1695.

Resuscitation and Emergency Medicine

13AP1-1

BIS may indicate cerebral hypoperfusion during experimental haemorrhagic shock

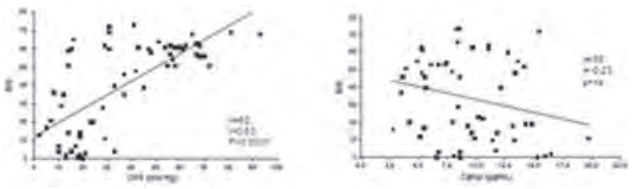
E. Cavus, P. Meybohm, V. Doerges, J. Scholz, B. Bein

Anaesthesiology and Intensive Care Medicine, University Hospital Schleswig-Holstein, Kiel, Germany

Background and Goal of Study: Bispectral index (BIS) has been proposed as an indirect measurement of cerebral perfusion (1). The purpose of this study was to investigate changes of BIS, and surrogates of cerebral perfusion, compared to plasma propofol concentrations in a porcine haemorrhagic shock model with slow and fast recovery of cerebral perfusion.

Materials and Methods: After Animal Investigational Committee approval, 16 anaesthetized pigs during propofol anaesthesia underwent a liver trauma with severe hypotension, and were randomly assigned to receive therapy for either slow recovery (Ringer, 40 $mL \bullet kg^{-1}$, and HES 130/0.4, 20 $mL \bullet kg^{-1}$; slow group; n = 8) or fast recovery of cerebral perfusion (vasopressin, 10 U bolus, and continuously 2 $U \bullet kg^{-1} \bullet hr^{-1}$, combined with hypertonic-saline starch 4 $mL \bullet kg^{-1}$ over 2 minutes; fast group; n = 8), respectively. Cerebral perfusion pressure (CPP = MAP-ICP), tissue oxygenation index (TOI), BIS, and plasma concentrations of propofol were measured at baseline (Pre-shock), at haemodynamic decompensation (Shock), and 5 (Therapy) and 30 minutes (End) after therapy, respectively. Statistical significance was considered at $P < 0.05$.

Results and Discussion: CPP, TOI, and BIS decreased significantly during shock (Pre-shock vs. shock, fast: CPP: 65 ± 14 vs. 15 ± 4 mm Hg; TOI: 64 ± 6 vs. 47 ± 7%; BIS 60 ± 5 vs. 9 ± 10; slow: CPP: 60 ± 12 vs. 13 ± 7 mm Hg; TOI: 68 ± 7 vs. 49 ± 7%; BIS 63 ± 5 vs. 13 ± 12; $P < 0.05$). In the fast group, CPP, TOI, and BIS increased after therapy compared to the slow group (Therapy, fast: CPP: 47 ± 15 mm Hg, TOI: 61 ± 7%, BIS: 47 ± 21; slow: CPP: 18 ± 9 mm Hg, TOI: 51 ± 5%, BIS: 21 ± 19; $P < 0.05$). BIS was significantly correlated to CPP, but not to plasma concentrations of propofol (Figure). Propofol concentrations were comparable between groups throughout the experiment.



Conclusion(s): Large variations of BIS values occurred during comparable propofol plasma levels. This suggests that during haemorrhagic shock, BIS reflected changes of cerebral perfusion, and possibly may give the chance to monitor recovery of cerebral electrical activity as a response to therapeutic interventions.

Reference:

1 Anesth Analg. 2005;100:158–61.

13AP1-2

COSBART; the evolution of a practical crisis management course for anaesthetists

J. Palmer

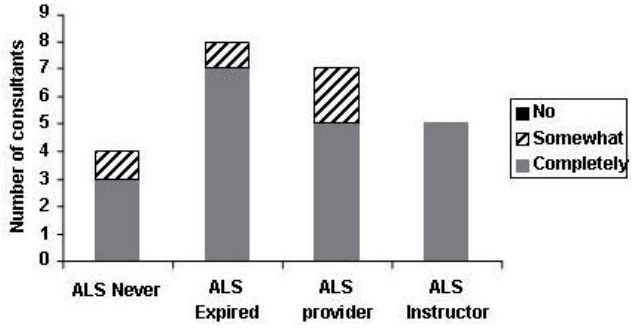
Anaesthesia, Salford Royal Foundation NHS Trust, Manchester, United Kingdom

Background and Goal of Study: In-theatre cardiac arrest is rare [1], anaesthetising 500 patients a year may result in only 2–3 patients needing cardiopulmonary resuscitation (CPR) each decade, so regular CPR training is vital to maintain skills [2]. Advanced Life Support (ALS) courses concentrate on cardiac causes of arrest, but those in theatre are mainly medication or airway related [1]. Other crises (e.g. can't intubate/can't ventilate) also need practice. We designed Continuing Scenario Based Anaesthetic Resuscitation Training (COSBART) to practice technical and non-technical skills required for perioperative cardiac arrest & critical incident management. We performed an observational study of attendees' confidence in managing crises & reviewed outcome of all subsequent anaesthetic related cardiac arrests.

Materials and Methods: COSBART lasts 3 hours, with three CPR and three non-CPR scenarios. Small groups (3–4) move through scenarios, with participants each taking the role of facilitator, subject, assistant & observer in turn. A mix of continuous assessment by outcome-based and criterion referenced methods is used, with immediate feedback using reflective critiquing. All participants perform all scenarios. Standard ALS resuscitation equipment is used, the only specific purchase was a cricothyrotomy trainer. Post-course, participants were surveyed about the course's impact on their confidence to manage a critical incident. All cardiac arrests in the operating theatre are reviewed for compliance with national guidelines.

Results and Discussion: All those taking the course felt more able to respond to critical incidents regardless of previous ALS training. In 2007–8 there were 6 in-theatre arrests (5/6 non-cardiac origin). Independent review of management shows near 100% compliance with guidelines, 4/6 patients had ROSC > 24 hrs.

Conclusion(s): CPR skills deteriorate by six months [1.] with near total loss at one year [2.]. To show training reduces mortality is impossible, but since both airlines and musicians [3, 4.] practice simulation and rehearsal to improve technical and non-technical skills, we recommend this cheap, easy, repetitive training to improve patient safety. and annual attendance is now mandatory in our department.



13AP1-3

Hypotensive rescusitation after prolonged hemorrhagic shock with co-existing severe head injury, improves outcome. An experimental study in pigs

T. Vrettos, P. Athanasopoulos, N. Karageorgos, G. Gatzounis, K. Filos

Anaesthesiology and Intensive Care Medicine, University of Patras Medical School, Patras, Greece

Background and Goal of Study: Hypotensive rescusitation [RS], e.g. RS without rapid volume expansion until surgical stop of the bleeding source, is an alternative way of managing hemorrhagic shock [HS]. Up to date, this method has been studied only in patients with closed thoracic trauma. In this study we examined the efficacy of hypotensive RS, compared to fluid RS, in animals with closed abdominal trauma and co-existing severe traumatic brain injury (T.B.I).

Materials and Methods: Female pigs (25–30 kg) were used. Anaesthesia was induced by i.m ketamine. Catheterizations of int. carotid artery, pulm. artery (Swan-Ganz cath) via inf. vena cava and a retrograde int. jugular vein (for SjO2) were performed. A surgical knot (4 mm) was made at the abdominal aorta. The abdomen was closed and the free ends of the stitch were laid outside. A standardized 6 cm diameter craniotomy was performed on which a cylindrical plexiglas reservoir with a 6,2 kg metal piston was adapted. A controlled T.B.I was made by a free fall of the 6,2 kg piston on the dura. Then, a cortical cerebral blood flow cath. (CoBF) was placed. After the T.B.I, the HS was made by pulling the stitch, which resulted in rupture of the abdominal aorta. Group A (fluid RS, n = 6) and group B (hypotensive RS, n = 6) animals that survived 60 min of HS underwent re-laparotomy, closure of the ruptured aorta and then one hour of fluid RS. Haemodynamic, CoBF and SjO2 measurements were performed in standardized intervals. Statistics was by ANOVA and post-hoc Newman-Keuls test.

Results and Discussion: Mortality in group A was 100% (even before re-laparotomy), while in group B it was only 50% ($P < 0.05$). Furthermore, group B animals showed after the surgical control of hemorrhage, a complete restoration of CoBF and brain oxygenation. Group B animals showed after shock a low SjO2, which can be attributed to the hemodilution after fluid RS given after aortic closure (table):

CoBF & SjO2 before and after surgical controlling of the hemorrhage

	baseline	5min before	15min before	45min before	5min after	15min after	45min after
Group A CoBF (ml/100g/min)	31,2	35,47	19,32	5,25*			
Group A SjO2 (%)	71,2	32,8	25,7	28,7***			
Group B CoBF	30,3	14,2*	14,5*	16,4	33,47	38,24	37,67
Group B SjO2 (%)	81,1	25,8***	22,7***	24,4***	38,5**	49,5**	57,1*

*: P < 0,05 **: P < 0,01 & ***: P < 0,001 compared to baseline

Conclusion(s): Hypotensive RS significantly reduces mortality (50% vs. 100%) in animals with closed intra-abdominal trauma and co-existing severe head injury, without putting in jeopardy the cerebral function.

13AP1-4

Prehospital use of Boussignac continuous positive airway pressure system in acute cardiogenic pulmonary edema

B. Fyntanidou, E. Amaniti, K. Fortounis, V. Grosomanidis, K. Paulou

Emergency Medical Services, Division of Thessaloniki, Thessaloniki, Greece

Background and Goal of Study: Continuous airway positive pressure (CPAP) has been shown to reduce morbidity, as well as the need for invasive mechanical ventilation among patients with acute respiratory distress in the setting of cardiogenic pulmonary edema. The goal of our study was to evaluate the efficacy of prehospital use of the Boussignac-Vygon™ CPAP system (CPAP-B) in the management of acute cardiogenic pulmonary edema (ACPE).

Materials and Methods: In this prospective descriptive open study without a control group, 79 prehospital patients (MM/F: 55/24, Mean age: 71.4 ± 9.5 years) presented with ACPE and managed on an emergency basis during the one-year period 01.07.2007–31.06.2008 by EMS Mobile Intensive Care Units (MICUs) physicians in the greater area of Thessaloniki, were enrolled. In adittion to standard therapy, all patients received CPAP-B at 10cm H_2O. Patients with decrease of consciousness level, bradypnea, hypotension (SBP < 90 mm Hg) and signs of shock were excluded. Vital signs including SpO_2, respiratory rate (RR), heart rate (HR) and systolic blood pressure (SBP) were recorded before CPAP-B placement and upon arrival in Emergency Department (ED). The efficacy of CPAP-B therapy was analyzed in terms of changes in vital signs, need for intubation, possible morbidity associated with CPAP-B, and prehospital mortality. Student's t-test and Wilcoxon signed ranks test were used for statistical analysis.

Results and Discussion: Mean duration of CPAP-B therapy was 31.1 ± 18.2min. Five (6.3%) patients required ETI before admission. Two of them experienced prehospital cardiad arrest, successfully managed by EMS crews. In one case, cardioversion was successfully attempted during the transport because of VT episode. There was one (1.3%) death in ED. CPAP-B treatment resulted in statistically significant improvement of all studied parameters: SpO_2: 79.39 ± 11.32/93.97 ± 7.19 ($p < 0.001$). RR: 28.21 ± 8.73/25.06 ± 7.49 ($p < 0.001$). HR: 122.27 ± 25.54/100.64 ± 17.14 ($p < 0.001$). SBP: 173.70 ± 37.81/140.94 ± 27.21 ($p < 0.001$). No technical problems or complications occurred during CPAP-B treatment.

Conclusion(s): The use of CPAP-B during emergency prehospital care of ACPE patients seems to be safe and efficient improving oxygenation, lowering RR, HR and SBP, and reducing the need for ETI. Subsequently, CPAP-B must be seen as a nonpharmacological form of treatment of ACPE, rather than only a supportive measure.

References:

1 Kallio T, Kuisma M, Alaspaa A, Rosenberg PH. *Prehosp Emerg Care* 2003; 7: 209–213.
2 Thompson J, Petrie DA, Ackroyd-Stolarz S, Bardua DJ. *Ann Emerg Med* 2008; 52: 232–241.

13AP1-5

The activity of a medical emergency team at an Australian teaching hospital

P. Calzavacca, E. Licari, M. Haase, A. Tee, R. Bellomo

Intensive Care Department, Austin Hospital, Heidelberg, Victoria, Australia

Background and Goal of Study: Monitoring of a Medical Emergency Team (MET) activity is an essential tool for the improvement of a Rapid Response System (RRS) according to the findings of the Consensus Conference on the activity of a RRS. At our institution, a RRS was introduced in September 2000. A continuous teaching activity has been in place since then. We sought to evaluate its activity five years after its introduction.

Materials and Methods: Retrospective observational study in a tertiary Australian hospital over a two-year period.

Results and Discussion: We analysed 2237 MET calls received by 1167 patients from August 2005 to August 2007. Mean age of the study population was 72 years, 60% were male, 28.8% were surgical patients, length of hospital stay was 18.8 days and hospital mortality 22.5%. In 25% of the patients receiving a MET call a written not for resuscitation (NFR) order was present at the time of the call. The MET instituted a new NFR order in 8.8% of the patients and 18.8% of the MET calls ended in an Intensive Care Unit (ICU) admission. The most common triggers of a MET call were respiratory distress (25%), hypotension (15%) and neurologic abnormalities (14.8%). However, 23% of the patients had more than one organ derangement triggering the call. Table 1 shows the

Table 1. Ten most common MET diagnoses.

MET diagnosis	Number
Atrial fibrillation/arrhythmia	154
Acute pulmonary oedema	118
Sepsis	117
Hypovolemia	81
Pneumonia	72
Vagal collapse/acute decrease in Glasgow coma scale	71
Drug overdose/withdrawal	56
Seizure	53
Acute coronary syndrome	47
Cerebro-vascular accident	29

ten most common MET diagnoses; Table 2 shows interventions and diagnostic procedures performed or ordered by the MET.

Table 2. Interventions performed by the MET and diagnostic procedures ordered.

Interventions	Number	Diagnostic procedures	Number
Airways management	82	Chest x-ray	416
Breathing support	140	ECG	753
Oxygen given	930	ABG	665
Circulatory support	306	Blood test or blood cultures	680
Vasoactive drugs	93		
Drug management	156		
Diuretics	260		
Fluid challenge	439		
Intravenous line placement	114		

Conclusion(s): The MET performed or facilitated comfort end of life care in many patients. Acute pulmonary oedema, atrial fibrillation and sepsis were the most common causes of activation of the MET. One fifth of the MET patients were admitted to ICU; of these, one fourth needed intubation. Mechanical ventilation or non-invasive ventilation was needed in nearly 10% of the patients reviewed by the MET, 20% needed diuretics, 40% a fluid challenge.

13AP1-6

Evaluation of performance of two different chest tubes with either a sharp or a blunt tip for thoracostomy in 100 cadavers

C. Ortner, N. Schaumann, V. Lorenz, M. Frass

Department of General Anaesthesia, General Intensive Care and Pain Management, Medical University Vienna, Vienna, Austria

Background and Goal of Study: Rapid and safe performance of tube thoracostomy is essential in the treatment of patients suffering from pneumothorax, hematothorax, pleural effusions or empyema. The aim of our study was to investigate two different types of chest tubes with respect to training effects, efficacy, and number of complications in cadavers.

Materials and Methods: In this, by local ethics committee approved, single center, prospective controlled trial, 20 emergency physicians performed five tube thoracostomies in 100 human cadavers using two different chest tube sets. Group 1 using a blunt tip (Tyco® Thoracic Trocar), group 2 using a sharp tip (Vygon® Thoracic Trocar). Age, sex, height, weight, BMI of cadaver, intercostal puncture site and time needed for procedure were recorded. By a following anatomical dissection the correct placement of the inserted chest tube was evaluated.

Results and Discussion: The chest tubes were accurately placed into the pleural space in 95% in group 1, and in 86% in group 2. Injuries, misplacements and technical problems taken together occurred more frequently using chest tubes with sharp tips (P = 0.030). There was no significant difference regarding time intervals from start of procedure to correct placement: 63 ± (20) sec in group 1 and 59 ± (15) sec in group 2 (P = 0.41). A training effect could only be observed in group 2 (P = 0.022 vs. P = 0.154 in group 1). In both groups, time for insertion was significantly dependent on BMI of cadavers (group 1: P = 0.002; group 2: P = 0.032).

Mean Time (in Seconds) for all Procedures and 1st Try versus 5th Try

	Blunt Tip	Sharp Tip
Try 1-5	63 (20)	59 (15)
1st Try	69 (16)	71 (21)
5th Try	50 (11)	51 (11)

Resutls are presented as Mean ans standard deviation (SD)

Success of Placement and Injuries (n=100)

	Blunt Tip	Sharp Tip
Interpleural Placement	95	86
Subphrenical Misplacement	1	4
Extrathoracal Misplacement	0	5
Liver Injury	2	1
Spleen Injury	0	4
Abborted	2	0

Conclusion(s): According to our results, chest tube sets with blunt tips were superior to those with sharp tips: there is no difference in time for insertion, but complication rate is higher using a sharp tip set. Furthermore, it seems to be more challenging to place chest tubes in patients with a higher BMI.

13AP2-2

Hypothermia after cardiopulmonary resuscitation attenuates brain pro-inflammatory cytokine mRNA expression

P. Meybohm, M. Gruenewald, K. Zacharowski, J. Scholz, B. Bein

Department of Anaesthesiology and Intensive Care Medicine, University Hospital Schleswig-Holstein, Kiel, S-H, Germany

Background and Goal of Study: Induction of mild hypothermia in patients after cardiopulmonary resuscitation (CPR) is associated with reduced mortality and a better neurologic outcome compared with normothermic controls [1,2]. The multifactorial protective action of hypothermia includes reduction in cerebral metabolism, oxygen consumption, and attenuation of neuronal damage [3]. Furthermore, the pro-inflammatory response, triggering apoptosis, induced by ischemia plays a pivotal role in reperfusion injury. However, effects of hypothermia on cerebral inflammatory response after CPR have not yet been elucidated.

Materials and Methods: Animal experiments were approved by the governmental ethical board for animal research in Kiel. After a 7-min non-intervention interval of untreated ventricular fibrillation, 14 pigs were resuscitated by external chest compressions at a rate of 100 per minute with a c/v ratio of 30:2, biphasic defibrillation attempts, and administration of epinephrine and vasopressin as suggested by the AHA guidelines. After return of spontaneous circulation, animals were randomized to undergo either normothermia (38°C; n = 7) or mild hypothermia for 12 hours (33°C; n = 7) followed by rewarming (0.5°C per hour). After 24 hours, brain tissue levels of IL-1, – 6, and TNF-α mRNA as well as genes regulating apoptosis were determined using quantitative real-time reverse transcriptase polymerase chain reaction. All samples were normalized for input based on GAPDH as a housekeeping gene. Data analyses were performed according to a relative standard curve method, and statistical significance was tested using randomization testing, as provided in the REST2005 program [4]. Samples with a probability value of <0.05 were regarded to be significant different between the groups.

Results and Discussion: Survival rate after 24 hours was slightly, however, not significantly higher in the hypothermia (5/7) compared to the normothermia group (3/7). The pro-inflammatory response upon CPR was significantly lower during hypothermia compared to normothermia ($p < 0.01$).

Conclusion(s): Mild therapeutic hypothermia after global cerebral ischemia resulted in decreased pro-inflammatory cytokine gene expression in brain tissue. This may promote, at least in part, brain protection.

References:

1 Bernard SA, Gray TW, Buist MD, et al. NEJM 2002, 346:557–563
2 Hypothermia after cardiac arrest study group. NEJM 2002, 346:549–556
3 Hachimi-Idrissi S, Van Hemelrijck A, Michotte A, et al. Brain Res 2004, 1019:217–225
4 Pfaffl MW, Horgan GW, Dempfle L. Nucleic Acids Res 2002;30:e36.

13AP2-3

Resuscitation in prehospital traumatic cardiopulmonary arrest: Futile or not?

B. Fyntanidou, K. Fortounis, E. Amaniti, V. Grosomanidis, K. Paulou

Emergency Medical Services, Division of Thessaloniki, Thessaloniki, Greece

Background and Goal of Study: Survival after prehospital traumatic cardiopulmonary arrest (TCPA) is rare, even with maximal resuscitative efforts. The decision of withholding or termination of in field resuscitation is difficult, since potential salvage of a very small subset of patients must be weighed against inherent costs and risks of resuscitation.

Materials and Methods: Twenty prehospital TCPA patients managed by EMS physicians in the greater area of Thessaloniki during the one-year period 01.07.2007-31.06.2008, were retrospectively studied. Excluding three patients, whose death resulted from primary cardiac arrest, 17 patients (M/F: 15/2, Mean age: 41.1 ± 18.3 years) were enrolled. Data recorded included prehospital times, type of trauma, initial rhythm, resuscitation duration, interventions and outcome.

Results and Discussion: Mean arrival time was 9.6 ± 5.4min, mean time at the scene 23.6 ± 9.1min and mean transport time 13.9 ± 8.9min. All patients but one suffered blunt trauma. Thirteen (76.5%) patients were found pulseless and apneic, while 4 (23.5%) experienced TCPA during initial assessment. PEA was the initial rythm in 10 (58.8%) patients, asystole in 6 (35.3%) and VF in 1 (5.9%). Mean resuscitation duration was 37.9 ± 29.2min. All patients, during CPR, received ALS interventions by means of endotracheal intubation, aggressive fluid resuscitation and chest tube drainage when necessary (7/17). Nine (52.9%) patients were declared dead upon arrival to hospital. Five (29.4%) patients experienced temporary return of spontaneous circulation (ROSC), but finally died, two in the operating room (OR) after surgical intervention for excessive hemorrhage, and three during ICU stay because of severe head or/and

cervical spine injuries. One patient suffering carotid artery injury was taken to the OR under CPR, but finally succumbed. There were two (11.8%) survivors suffering closed head injury and traumatic asphyxia respectively and presented in field with VF the first and SR the second one. Full neurological recovery after ICU stay was achieved in both patients. In all cases of ROSC–temporary or definitive, resuscitation lasted <15min. Death was the result of exsanguination in 4 (23.5%), severe head injury in 5 (29.4%), spinal injury in 1 (5.9%), and multiple organ system injuries in 5 (29.4%) patients.

Conclusion(s): Resuscitation in prehospital TCPA should be focused on patients with EMS-witnessed arrest or presented at the scene with organized ECG activity. Termination of resuscitation attempts should be considered after 15min of unsuccessful CPR.

13AP2-4

Cardio-Pulmonary Resuscitation (CPR) with Extra-Corporeal Membranous Oxygenation (ECMO) for refractory out-of-hospital cardiac arrest: An observational and pilot study

M. Le Guen, A. Nicolas-Robin, D. Barouk, P. Leprince, O. Langeron

Anesthesiology and Critical Care Medicine, Pitié-Salpêtrière Hospital – APHP, University Pierre et Marie Curie, Paris, France

Background and Goal of Study: Successful resuscitation with a good neurological outcome following out-hospital Cardiac Arrest (CA) remains very low [1]. Extra-Corporeal Membranous Oxygenation (ECMO) arouses enthusiasm in cases of drug poisoning or intra-hospital CA. [2-3] The aim of the present study was the assessment of early outcome (day 8) and of technical feasibility for out-of-hospital CA with setting of an ECMO during Cardio-Pulmonary Resuscitation (CPR).

Materials and Methods: Every patient (>15 years old) with a witnessed out-of-hospital CA and with an early specialized resuscitation (<15 minutes) were included in this prospective monocentric study. If CPR alone failed with an asystole rhythm, patients were quickly transported at hospital, where a femoro-femoral ECMO was set by a cardio-thoracic team during continuous external compression. Every delay from the fall to the ECMO start was collected (mean ± SD) and a comparison between survivors and non survivors was scheduled. A p value <0.05 was considered as significant.

Results and Discussion: 16 patients were included with 12 functional ECMO (75%) in these extreme conditions but no one survived beyond 3 days. The mean delay before RCP was 6 ± 6 minutes with 5 early asystole rhythm and 11 cases of ventricular fibrillation evolving in an asystole rhythm after defibrillation. The delay before ECLS start was only 125 ± 29 min. Severe lactic acidosis was present before ECMO and persisted after. Deaths were the consequence of multi-organ failure (7 cases), brain death (4 cases) and refractory haemorrhagic shock (1 cases).

Conclusion(s): This dramatic poor outcome was unexpected according to current literature and should lead to a major reflection about precise criteria to collect before initiation of this “extra-ordinary” technique.

Acknowledgements: To the cardio-thoracic team of Pr Leprince and to our nurses for their professionalism.

References:

1 Cobbe SM, Dalziel K, Ford I, Marsden AK. BMJ 1996; 312: 1633–7.
2 Megarbane B, Leprince P, Deye N, et al. Intensive Care Med 2007; 33: 758–64.
3 Morris MC, Wernovsky G, Nadkarni VM. Pediatr Crit Care Med 2004; 5: 440–6.

13AP2-5

FIO_2 and oxygen conservation during simulated cardiopulmonary resuscitation depending on the kind of resuscitation bag and oxygen flow

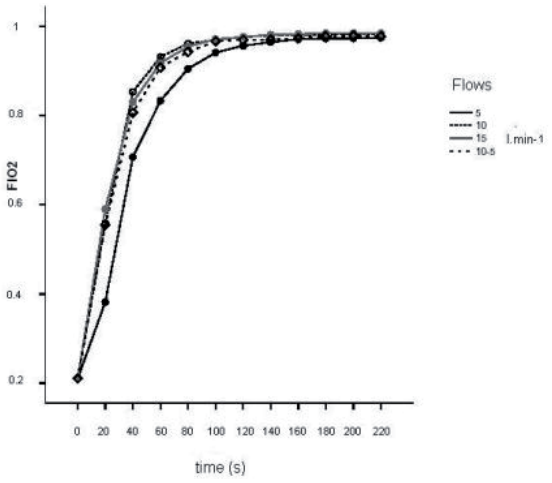
J. Ariño, J. Velasco, B. Herranz, B. Carrillo, F. López-Timoneda

Anesthesia, Hospital Clínico San Carlos, Madrid, Spain

Background and Goal of Study: Emergency cases for resuscitation include built-in oxygen cylinders with limited oxygen supply. The use of autoinflated resuscitation bags (ARB) with reservoir require a high constant flow of oxygen. The aim of the study was to analyze what FIO_2 can be reached and how long it takes using different ARB with their reservoir device and different oxygen flows in order to allow a reduction in oxygen requirements during simulated cardiopulmonary resuscitation (CPR).

Materials and Methods: Experimental analysis during simulated CPR on the effect of two different models of ARB with their reservoir device (Mark IV, Ambu S.L. Madrid. Spain and Revivator Plus, Hersill S.L., Madrid, Spain) and four different oxygen flows 5 l · min^{-1},10 l · min^{-1}, 15 l · min^{-1} and 10 l · min^{-1} during one minute followed by 5 l · min^{-1} (10^{-5}), in the final FIO_2 and the time spent to reach it. The inlet oxygen flow was administered using a flowmeter. Oxygen flows were administered until FIO_2 stabilized (220 s). An O_2 paramagnetic analyzer (Datex Ohmeda Anesthesia monitor, GE Healthcare, Madrid, Spain) to measure every 20 s the outlet FIO_2 and a lung simulator (VBM test lung, O-TWO Medical Technologies. Ontario. Canada) were used. The ratio of compressions to ventilations was 30:2. A constant tidal volume of 600 ml was administrated during the CPR. Data are expresed as mean (SD). Statistical analysis was performed using a statistical software program SPSS 15.0 for windows (SPSS Inc.). A *P* value < 0.05 was considered statistically significant.

Results and Discussion: With both ARB studied: a.- The FIO_2 reached with 10,15 and 10^{-5} l · min^{-1} were similar (p = 0.101) and higher than 0.90 (0.902 (0.07)) in 60 s. b.- With 5 l · min^{-1} higher FIO_2 were reached later (p ⟨⟨ 0.001) and were higher than 0.90 (0.905 (0.005)) in 80 s. c.- A $FIO_2 \geq 0.98$ was reached with all the oxygen flows during the study.



Conclusion(s): To allow a substantial reduction in oxygen requirements a 10 l · min^{-1} during 1 min. followed by 5 l · min^{-1} oxygen flow can be used during CPR with both ARB studied. Increasing supplemental oxygen flow did not appreciably increase the FIO_2.

13AP2-6

Public access defibrillators: Time to access the public

F. van Dehn, P. Schober, J. Bierens, S. Loer, L. Schwarte

Department of Anaesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: Sudden cardiac death is most frequently due to ventricular fibrillation (VF). Since the chance for successful termination of VF by electrical defibrillation rapidly declines over time, automatic external defibrillators (AED) have widely been made available to the public in highly frequented places such as railway stations or airports [1]. This approach is intended to allow virtually every coincidental bystander to use an AED and thus to minimize the delay between heart arrest and defibrillation. However, successful use requires a variety of premises to be met, e.g. that the potential rescuer knows what an AED looks like, what it is used for and would be willing to use it in an emergency situation. Therefore, we aimed to investigate knowledge and attitudes of potential public rescuers.

Materials and Methods: At Amsterdam central railway station, a total of 513 persons from 33 nations (40 ± 19 years, 298 male, 215 female) were interviewed using a standardized questionnaire in a zone of 3 meters around an AED. While interviewers pointed at one of the AEDs positioned at the wall (Powerheart G3, Cardiac Science, Bothell, WA, USA; eye-catching yellow colour in green container, labeld “AED”) they asked the responded to identify the device and to explain what an AED is used for. Moreover, the potential rescuers were asked whether they would actually be willing to use it in an emergency situation.

Results and Discussion: 239 out of 513 (= 47%) interviewed persons where able to identify the device as an AED or defibrillator. 273 persons (= 53%) could explain the purpose of an AED and 219 persons (= 43%) would actually be willing to use it. Only 142 out of 513 persons (= 28%) meet all of these premises which are all necessary to successfully use an AED in an emergency situation.

Conclusion(s): Only a minority of potential rescuers coincidentally coming along an AED at a major international railway station have sufficient knowledge and willingness to use this device in emergency situations. Broader public information campaigns and training may be necessary to improve the success of public access defibrillator programs.

Reference:

1 Moule P, Albarran JW. Resuscitation. 2002;54:223–30.

Acute and Chronic Pain Management

14AP1-1

Comparison of epidural corticosteroids in lumbar and sciatic pain in patients with previous lumbar surgery

M. Zackova, S. Gualdani, M. Zanello

Neurosciences Department, Ospedale Bellaria, Bologna, Italy

Background and Goal of Study: Controversy exists to the efficacy of epidural steroids in the treatment of low back pain. This syndrome is difficult diagnostic problem both clinically and radiologically. The aim of this retrospective study is to compare efficacy of epidural steroids in patients with recurrent lumbar and sciatic pain after lumbar surgery.
Materials and Methods: After their informed consent 89 patients (adge range 27 – 86 years) with long standing low back pain with o without radiation to one or both lower limbs, were treated. All these patients had previously undergone unsuccessful conservative therapy. Only group A (49 patients) had already undergone surgery for lumbar erniated disc some years ago. Each lumbar redicular pain patient received 80 mg methylprednisolone (Me) and 10 mg of Bupivacaine epidurally. Using a standard epidural technique, with 18 G Tuohy needle the puncture was performed medially in corresponding affected interspace. Patient'a active daily life (ADL) and pain score (VQS) were evaluated one and six months later by phone questionnaire. Statistical analyses were done by Wilcoxon's t-test.
Results and Discussion: Just after first month, 76% (group A) vs 79% (group B) patients were satisfied and their VQS and ADL were improved significantly. After six months we noticed, only 59% (group A) vs 62.5% (group B) patients were satisfied. No complication were reported. There were no statistical differences between groups considered previous lumbar surgery.
Conclusion(s): Radicular lumbar pain can be relieved by epidural steroids and local anaesthetics injection, often only with transient effects. The importance of previous lumbar surgery doesn't seem to be incisive.
Reference:
1 Samanta A, Samanta J. British Medical Journal 2004; 328:1509–10.

14AP1-2

The influence of thoracic epidural and thoracic paravertebral analgesia on development of post-thoracotomy pain syndrome in patients undergoing lung surgery

S. Kozar, L. Andjelkovic, V. Novak-Jankovic, T. Štupnik

Clinical Department of Anaesthesiology and Intensive Therapy, University Medical Centre, Ljubljana, Slovenia

Background and Goal of Study: Pain following thoracotomy can be managed with different technicques, including infusion of analgesic mixture through the epidural or paravertebral catheter. The aim of our study was to compare the efficacy of postoperative pain relief using thoracic epidural analgesia (TEA) and thoracic paravertebral analgesia (TPA) in patients who have undergone anterolateral thoracotomy and to determine the developement of postthoracotomy-pain syndrom.
Materials and Methods: A prospective randomised study was conducted on 30 patients who had undergone lung surgery. Patients were allocated in two groups. In TEA group thoracic epidural catheter was placed in Th6 – Th7 interspace. In TPA group a cathether was placed in the paravertebral space on Th6-Th7 level. Before induction of anaesthesia patients in both groups recieved 60 µg/kg morphine and local anaesthetic (TEA group: 0.125% bupivacaine, TPA group: 0. 5% bupivacaine according to Bromage scheme). Analgesic mixture was used postoperatively. TEA group recieved a mixture, composed of morphine 10 mg, bupivacaine 125 mg and clonidine 0.15 mg/100 ml saline; the rate of infusion was 0.05 ml/kg/h. TPA group received a mixture, composed of morphine 10 mg, bupivacaine 250 mg and clonidine 0.15 mg/100 ml saline; the rate of infusion was 0.05 ml/kg/h. PCA system was used in both groups (bolus 0.5 ml/kg; lock out 30 min) for 3 days postoperatively. Postoperative pain was evaluated in 6–12 months' period after the surgery. Groups were compared using Fisher's exact test.
Results and Discussion: Postthoracotomy pain was experienced in 21% of patients in TPA group and in 40% of patients in TEA group. TPA appears to be more effective in prevention of development of post-thoracotomy pain syndrom in 6–12 months' period after surgery as compared to TEA, although the difference is statistically not significant ($p = 0.29$). Our study showed lower incidence of this syndrome in both groups as compared to others (1).
Conclusion(s): TPA was superior compared to TEA in prevention of post-thoracotomy pain syndrome in 6–12 months' after lung surgery.
Reference:
1 Karmakar MK, Ho Am. Postthoracotomy pain syndrome. Thorac Surg Clin 2004; 14(3): 345–52.

14AP1-3

Intrathecal drug delivery: How small is a bolus non-significant?

C. Perruchoud, R. Nelissen, E. Buchser

Department of Anesthesiology, Lausanne University Hospital (CHUV), Lausanne, Switzerland

Background and Goal of Study: In chronic pain patients treated with intrathecal drug delivery (ITD) the continuous administration of bupivacaine does not improve pain relief (1) while the delivery of a very small, relatively fast bolus dose can produce significant pain improvement (2). We conducted a clinical trial to assess reproducibility of this observation.
Materials and Methods: Fifty intrathecal bolus administration of bupivacaine were performed in 46 blinded patients treated for chronic pain with Medtronic–Synchromed ITD system. All boli were administered through the pump. All patients received continuous intrathecal bupivacaine in addition to morphine and/or clonidine. Changes in pain intensity measured by visual analogue score (VAS), neurological status and vital signs were measured before and up to 2 hours after the bolus injection.
Results and Discussion: The average bolus dose and volume of bupivacaine were respectively 0.74 mg (0.10–2.36) and 44 µL (8–102). The average injection rate was 0.28 (0.03–0.38) µL/s. Pain scores improved in 77% of all trials, the average VAS decreased by 57% at rest and 58% during mobilisation. Loss of cold sensation in at least one dermatome was observed in 75% of the trials after the bolus injection. The changes in vital signs were neither clinically nor statistically significant.
Conclusion(s): Very small bolus doses of bupivacaine administered on top of a continuous intrathecal background infusion produce unexpectedly profound pain relief and large neurological changes. This cannot be explained by pharmacokinetics and pharmacodynamics alone. Factors related to the distribution of the drug in the cerebrospinal fluid must be considered.
References:
1 Mironer YE, Haasis JC, Chapple I, Brown C, Satterthwaite JR: Efficacy and safety of intrathecal opioid/bupivacaine mixture in chronic nonmalignant pain: A double blind, randomized, crossover, multicenter study by the National Forum of Independent Pain Clinicians (NFIPC). Neuromodulation 2002; 5: 208–213.
2 Buchser E, Durrer A, Chedel D, Mustaki JP: Efficacy of intrathecal bupivacaine: how important is the flow rate? Pain Med 2004; 5: 248–52.

14AP1-4

Meta-analyses of NMDA receptor antagonists for the treatment of neuropathic pain

S. Collins, M. Stigtermans, A. Dahan, W. Zuurmond, R. Perez

Anesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: The NMDA receptor has been proposed as a primary target for the treatment of neuropathic pain. The aim of the present study was to perform a meta-analysis evaluating the effects of (individual) NMDA antagonists on neuropathic pain, and the response (sensitivity) of individual neuropathic pain disorders to NMDA receptor antagonist therapy.
Materials and Methods: Medline, Embase and Cochrane databases were searched over the period 1966 till 21 December 2007 for randomized placebo controlled trials (RCTs) on neuropathic pain. The methodological quality of the included trials was independently assessed by two assessors using the Delphi list 1. Fixed or random effects model were used if appropriate to calculate the summary effect size using Hedges's g.
Results and Discussion: Twenty-eight studies were included meeting the inclusion criteria; individual and summary effect sizes were calculated for 16 good quality studies. Treatment with NMDA antagonists decreased pain significantly compared to placebo (– 0.25 (CI95% – 0.43, – 0.07), $p = 0.007$). Ketamine significantly reduced pain in neuropathic pain patients (– 0.66 (CI95% – 1.00, – 0.32), $p = 0.0002$). No significant reduction in pain was found for the other NMDA antagonists. Pain was significantly reduced in diabetic neuropathy patients after treatment with NMDA antagonists (– 0.40 (CI95% – 0.79, – 0.02), $p = 0.04$). No significant effect on pain in postherpetic neuralgia patients was found.
Conclusion(s): This meta-analysis provides clear indications of the effectiveness of NMDA antagonists for treatment of neuropathic pain. The most favourable effects were found for ketamine. RCTs further investigating the effects of other NMDA antagonists in homogenous groups of neuropathic pain patients are warranted.
Acknowledgements: This study was performed within TREND (Trauma Related Neuronal Dysfunction), a knowledge consortium that integrates research on Complex Regional Pain Syndrome type 1. The project is supported by a government grant (BSIK03016).

Reference:
1 Verhagen AP et al. The Delphi List: A Criteria List for Quality Assessment of Randomized Clinical Trials for Conducting Systematic Reviews Developed by Delphi Consensus, Journal of Clinical Epidemiology, 51 (1998) 1235–1241.

14AP1-5

A characterization of the determinants of persistent post-surgical pain after dental extraction – A 12 months follow-up study

A. Grigoras, P. Lee, G. Shorten

Anaesthesia and Intensive Care, Cork University Hospital, Cork, Ireland

Background and Goal of Study: Chronic post-surgical pain is an under-recognized and prevalent health care problem associated with significant morbidity and potential high cost. Two distinct chronic pain syndromes have been reported after dental surgery: post-traumatic dysestesia (5–13%) and phantom tooth pain (3%). It is largely unknown why pain in some cases persist or even develop after dental surgery. The purpose of this study is to describe pain and identify risk factors for chronic post-surgical pain one year after dental extraction.
Materials and Methods: With institutional Ethics Committee approval and having obtained written informed consent, 4 questionnaires were mailed to 100 patients who had undergone the extraction of a minimum of two lower impacted wisdom teeth under general anaesthesia, 12 months previously. This cohort had been followed previously: clinical, psychological and genetic data had been collected from patients pre-operatively, immediately post-operatively and at 3 months follow-up. Short Form McGill Pain Questionnaire (SF-MPQ), Pain Catastrophizing Score (PCS), Hospital Anxiety and Depression Scale (HADS) and Postoperative Symptom Severity Scale (PoSSe) were used at 3 months follow-up. The same questionnaires are used at 12 months follow-up. PPSP (Persistent Post-Surgical Pain) was defined as the answer "yes" to the following question: "have you had any pain in the last week that you attribute to your teeth extraction,12 months ago?". At the time of submitting the abstract, data were collected from 10 patients.
Results and Discussion: Preliminary results are summarized in Table 1 – Summary of data of the 10 cases mean ± SD. n–the number of patients. SF-MPQ-III stands for evaluative overall intensity of total pain experience.

Table 1.

	No PPSP 12 months, n = 8	PPSP 12 months, n = 2
Age	24.75 ± 7.72	20 ± 4
Gender (M/F)	5/3	0/2
PPSP 3 months (Yes/No)	1/7	2/2
SF-MPQ-III 3 months	0.75 ± 0.54	1.5 ± 0.7
PCS (preop)	2.75 ± 2.54	8 ± 0

Conclusion(s): The results obtained so far suggest that perioperative pain could be a risk factor for chronic post-surgical pain. The analysis of data collected from all patients will show if age, gender, genetic and psychosocial factors could be also risk factors.

References:
1 Macrae W.A., Chronic pain after surgery, BJA 2001,87:88–98.
2 Kehlet H. et.al., Persistent postsurgical pain: risk factors and prevention, Lancet 2006;367:1618–25.

14AP1-6

Effects in quality of life of the association of acupuncture to conservative treatment of chronic nonspecific low back pain

F. Figueiredo, J. Viana

Medicina, Faculdade de Medicina, Coimbra, Portugal

Background and Goal of Study: The high prevalence rate of back pain, especially chronic nonspecific low back pain, makes this condition one of the most common reasons for seeking medical help. It is also one of the major causes of physical limitation for working age people and results in absence from work and lowered productivity. Settings: To compare the evolution of pain levels, functional disability and global quality of life (QOF) in patients treated with acupuncture as complementary to conservative treatment and patients receiving only conservative treatment in National Health Centres.
Materials and Methods: Type of study: Observational, controlled, non-randomized. Patients: The sample was made up of 60 individuals: 30 underwent conservative treatment as well as acupuncture treatment in private practices (Group I); 30 underwent only conservative treatment in National Health Centres (Group II or control group). Methodology: Patients were assessed at two different times: before treatment began and three months later (which was considered the end of treatment). The following questionnaires were used: the Visual Analogue Pain Assessment Scale, the Oswestry Disability Index 2.0, the WHOQOL-BREF instrument, and the MOS-SF 36 General Health Survey Questionnaire 2.0 to assess QOF. The Visual Analogue Scale was used to assess other parameters such as Satisfaction with Treatment and Satisfaction with Heath Care Professionals.
Results and Discussion: The two groups had the same demographic characteristics, but Group I had a lower degree of functional disability. A comparison of the results obtained within each group at the beginning and at the end of the study shows a marked decrease in pain intensity as well as significant improvement in quality of life and functional capacity. However, a comparison between the two groups at the end of treatment did not reveal significant differences as to levels of pain, functional disability, QOL or satisfaction with treatment. Group I showed a higher degree of satisfaction with the relation between patient and health care professional. Absence from work is high in both groups.
Conclusion(s): The use of acupuncture treatment alongside conservative treatment cannot be said to have any objective advantage, apart from a more favourable reaction by patients to their relation with the health care professional. Nevertheless, this study clearly shows the need for reassessment in a randomized, blind study involving a higher number of patients.

14AP1-7

A proposed comprehensive pain score to triage chronic pain patients to outpatient clinics (similar to the Glasgow Coma Scale)

P. Ganty

Department of Anaesthesia, Critical Care and Pain Management, University Hospitals of Leicester, Leicester, Leicestershire, United Kingdom

Background and Goal of Study: It is getting increasingly difficult to triage patients for an urgent outpatient pain clinic appointment based on their symptoms alone due to the increasing number of referrals to the Pain clinic. To help ease this problem, I propose a simple Comprehensive Pain Score (CPS) which would allow the Pain physician to triage urgent referrals from non-urgent referrals.
Materials and Methods: All patients referred to the Pain clinic would be given a questionnaire containing 6 questions. Each question would cover one aspect of the patient's life. The six areas that would be covered would be: Ability to work, Social life, Mood, Sleep, Finances, and Response to current treatment. These six areas would have 6 simple options for the patient to choose from. Each option would range from 'not being affected' (option 1) to "severely affected" (option 5). Option 6 would include factors unrelated to the patient's pain. For example, a patient who is a paraplegic from past trauma and rarely moves out of bed would clearly indicate option 6 in the 'Ability to work' question. Each patient could then be assigned a score ranging from 6 to 36. Six would be scored by a person who is essentially normal, (similar to GCS 15), and 30 would be scored by a patient who would definitely need to be seen urgently as his sleep, mood, social life, finances were all severely affected because of the pain and the current treatment was inadequate (as per the patient). The range would be classified as shown.

Comprehensive Pain Score

Score	Suggested action
6–12	Consider appointment within 12 weeks
13–18	Consider appointment within 8 weeks
19–24	Consider appointment within 4 weeks
25–30	Consider appointment within 2 weeks or earlier if feasible
31–36	Consider one out-patient appointment and decide on further course of action (e.g. referral to Physiotherapy, Psychiatry, Rehabilitation etc.)

Results and Discussion: The Comprehensive Pain Score, when validated, would give Pain physicians a tool to triage their referrals depending on urgency. This would hopefully allow the most suffering-patients to be seen earlier than those patients in whom their pain was not that severely incapacitating. The Comprehensive Pain Score could also be used prospectively to assess a patient's response to the initial out-patient visit by comparing the score during the follow-up visit and further visits.
Conclusion(s): The Comprehensive Pain Score would be a helpful tool in the triage of referrals to the Pain Clinic.

14AP1-8

Management of muscular-skeletal cervicocranial pain

O. Zagorulko, L. Medvedeva, A. Gnezdilov, N. Samoilova

Anaesthesiology, National Research Centre of Surgery Academy of Medical Science, Moscow, Russian Federation

Background and Goal of Study: To increase efficacy and safety of complex pathogenetic management of muscular-skeletal cervicocranial pains.
Materials and Methods: 80 patients with muscular-skeletal cervicocranial pains were divided into 2 groups: study and control. The control group consisted of 40 patients (19 (47.5%) men and 21 (52.5%) women, mean age 39.06 ± 5.17 years, disease duration 2.45 ± 0.37 years) who received complex pharmacotherapy (lornokcicam 8–16 mg/day, tizanidin 4–8 mg/day and vitamins of group B for 10–14 days). The study group included 40 patients (17 (42.5%) men, 23 (57.5%) women, mean age 42.16 ± 4.60 years, disease duration 2.75 ± 0.34 years), in addition to conventional therapy therapeutical blocks at trigger points in the cervicocranial zones and non-drug therapy (manual therapy and reflex actions) were administered. Methods of investigation: anamnesis, neurological and neurorthopedic examination, pain testing (Visual Analogue Scale – VAS), MRI and X-ray examination of the cervical spine with functional tests, US duplex scanning of brachycephalic arteries. Clinical examination and pain testing were performed on 1,5,10 and 21 days.
Results and Discussion: During the course of treatment, by day 5 pain intensity decreased up to 2.52 ± 0.31 scores in 29 patients (72.5%), and by day 10 pain disappeared completely in 37 (92.5%) patients in the study group. Simultaneously, since the first days of treatment there were observed an increase in the range of active motions in all the parts of the spine and normalization of the muscle tone. In the control group, by day 5 of treatment, a significant improvement (a decrease in pain intensity up to 3.09 ± 0.45 scores) was seen in 18 (45%) patients. By day 10 of treatment pain was eliminated completely in 31 (76%) patients. However, by day 21, worsening of the condition was registered in 7 (18%) patients of the control group, while only in 2 (5.0%) patients in the study group insignificant pain sensations persisted.
Conclusion(s): The use of therapeutic blocks at trigger points of the cervicocranial zone, methods of reflex actions, and manual therapy makes it possible to increase efficacy and safety of treatment for patients with muscular-skeletal cervicocranial pains.

14AP1-9

Approaches to treatment for chronic pain syndrome in patients with severe knee arthrosis

O. Zagorulko, N. Samoilova, A. Gnezdilov, L. Medvedeva

Anaesthesiology, National Research Centre of Surgery Russian Academy of Medical Science, Moscow, Russian Federation

Background and Goal of Study: Selection of adequate analgesia in patients with apparent degenerative dystrophic lesions of knee joints depending on the duration and intensity of pain.
Materials and Methods: 287 women and 63 men (mean age 65.5 + 3.8 years) with knee osteoarthrosis (stages III–IV) who refused to undergo surgery or had contraindications to surgery because of the somatic status considerations were examined. The pain syndrome duration was from 6 months to 18 years. According to the results of orthopedic examination the patients were divided into 3 groups. A discrepancy between pain intensity and X-ray and MRI findings in patients of groups I and III engaged our attention. Pain appearing during prolonged static and dynamic loading accounted for 3–9 cm by the numerical Visual Analogue Scale (VAS). Approaches to patients' therapy were different in all 3 groups. Group I underwent rational orthesis, blocks with local anesthetics at trigger points, therapeutic exercises to strengthen the quadriceps muscle of thigh, massage, and physical therapy. The patients of group II were prescribed hyaluronic acid intra-articularly (1–3 injections), reasonable therapeutic exercises, and orthesis. In group III the therapy began with intra-articular administration of steroids in combination with local anesthetics; the number of blocks was equal to 3–4 depending on duration and intensity of pain. After pain relief intra-articular administration of hyaluronic acid (1–2 injections), followed by acupuncture, therapeutic exercises, physical therapy, and orthesis were used.
Results and Discussion: The treatment results were assessed before treatment and after 1, 6, 12, 24 months of follow-up (presence and intensity of pain). In group I pain intensity decreased up to 1–2 scores by the end of month I of treatment. After 6–12 and 48 months no increase in pain intensity >4 scores by VAS was noted. In group II, immediately after the therapy, pain intensity decreased up to 2–4 scores and 48 months later its intensity did not exceed 5 scores. In group III, pain intensity decreased up to 4–6 scores by the end of month I.6, 12, 48 months later the intensity of pain did not exceed 6 cm (VAS).
Conclusion(s): Adequate use of therapeutic blocks in combination with reasonable orthesis for unloading the joint and therapeutic exercises aimed at strengthening thigh muscles makes it possible to achieve a stable decrease in pain intensity, to avoid possible exacerbations and to improve the quality of life in patients with severe knee arthrosis without surgery.

14AP1-10

Stage management of pain syndrome and electrophysiologic monitoring of its efficacy in patients with cervical spine pathology

O. Zagorulko, L. Medvedeva, A. Gnezdilov, A. Syrovegin, N. Samoilova

Anaesthesiology, National Research Centre of Surgery Russian Academy of Medical Science, Moscow, Russian Federation

Background and Goal of Study: Selection of methods for the treatment of acute and chronic radicular pain syndromes resulting from cervical spine pathology as their character and intensity require. Development of electrophysiological techniques of monitoring the efficacy of the given therapy.
Materials and Methods: 438 patients with radicular pain syndrome, caused by herniation of intervertebral disk at $C_4 – C_7$ levels were examined and treated. Monitoring of the therapy efficacy was conducted basing on neurologic examination, Visual Analogue Scale (VAS), spectral analysis of electroencephalogram (EEG) capacity, electromyography (EMG) of neck muscles, somatosensory induced potentials (SSIP) at fingers stimulation with monitoring potentials in the cervical area. Blocks of brachial plexus, pharmacopuncture at trigger zones of the neck and back muscles, pharmacotherapy with NSAIDs, central myorelaxants, group B vitamins, acupuncture, cervical collar were used as therapeutic techniques.
Results and Discussion: When pain intensity was 8–10 cm by VAS the treatment was started with central therapeutic blocks (epidural, brachial plexus) with corticosteroid drugs (diprospan) in combination with local anesthetics (marcain, naropin). Not more than 3 blocks 3 days apart were conducted. At repeated blocks the dose of diprospan was reduced by half. The blocks were accompanied by pharmacotherapy. Even after 1–2 blocks a decrease of pain up to 3–5 cm by VAS was achieved in 83% of patients. At pain intensity of 5–7 cm by VAS pharmacopuncture using local anesthetics (up to 10ml of 0.2% naropin solution or 0.125% marcain solution) in combination with 0.5–1.0ml of diprospan was administered. After 1–4 procedures the intensity of pain in 92% of patients decreased up to 1–2 cm by VAS. At pain intensity of <4 cm by VAS we carried on acupuncture according to our own original technique without prescribing medication. Cervical collar was recommended for wearing up to 2–3 hours a day at pain of any intensity.
Conclusion(s): The therapy of radicular pain syndrome in cervical spine pathology should be based on the principles of integrative medicine and include therapeutic blocks, pharmacotherapy, pharmacopuncture, and acupuncture depending upon pain intensity and results of electrophysiologic investigations.

14AP2-1

Audit of transversus abdominis plane blocks for elective gynaecological laparotomy surgery

C. Nutt, R. Laird, J. Bradley

Department of Anaesthetics, Altnagelvin Hospital, Londonderry, United Kingdom

Background and Goal of Study: The Royal College of Anesthetists suggests patients should be pain free at rest after surgery, but to avoid morbidity the ability to deep breathe and cough is required. The transversus abdominis plane (TAP) block; performed by introducing local anesthetic via the triangle of Petit; can provide effective post operative analgesia for midline surgical wounds[1] and caesarean sections[2]. Various analgesic modalities are used for gynaecological laparotomy surgery. This audit aims to assess the adequacy of pain relief provided, the effect of regional blocks and side effects.
Materials and Methods: Patients were identified from theatre lists. Information on nausea risk, operation and anesthetic technique was collected. Pain, nausea and vomiting scores were recorded on recovery admission, discharge, one hour post op and at 24 hours using a four point likert scale. Analgesic requirements and timings were collected. Patient satisfaction was sought. Non parametric statistical analysis was performed.
Results and Discussion: 50 patients were enrolled. Operations were by Pfannensteil incisions under general anesthesia. All patients were given morphine, 90% received paracetamol and 58% diclofenac. TAP blocks were used in 26, the remainder had local infiltration. In recovery there was no difference in pain scores (P = 0.24), fewer TAP block patients required analgesia (58%vs75%, P = 0.28) and morphine requirements were reduced (P = 0.17) but not significantly. Day one pain scores were lower for TAP block patients (1vs1.5 P = 0.01) with 85% vs 50% reporting no or mild pain. Day one morphine requirements were reduced (8.2mg vs 23.2mg, P = 0.001) with increased time to first analgesia (6hrs vs 3.5hrs P = 0.01). Diclofenac use had non significant reduction in day one pain (P = 0.31). Prophylactic anti emetics were used in all patients. Nausea was reported by eight in recovery increasing to 50% on day one. Those who received a TAP block had lower nausea scores (P = 0.01). 96% and 92% of patients were satisfied.

Conclusion(s): Pain, analgesic requirements and nausea scores during the first 24 hours can be reduced using a TAP block. Routine TAP block introduction may decrease ward workload.

References:

1 McDonnell J G et al. The Analgesic Efficacy of Transversus Abdominis Plane Block After Abdominal Surgery: A Prospective Randomized Controlled Trial. Anesthesia & Analgesia 2007;104(1):193–97.

2 McDonnell JG et al. The analgesic efficacy of transversus abdominis plane block after cesarean delivery: a randomized controlled trial. Anesthesia & Analgesia 2008; 106(1):186–91.

14AP2-2

Comparison of IV oxycodone and IV morphine in patient-controlled postoperative analgesia following laparoscopic hysterectomy

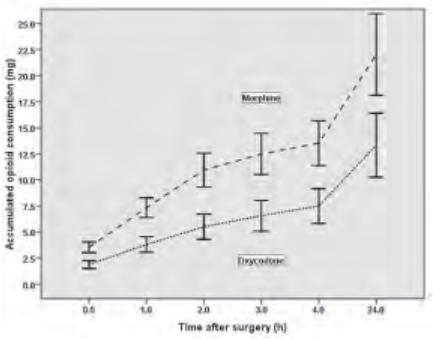
H. Lenz, J. Raeder

Department of Anaesthesia, Ullevaal University Hospital, Oslo, Norway

Background and Goal of Study: The equipotent doses of iv. oxycodone compared to iv. morphine are presumed to be 1:1.[1] Experimental studies in humans suggest that oxycodone is a more potent drug in the treatment of visceral pain compared to morphine.[2] This study investigated the dose requirements, pain-relief and side effects of oxycodone vs morphine after surgery with mainly visceral pain.

Materials and Methods: 91 women scheduled for laparoscopic hysterectomy were included in this randomized, double-blind study. General anaesthesia was induced and maintained with infusion of propofol and remifentanil. Before the end of surgery, the patients received 0.07 mg/kg of either oxycodone (Gr. O) or morphine (Gr. M) iv. The patients used a PCA pump for 24 h postoperatively. Gr. O received 0.015 mg/kg oxycodone, and Gr. M 0.015 mg/kg morphine iv. every time they push the button. Accumulated opioid consumption, VAS and side effects were registered for 24 h.

Results and Discussion: The accumulated oxycodone consumption was significantly less compared to the accumulated morphine consumption (13.3 ± 10.4 mg vs 22.0 ± 13.1 mg, P = 0.001). In Gr. O, VAS scores at rest and when coughing were significantly less than in Gr. M at 0.5 h and 1 h postoperatively: VAS rest at 0.5 h 45 ± 20 mm and 1 h 37 ± 18 mm (Gr. M: VAS rest at 0.5 h 52 ± 18 mm and 1 h 45 ± 14 mm), P = 0.037; VAS cough at 0.5 h 51 ± 20 mm and 1 h 43 ± 18 mm (Gr. M: VAS cough at 0.5 h 60 ± 19 mm and 1 h 54 ± 14 mm), P = 0.006. Gr. O was significantly less sedated during the whole postoperative period compared to Gr. M (mean sedation (scale 0–4); Gr. O: 0.77 ± 0.40 and Gr. M: 1.03 ± 0.47, P = 0.006).



Conclusion(s): In this clinical model of visceral postoperative pain, the ratio between oxycodone and morphine was found to be approximately 2:3. Group O had less pain during the first postoperative hour and was less sedated during the whole study period.

References:

1 Silvasti M et al. Comparison of analgesic efficacy of oxycodone and morphine in post-operative intravenous patient-controlled analgesia. Acta Anaesthesiol Scand 1998;42: 576–80.

2 Staahl C et al. A comparative study of oxycodone and morphine in a multi-modal, tissue-differentiated experimental pain model. Pain 2006;123:28–36.

14AP2-3

Intratechal morphine for postoperative analgesia after major liver resection

F. Pissarra, M. Garcia

Anesthesiology, Hospital Curry Cabral, Lisboa, Portugal

Background and Goal of Study: Major hepatic resection is often associated with coagulopathy and drug metabolism disorders which make epidural and intravenous postoperative analgesia problematic choices. Few studies have been made using intrathecal morphine as an alternative for this type of surgery. In this study intrathecal morphine was used at a 0,35mg dose and pain relief efficacy and side effects were studied.

Materials and Methods: Retrospective study of 18 months period. Patient selection criteria was major hepatic resection (three segment or more) and 0,35mg dose of intrathecal morphine. Analgesia was complemented with Paracetamol at 8 hours intervals and intravenous tramadol as rescue until 24h after the intrathecal dose. The postoperative analgesia registry was analysed for pain (simple verbal scale), respiratory depression, sedation (Ramsay Score), nausea, vomiting and pruritus immediately after surgery (0H) and 24 hours after.

Results and Discussion: Forty seven patients were enrolled, 36 men (77%), age 60,6 ± 12,5 years, weight 72,2 ± 10,9 kg, 2 patients ASA I (4%), 41 ASA II (87%) and 4 ASA III (9%). 81% of patients had a diagnosis of colorectal metastasis, 17% of primary liver cancer and one patient with hepatic cysts. Immediately after surgery (0H) 34 patients had no pain (72%), 8 patients mild pain (18%), 3 moderate pain (6%) and 2 severe pain (4%). At 24H, 35 patients experienced no pain (74,5%), 8 mild pain (17%), and 4 moderate pain (8,5%). No patient had intolerable pain. Rescue therapy was used in 9 patients (19%). Side effects were uncommon and no respiratory depression was registered. At 24H 3 patients had sedation Ramsay 3 and 1 patient Ramsay 5. Four patients (8,5%) developed nausea or vomiting until 24H after the end of surgery. One patient reported light pruritus at 24H. Complete pain relief or mild pain immediately after surgery was accomplished in 90% of patients and 91,5% at 24 hours after surgery. There are few studies regarding this technique in this surgery and an optimal morphine dose has not been established. The incidence of side effects with this dose is acceptable considering the analgesia efficacy and the drawbacks of the other analgesia options.

Conclusion(s): Intrathecal morphine is a good alternative for postoperative analgesia in major hepatic resection surgery. It is simple, cost effective, with good pain relief results until 24 hours and few side effects. More studies are required to evaluate the optimal morphine dose, adjuvant analgesic therapy and comparison with other techniques.

14AP2-4

Pre-operative high-dose paracetamol is morphine-sparing in super-obese patients undergoing bariatric surgery

N. Enzor, P. Johnston, M. Bentley, M. Margarson

Dept of Anaesthesia, St Richard's Hospital, Chichester, West Sussex, United Kingdom

Background and Goal of Study: Morbidly obese patients have a high incidence of co-morbidities including occult sleep apnoea and are at high risk of post-op complications. A multi-modal analgesia technique has been developed to minimise morphine use and CO_2 retention during the critical first 24 hours following surgery. We compared a low and a high dose paracetamol regimen by auditing morphine PCA usage.

Materials and Methods: We studied all Super-obese patients (BMI > 50 kg/m^2) who underwent Gastric Bypass at our unit between May 06 and Nov 08. All patients received fentanyl 1mcg/kg and morphine 20mcg/kg at induction then a sleep dose of propofol and maintenance with sevoflurane or desflurane in air. Intra-operative analgesia was provided with iv morphine, iv paracetamol, and wound infiltration with bupivacaine 0.25%. Post-operatively patients received regular paracetamol, diclofenac and a morphine PCA. Patients were grouped as high-dose (3–4 g of per-operative paracetamol) and low dose (0–1 g). Subsequent paracetamol, diclofenac and morphine were compared over the first 8-hours and 24 hours post-operatively. Arterial blood gases were reviewed to note the highest arterial pCO_2 level within each time period.

Results and Discussion: 253 patients were screened: 210 (83%) received a standard intra-operative 2g of iv paracetamol. 43 patients (34 female, 9 male) received either high dose paracetamol (n = 23) or low-dose (n = 20). Their average age was 43 years, median BMI 60 kg/m2 (range 48–92) and the median weight 170 kg (range 112–295 kg). The table below compares the high and low dose groups per-operatively and over the first 8 hours. Values are medians and statistical significance calculated using the Mann-Whitney test. The median 24-hour dose of paracetamol was 7.1 vs 5.0 g. Median hourly morphine dosage in the first 24 hours post-operatively was 2.0 (0–5.8) mg/hr.

		Per-op			0-8 hours post-op		
	Body weight	Paracet	Morph	Diclof	Paracet	Morph	Peak pCO2
Low-Dose (n = 20)	160 kg	0.6 g	6 g	10 g	1.5 g	27 g	6.74
High-Dose (n = 23)	180 kg P = 0.01	3.4 g p < 0.001	7.6 g ns	71 g P < 0.01	1.3 g ns	18 g P = 0.03	6.38 P = 0.18

Conclusion(s): Morphine requirements were more than 30% lower over both the first 8 hours and over the first 24 hours in the patients receiving the high-dose paracetamol regimen. There was a trend toward lower pCO_2 in the high-dose paracetamol group. The relative importance of paracetamol and diclofenac in reducing the morphine PCA usage will be the subject of further study.

14AP2-6

Effect of intra-operative magnesium sulphate on pain relief and patient comfort after thoracotomy

C. Oztin Ogun, B. Ozkaya, A. Duman, G. Sarkilar

Anaesthesiology and Intensive Care, Selcuk University Meram Medical Faculty, Konya, Turkey

Background and Goal of Study: As an NMDA receptor antagonist and natural Ca^{++} channel blocker; magnesium sulphate (Mg^{++}) has antinociceptive effects. Although some studies report that Mg may reduce postoperative analgesic requirements after various surgical procedures, evidence on postthorocatomy pain is lacking. We investigated the effects of preinduction and intraoperative Mg^{++} infusion on analgesic requirement and patient comfort in patients undergoing thoracotomies.

Materials and Methods: After ethical committe approval and written consent; 75 ASA I–II (age 16–65yr, weighing 50–100kg) were included in this double blind, prospective, randomised study. Group I and group II received 50 mg. kg^{-1} Mg as a loading dose before anaesthesia induction. For maintenance; group I received 8mg. $kg^{-1}hr^{-1}$ Mg and group II received 15mg. $kg^{-1}hr^{-1}$ Mg intraoperatively Control group received saline as a loading and for maintanence. Standard anesthesia induction (propofol; atracurium) and maintenance (desflurane, remifentanil) were performed in all groups. Study drugs were discontinued immediately after closure of fascia. For routine postoperative pain treatment; intercostal nerve block was performed by the surgeon and 3mg. kg^{-1} tramadol i.v. was given in all patients. Patient controlled analgesia was used with tramadol. Pain scores were evaluated by using VAS (0–10) at 10 minutes after extubation, 30th min, and 2nd, 6th, 12th, 24th hours (at rest and during coughing at the same-time). During postoperative period; Ramsay sedation scores (RSS) and side effects were evaluated. Sleep comfort was evaluated by using VAS. Repeated measures for ANOVA and Tukey-HSD, t tests and chi square were used for statistics ($p < 0.05$ = significant).

Results and Discussion: Patients demographics were similar. Total analgesic consumption and side effects were similar among the groups. Pain scores (both resting and coughing) were lower in group II than control group until 2nd hr after extubation ($p < 0.05$). Pain scores were similar among the groups at 6th, 12th 24 th hours (both resting and coughing). Agitation incidence (RSS = 1) was higher in control group than the magnesium groups ($p < 0.05$). Scores of sleep comfort were higher in group II than the others ($p < 0.05$).

Conclusion(s): Magnesium increased sleeping comfort and smoother emergence at extubation without increasing side effects, when given 15mg. $kg^{-1}hr^{-1}$ intraoperatively. However, although better than control, magnesium provided only moderate postoperative analgesia at early postoperative period even in group II.

14AP2-7

Satisfaction with CSE vs. EA postoperative analgesia for low anterior resection

D. Stamenkovic, D. Janjevic, Z. Slavkovic, M. Veljovic, A. Popadic

Anesthesiology Dept, Military Medical Academy, Belgrade, Serbia

Background and Goal of Study: The aim was to compare patients' satisfaction with postoperative analgesia after combined spinal-epidural analgesia (CSE) vs. epidural analgesia (EA) as adjunct to general anesthesia in patients undergoing low anterior resection.

Materials and Methods: 156 patients with rectal carcinoma were included in this prospective patient blinded and randomised study. Preoperatively spinal anatomy and habitus were assessed. CSE (Espocan CSE set) (G-CSE) was performed the L2-3 space, and epidural (G-EA) was performed in T9-10 space. Both groups had bupivacaine 0.25% for EA, while G-CSE had morphine 200 mcg in subarachnoid space. The same intermittent EA regime was used in both groups: For intraoperative analgesia regular boluses of 0.25% bupivacaine 5 ml were given hourly. For postoperative analgesia, starting at the time the fascia was closed, 0.125% bupivacaine 13 ml with morphine 3 mg was given every six hours and tramadol 50mg if VAS > 30 mm. Patient satisfaction with postoperative analgesia was rated on a 5 point scale (very dissatisfied = 1, dissatisfied = 2, neutral = 3, satisfied = 4, or very satisfied = 5) and recorded on postoperative day four. Independent sample T-test and Pearson X^2 were used for data analysis. The significance was set at $P < 0.05$.

Results and Discussion: Groups were comparable in age, gender, spinal anatomy and body habitus. All blocks were succesfull. There were no significant intergroup difference in time needed for block performance, number of punctures and highest VAS pain [Table 1]. Patients' satisfaction with analgesia was similar between groups [Table 2].

Table 1. Block performance time and analgesia details.

Group	G-CSE (n = 78)	G-EA (n = 78)	P
Time needed for neuraxial block performance (min)	15.3 ± 6.7	12.8 ± 5.3	0.275
Time to 1st analgesia request (min)	236.3 ± 238.7	148.7 ± 211.8	0.108
Highest VAS pain score (mm)	45.36 ± 26.6	41.7 ± 29.3	0.133

Data presented as mean ± SD.

Table 2. Patient's satisfaction with postoperative analgesia.

Group	G-CSE (n = 77)	G-EA (n = 74)
very dissatisfied	0	1
dissatisfied	0	1
neutral	6	8
satisfied	30	28
very satisfied	41	36

Conclusion(s): Similar satisfaction with postoperative analgesia whether CSE in lumbar or EA in thoracic region was used, can influence clinical practice as CSE in lumbar region minimizes potential harm to nerve structures.

14AP2-8

Postoperative pain modulation by preoperative intramuscular ketamine

A. Weinbroum, S. Chazan, Y. Kollender, J. Bickels, E. Rachman

Department of Anesthesia, CCM, Acute Pain Service, PACU, Tel Aviv Sourasky Medical Center and The Sackler Faculty of Medicine, Tel Aviv, Israel

Background and Goal of Study: Administration of drugs, such as opioids, glutamate inhibitors and N-Methyl-*D*-Aspartate receptor (NMDAR) antagonists during induction has been suggested to affect postoperative pain. Such pre-emption is still controvertial. Assess the effects of multiple doses of preoperative ketamine on postoperative pain and analgesics consumption.

Materials and Methods: The institutional ethics committee approved this study. Thirty patients undergoing bone and/or soft tissue tumor resection under general anesthesia were randomly and blindly given 3 ketamine doses of 5, 10 and 25mg or equivalent volumes of 0.9% saline intramuscularly Q6h starting at 18h preoperatively. Postoperatively, all received morphine (1.5mg/bolus every 7min) via IV-PCA.

Results and Discussion: The demographic, medical, surgery and anesthesia data were similar between the two groups. Ketamine administration was associated with slight and brief (1–3min) dizziness following the 25mg dose. Ketamine patients used less morphine via IV-PCA during 24h than the placebo group: their effective use was lower than in the placebo group (0.48 ± 0.66/pt vs. 1.13 ± 1.27, P = 0.01). Pain scores were also lower in the former than in the latter (2.6 ± 1.4[SD]mg/pt vs. 4.0 ± 1.9, P = 0.01). It seems that ketamine intramuscularly, even many hours before surgery, could affect postoperative pain, presumably by antagonising NMDAR.

Conclusion(s): Preoperative (>12h) ketamine improves pain score and reduces IV-PCA-administered morphine.

14AP2-9

Effect of remifentanil on postoperative pain in gynecologic surgery with sevoflurane anesthesia

J. Kwon, A. Cho, H. Kim, K. Kim, W. Kim

Anesthesia and Pain Medicine, Pusan National University Hospital, Busan, Korea

Background and Goal of Study: Rapid development of acute opioid tolerance and hyperalgesia is well established in animal studies and is more likely to occur with large doses of short-acting drugs. Several experimental and clinical studies of varied design that have been conducted in humans comparing remifentanil with other routinely used anesthetics or placebo preparations have produced conflicting results. The aim of this study was to investigate whether remifentanil had any impact on postoperative pain after gynecologic surgery.

Materials and Methods: Sixty patients undergoing gynecological surgery were randomly allocated into three groups (each n = 20): N group with normal saline, L group with target-controlled infusion (TCI) of 1 ng/ml remifentanil, and H group with TCI of 3 ng/ml remifentanil. All patients were anesthetized with sevoflurane to maintain mean arterial pressure within 20% of basal values. Thirty minutes before the end of surgery, patients received

morphine sulfate through a patient-controlled infusion device. Pain scores, sedation scores, and analgesic requirements were recorded for 48 hours postoperatively.

Results and Discussion: The mean remifentanil infusion dose of the H group was significantly higher than that of the L group. The VAS scores of the L and H groups were significantly higher than those of the N group only at the postanesthetic care unit and not at the ward.

Conclusion(s): Intraoperative use of remifentanil with sevoflurane may be related to increased postoperative pain during early postanesthetic period. Provision for effective preventive and therapeutic management strategies in case of intraoperative remifentanil use may be reasonable.

14AP2-10

Topical local anaesthesia in high-dose-rate brachytherapy for cervical cancer

L. Green, J. McGhie

Department of Anaesthesia, Western Infirmary, Glasgow, Scotland, United Kingdom

Background and Goal of Study: The Beatson Oncology Centre in Glasgow delivers high dose rate (HDR) intracavity brachytherapy for women with cervical cancer. Transvaginal rods are inserted under general anaesthetic. After brachytherapy delivery, the rods are removed with the aid of Entonox alone. All parts of the treatment can be painful and this is managed using a combination of simple analgesics and opioids. Topical lidocaine to the vagina can result in safe and effective anaesthesia for this type of procedure [1]. The aim of this audit was to establish pain scores associated with the treatment. A trial of topical cervical/vaginal local anaesthesia (LA) was then undertaken. The primary outcomes measured were pain scores and opioid use.

Materials and Methods: Eleven consecutive patients (no LA) group underwent 41 treatments. They were asked to rate pain using a numerical rating scale (NRS 0–10) for each part of the treatment. Following this, a second cohort of 13 patients (LA group) who underwent 42 treatments received a combination of 20ml of 1% lidocaine and 10ml of 0.5% levobupivacaine topically. This was distributed equally as a bolus via two epidural catheters, one attached to each brachytherapy rod to ensure local anaesthetic administration to both vaginal fornices. This was done under general anaesthesia at the time of rod insertion. A Mann-Whitney U test was used for statistical comparison.

Results and Discussion: Median NRS (IQR) during rod removal reduced from 5 (4–6) in the 'no LA' group to 2.5 (0–4.75) in the LA group, $p < 0.0001$. 16 (39%) treatments resulted in a discharge NRS other than 0 in the 'no LA' group compared to 7 (17%) treatments in the LA group, $p = 0.0064$. Median oral equivalent [IQR(range)] morphine consumption for the 'no LA' group was 44 [27.5–62.5(0–230)] mg compared to 29 [14.5–42(0–80)] mg in the LA group, $p = 0.0045$.

Conclusion(s): Administration of topical local anaesthesia decreased pain scores and morphine consumption in HDR brachytherapy. There were no complications. These findings have confirmed current practice and future use of this analgesia may involve repeated LA bolus prior to rod removal or continuous infusions.

Reference:

1 Chen HC et al. Local vaginal anaesthesia during high-dose-rate intracavitary brachytherapy for cervical cancer. International Jnl of Radiation Oncology 1998; 42:541–4.

14AP3-1

Patient-controlled transdermal iontophoretic fentanyl versus patient-controlled intravenous morphine for postoperative analgesia after abdominal surgery

R. Luntzer, B. Urbanek, J. Stark, C. Scheibenpflug, W. Klimscha

Department of Anaesthesiology and Critical Care Medicine, Danube Hospital, Vienna, Austria

Background and Goal of Study: Copied-based intravenous patient-controlled analgesia is a well established method of pain relief after major open abdominal surgery. Recently, a patient-controlled transdermal iontophoretic fentanyl system, which releases a bolus fentanyl, was introduced into clinical practice for patient-controlled analgesia (PCA). In this single-blinded, randomized, controlled study we hypothesized that patient-controlled transdermal iontophoretically released fentanyl (FENTA) provides superior postoperative analgesia when compared to conventional morphine i.v.-PCA (MO).

Materials and Methods: After IRB approval and written informed consent, 60 adult patients, undergoing major abdominal surgery, were included in this study. In the FENTA-group, a patient-controlled transdermal system releasing 40µg of fentanyl, with a lock-out time of 10 min, and up to a maximum of 80 iontophoretic boli in 24 hrs was applied to the left upper arm for 72 hrs post-surgery. In the MO-group a patient-controlled intravenous morphine pump, releasing 20µg of morphine/kg BW (e.g. 1,4mg for a 70kg patient) with a lock-out time of 6 min and up to a maximum of 6 boli/hr was given for 72 hrs post- surgery. VAS score and patient-satisfaction were documented for 3 postoperative days (POD). For statistical analysis, a t-test, a Chi-square test, and a Mann-Whitney-U test were used. A p-value < 0,05 was considered significant.

Results and Discussion: Until the end of May 2008, 60 patients were included in our study (FENTA n = 30; MO n = 30) The mean cumulative opioid consumption in the first three postoperative days were 3240 ± 1270 µg fentanyl (FENTA) and 86,6 ± 44,5 mg morphine (MO) respectively (mean ± SD).

Table 1. Patients characteristics

	Group (n = 30)	FENTA	MO
Age (years)	57.8 ± 14.9	60.1 ± 18.3	n.s.
Sex (m/f)	15/15	13/17	n.s.
BMI (kg/m2)	24.9 ± 4.7	25.8 ± 3.9	n.s.
ASA status 1/2/3	7/13/10	5/16/9	n.s.
Duration of surgery (min)	154 ± 84	189 ± 86	n.s.
Hospital stay (days)	9.4 ± 3.3	10.6 ± 2.4	n.s.
Episodes of nausea	10	11	n.s.
VAS POD1	2.6 ± 1.1	3 ± 1.3	n.s.
VAS POD2	1.7 ± 1	2 ± 1.1	n.s.
VAS POD3	1.2 ± 0.9	1.2 ± 0.8	n.s.
Patient-satisfaction at discharge	1.35 ± 0.5	1.3 ± 0.6	n.s.

Values are mean ± SD or absolute numbers

Conclusion(s): Our results show that postoperative VAS scores on POD 1,2,3, the number of episodes of nausea and patient-satisfaction does not significantly differ from an analgesic regime with intravenous patient-controlled morphine.

14AP3-3

Adverse events involving patient-controlled analgesia devices: Prospective analysis of 2883 patients

M. Francisca Isabel, N. Pavel, E. Del Rosario, E. Neus, J. Aguilar

Anesthesia, Son Llátzer Hospital, Palma de Mallorca, Baleares, Spain

Background and Goal of Study: It is difficult to determine the incidence of PCA pump failures due to low registration rate of these complications.(1) Analysis of these potentially adverse effects, even though they do not cause any harm to a patient, helps us to detect failures and to establish measures to improve safety of postoperative acute pain treatment. We considered as a potentially adverse effect: PCA pump malfunction, medication error and improper use of PCA.(2)

Materials and Methods: Qualitative analysis of potentially serious adverse effects registered during the daily follow-up of all patients treated by the Acute Pain Unit between June 2006 and June 2008 (2683 patients).

Results and Discussion: We registered 4.92% of adverse effects related to PCA equipment: 9 cases of medication errors (0.33%), 101 of misuse (3.76%) and 22 of PCA pump failure (0.82%). Only one of them produced harm in the form of mild respiratory depression, in PCA controlled by a relative (Proxy-PCA). Eighty-eight percent of medication errors were solved, as well as 87.85% of cases of misuse and 90.9% of pump failures. Satisfaction rate was 85.6%. Cause of ineffective PCA in the group of medication error was an error in the preparation in one case (too low concentration of local anesthetics). In the group of PCA pump malfunction there was a PCA pump which did not administer boli and in the group of misuse 4 cases of problems in the understanding of how PCA works and 3 cases of boli administered by relatives (Proxy-PCA).

Conclusion(s): Daily registry of adverse events in the treatment of acute postoperative pain permits us to evaluate outcomes of our daily practice, as well as to prevent harm to a patient; early detection allows that 91.04% of all adverse effects could be solved. Eighty-six percent of the patients were satisfied with their acute pain treatment.

References:

1 Cullen DJ, Bates DW, Small SD. The incident reporting system does not detect adverse drugs events: a problem for quality improvement. Jt Comm J Qual Improv. 1995,21:541–8.

2 Hankin CS, Schein J, Clark JA, Panchal S. Adverse events involving intravenous patient controlled analgesia. Am J Health Syst Pharm. 2007;64:1492–9.

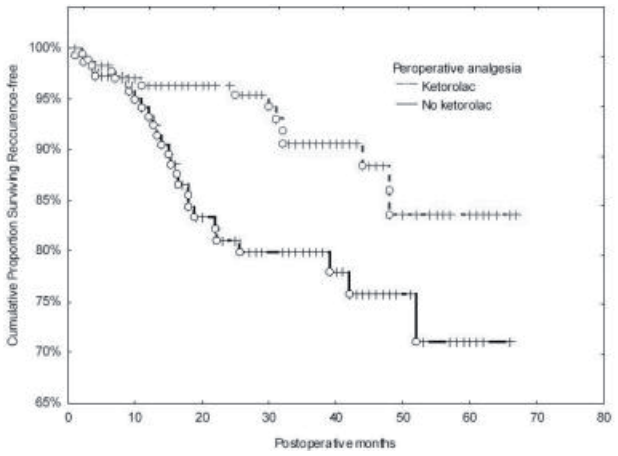
14AP3-4

Does peroperative analgesia influence cancer recurrence after mastectomy? A retrospective analysis

P. Forget, J. Machiels, B. Nussbaum, M. Berlière, M. De Kock

Anesthesiology, Oncology and Gynecology Departments, St-Luc Hospital, Université Catholique de Louvain, Brussels, Belgium

Background and Goal of Study: Whether peroperative analgesics have an impact on postoperative cancer recurrence is unknown. Some investigations suggest that the opioids could favor relapse and that locoregional analgesia and NSAIDs could improve cancer prognosis. To clarify this issue, we reviewed our series of operated breast cancer to investigate if the risk of relapse could be linked with the type of analgesia.
Materials and Methods: This retrospective study included 328 consecutive patients who underwent mastectomy with axillary dissection for breast cancer. The main objective was to compare the incidence of cancer recurrence between the patients who were treated with different analgesics during surgery. Student-t and Chi-square tests were used to compare normally-distributed and categorical variables. Kaplan-Meier analyses were used to calculate disease-free survival probabilities. The log-rank test was used to compare groups. Cox proportional hazards regression was used for multivariate analysis. A *P* value < 0.05 was considered to be statistically significant.
Results and Discussion: Preoperative characteristics, cancer prognostic factors, and the length of surgery were comparable between groups. Univariate and multivariate analyses showed a significant lower cancer recurrence rate in the ketorolac group (figure 1) (*P* < 0.01). Other analgesics (sufentanil, ketamine, clonidine and magnesium sulfate) were not associated with a significant difference.



Conclusion(s): This retrospective analysis suggests that peroperative analgesia with ketorolac could decrease the risk of breast cancer relapse. These data need to be confirmed in a prospective clinical trial.
Acknowledgements: The authors wish to greatly acknowledge the help of Julie Vandenhende for reviewing the data base.

14AP3-7

Multimodal regimen for acute postoperative pain in laparoscopic bariatric surgery

I. Cindea, A. Balcan, V. Gherghina, G. Nicolae, R. Popescu

Anesthesiology and Intensive Care, Emergency County Hospital, Constanta, Romania

Background and Goal of Study: Bariatric surgery represents a challenge for the anesthesiologist who has to manage the technique difficulties and specific comorbidities such as diabetes and hypertension. During postoperative period the analgesia protocol has to be adapted to surgical technique as well as individual requirements. The goal of our study is to compare in terms of effectiveness and safety the multimodal analgesia strategy and standard regimen with intravenous morphine, in acute postoperative pain after laparoscopic bariatric procedures.
Materials and Methods: 53 obese subjects with laparoscopic bariatric surgery have been randomly allocated to group A (n = 26), treated with intravenous paracetamol and dexketoprofen according to a predefinite protocol, for acute postoperative pain during first 24 hours post-procedure, and respectively, to group B (n = 27), that has received standard regimen with intravenous boluses of morphine. For rescue analgesia in group A, i.v. morphine has been used. We have recorded the following variables for both groups: severity of acute postoperative pain (VAS) evaluated at 6, 12, respectively 24 hours postoperatively, number of pain-free hours, morphine consumption for the first 24 hours postsurgery. Adverse effects such as sedation, respiratory depression, nausea/vomiting have been controlled, too. "T" Student test has been adequate to evaluate the significance of the differences between groups.
Results and Discussion: Demographics, Body Mass Index values, comorbidities, type of surgery, anesthesia procedure and its duration have been comparable in both groups. Patients in group A have had a better analgesia during first 24 hours post-surgery in terms of pain score evaluated at 6 (1.1 ± 0.07 vs 2.38 ± 1.35, p < 0.001), 12 (0.7 ± 0.04 vs 2.21 ± 1.14, p < 0.001) and 24 hours postoperatively (0.8 ± 0.01 vs 1.12 ± 1.05, p < 0.001) and pain-free hours (10.2 ± 1.2 vs 7.5 ± 1.2, p < 0.05). Morphine consumption has registered significantly lower values in group A compared to group B (9.3 ± 8.1 vs 31.7 ± 20.2, p < 0.001). Sedation has been noted in 1 of 27 subjects in group B. No case of respiratory depression has been noted. Nausea/vomiting episodes have been detected with a remarkable higher incidence in group B compared to group A (1/26 vs 4/27, p < 0.05).
Conclusion(s): Multimodal analgesia has provided a better control of acute postoperative pain than standard intravenous morphine, after laparoscopic bariatric surgery. The safety of this strategy is also improved, since it has been devoid of any noticeable adverse event.

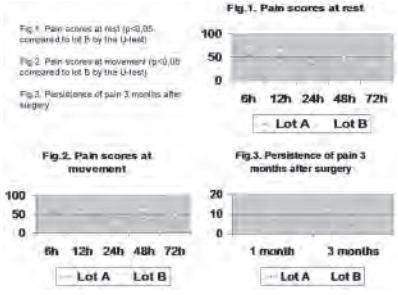
14AP3-8

Pregabalin vs paracetamol in multimodal postoperative analgesia for neoplastic and traumatic thoracic surgery. Which is the best?

D. Pavelescu, C. Pavelescu, I. Grintescu

Intensive Care Unit, The Emergency Hospital "Floreasca", Bucharest, Romania

Background and Goal of Study: Thoracic surgery for cancer and trauma is associated with severe acute pain and a high risk of chronic pain development. We hypothesized that a multimodal analgetic regimen including pre-emptive use of pregabalin may be effective in preventing both acute and chronic postoperative pain and investigated which regimen is better: with pregabalin or with paracetamol?
Materials and Methods: 86 patients ASA I–III, aged between 20 and 75 years, scheduled for neoplastic or traumatic thoracic surgery, were recruited. Exclusion criteria: coagulopathy, lack of cooperation, severe disfunctions. Patients were randomly allocated to receive one of the two study drugs: *Lot A*: 150 mg of pregabalin orally, 2 hours before surgery, then 150 mg each 6 hours for 72 hours postoperatively. *Lot B*: 2 grams of paracetamol i.v., 1 hour prior to surgery, then 1 gram each 6 hours for 72 hours postoperatively. The epidural analgesia was similar in the two groups. Whenever the patients experienced severe pain (VAS > 60mm) they received 100 mg i.v. tramadol as rescue therapy. Pain scores at rest and at mobilisation, discomfort, sedation, extraanalgetic needs were recorded for up to 72 hours postoperatively; we also recorded the development of chronic pain 3 months after surgery.
Results and Discussion: Pain scores at rest and at mobilisation were statistically significant lower in pregabalin group (p < 0,05) postoperatively. The number of patients requiring rescue analgesia was significantly higher in the paracetamol group (p < 0,05) there is a mild difference in sedation for pregabalin group, which disappeared after the first 6 hours. Patients receiving pre-emptive pregabalin regimen experienced significantly lesser discomfort. Multimodal regimen with gabapentin significantly reduce chronic pain development.



Conclusion(s): Multimodal analgesia with pre-emptive administration of pregabalin and epidural analgesia reduce analgetic consumption in thoracic surgery for trauma and neoplastic diseases, without side-effects. The incidence of chronic pain development, the intensity of acute pain and long-term analgetic requirements associated with thoracic surgery were lower in the pregabalin group.

14AP3-9

Pre-emptive analgesia with COX-2 inhibition in laparoscopic cholecystectomy patients improves their postoperative pain management

G. Nicolae, V. Gherghina, A. Balcan, I. Cindea

Anesthesiology and Intensive Care, Emergency County Hospital, Constanta, Romania

Background and Goal of Study: The goal of our study was to determine an analgesia quality after laparoscopic cholecystectomy (LC) with pre-emptive analgesia (PEA) utilizing COX-2 inhibition, celecoxib.
Materials and Methods: After approval of the Ethical Committee and written informed consent, 115 ASA I or II patients (age 35 ± 8 yr.) were enrrolled in this blind-controlled study. Patients were divided into 2 groups underwent LC under combined general anesthesia. Groups were composed without significant differences of BMI, lab data, risk factors, etc. The 1st group (PEA, 64 pt) recived celecoxib 400 mg beside standard premedication (SP) 1 h prior induction of anesthesia. The 2 nd group (SP, 51 pt) was given SP only. The anesthesia protocols were identical for both groups general combined endotracheal anesthesia, CMV ventilation after paralysis with 12 mm Hg carboperitoneum. Postoperative analgesia protocols were the same in both groups and simplified. The celecoxib 200mg po patient received at the pain onset about 2 points (Wong Baker FACES Pain Rating Scale 1991) following celecoxib 200mg po every 12 hours. An additional analgesia was available with morfine 5–10 mg im on demand.
Results and Discussion: Postoperative analgesia requirements were studied in both groups as shown in tabel below (Mean ± SD).

Table 1. Postoperative Pain Management

	SP only	PEA + SP	P
First p/op demand, min	58 ± 37	172 ± 53	<0.01
Morphine at the I day, mg	21.5 ± 8.4	6.1 ± 5.7	<0.01
Morphine at the II day, mg	25.3 ± 9.3	6.5 ± 9.8	<0.01
Overall Morphine, mg	51 ± 20.3	13.9 ± 9.8	<0.01
Morphine IM, times	4.9 ± 2.2	1.3 ± 1.1	<0.01
First walk, hours p/op	20.1 ± 6.3	12.4 ± 5.2	<0.01

Conclusion(s): Pre-op administration of celecoxib prior laparoscopic cholecystectomy results in significant threefold post-op analgesia prolongation and decreases analgesics consumption in post-op patients. Such kind of preemptive analgesia makes economical benefits for medical service.

14AP3-10

Comparison of lornoxicam versus tramadol preemptive and postoperative analgesic efficacy in patient undergoing lumbar disc surgery

E. Dincer, E. Coskun, A. Ozgultekin, G. Turan, G. Yuksel

II. Anesthesiology and Intensive Care Unit, Haydarpasa Numune Teaching and Research Hospital, Istanbul, Turkey

Background and Goal of Study: This study was designed to compare the preemptive and postoperative analgesic effects of lornoxicam versus tramadol in lumbar disc surgery.
Materials and Methods: Sixty patients (aged 18–60, ASA I–II) who were scheduled for elective lumbar disc surgery were randomly assigned into two groups. Five minutes before the induction of anesthesia, Group L received lornoxicam 8 mg IV, Group T received tramadol 1,5 $mg^{-1}kg^{-1}$ IV. Anesthesia was induced using fentanil 2 $\mu^{-1}kg^{-1}$ and thiopental sodium 5–7 $mg^{-1}kg^{-1}$. Vecuronium 0.1 $mg^{-1}kg^{-1}$ was used for muscle relaxation. Isoflurane 1–2% and 50% $N_2O + O_2$ were used for the maintenance. During the postoperative period, Group L received lornoxicam 2 x 8 mg IV (24 $mg^{-1}mg^{-1}$day, in total), Group T received tramadol 2 x 1,5 $mg^{-1}kg^{-1}$ IV (3x1,5 $mg^{-1}kg^{-1}$day, in total). Periferic oxygen saturation, heart rate, systolic and diastolic blood pressures were recorded before induction and during the postoperative period. The requirements for supplemental analgesics were recorded for 24 hours. Postoperative pain scores were evaluated at 30th min, 1, 2, 4, 6, 8, 12, 24th hours using Visual Analogue Scale (VAS) and Pain Intensity Difference (PID). During the postoperative period; time to first analgesic need, Ramsay sedation scores and patient satisfaction scores were determined. Postoperative nausea, vomiting and other adverse events were also recorded.
Results and Discussion: The baseline demographic characteristics and duration of surgery were similar in two groups. The mean VAS and PID scores in the lornoxicam group were significantly lower than the tramadol group of patients at 30 minutes and at the 1st hour ($p < 0,01$) postoperatively. No difference were found between the two groups in terms of pain scores at other times. Need for supplementary analgesics and rate of side effects were also similar in both groups. However, lornoxicam was associated with a lower incidence of nausea and vomiting (Nausea/Vomiting rates: 9/4 in Group L and 11/8 in Group T). Ten patients in Group L and 14 patients in Group T needed extra supplement of analgesics. Over 90% of patients were highly satisfied in both groups.
Conclusion(s): This study suggests that preemptive and postoperative lornoxicam is a good alternative to tramadol for the treatment of postoperative pain.

14AP4-1

Potentiation of morphine's antinociception by group III metabotropic glutamate receptor agonist on a rat neuropathic pain

M. Yoon, S. Chung, W. Kim, H. Lee, J. Cui

Anesthesiology and Pain Medicine, Chonnam National University Medical School, Gwangju, Korea

Background and Goal of Study: Despite the importance of spinal metabotropic glutamate receptors (mGluRs) and opioid receptors on nociceptive processing, the role of those receptors in the modulation of neuropathic pain has not been thoroughly investigated at the spinal level. Although mGluRs have been divided in three groups, the role of group III mGluRs compared to group I and II mGluRs remains to be determined in the spinal cord. The purpose of this study was to clarify the role of spinal group III mGluRs and opioid receptors to neuropathic pain. In addition, the effect of combination of group III mGluRs agonist and morphine was determined.
Materials and Methods: Male SD rats underwent L5 and L6 spinal nerves ligation for induction of neuropathic pain and intrathecal catheterization for drug administration. A paw withdrawal threshold to mechanical stimuli was measured using the up and down method. A pharmacologic characteristic for interaction between group III mGluRs agonist and morphine was evaluated with a fixed-dose analysis.
Results and Discussion: Intrathecal group III mGluRs agonist (ACPT-III) did not alter the withdrawal threshold after spinal nerve ligation. Contrariwise, intrathecal morphine dose-dependently increased the withdrawal threshold. A fixed-dose analysis revealed that group III mGluRs agonist (ACPT-III) enhanced the antinociceptive action of morphine.
Conclusion(s): These results suggest that group III mGluRs may not directly play a modulatory role in the processing of spinal nerve ligation-induced neuropathic pain at the spinal level. But agonizing group III mGluRs in the spinal cord may indirectly contribute to the potentiation of the antinociception of morphine. Thus, spinal combination of morphine with group III mGluRs agonist (ACPT-III) may be useful in the management of the neuropathic pain after spinal nerve injury.

14AP4-2

The role of snoRNA(RBII-52) in a rat model of oro-facial neuropathic pain

A. Nakae, K. Nakai, T. Tanaka, S. Hagihira, T. Mashimo

Anesthesiology, Osaka University Graduate School of Medicine, Suita, Japan

Background and Goal of Study: The serotonin 2C receptor(5HTR2C) is a G-protein-coupled receptor whose pre mRNA is a substrate for base modification that, via hydrolytic deamination of adenosines, yields inosines. We already studied the 5HTR2C RNA editing efficiency in a rat oro-facial neuropathic pain model (Nakae et al. EJN 2008). The next, we were interested in what the factor which contributed to RNA editing of 5HTR2C in neuropthicpain model. In human study, HBII-52(one kind of small nuclear RNA; the equal function to RBII-52) is contributed to regulate the 5HTR2C RNA editing (Kishore et al. Science, 2006). Our purpose of this study was to clarify the relationship between RNA editing of the 5HTR2C and RBII-52.
Materials and Methods: We used infra-orbital loose ligation (ION-LL) model as a oro-facial neuropathic pain according to the methods by Vos et al.(1994) Behavioral tests were carried out using von Frey Filament. From post injury day 14, fluvoxamine was administered intraperitoneally to some animals at a dose of 30 mg/kg/day for 14days. The animals were killed by decapitation on post injury 28 and cervical spinal cord samples were taken from each animals and total RNA was extracted. Quantitative RT-PCR was performed using TaqMan probes supplied by ABI. Results were then normalized to those obtained for amplifications of the same cDNA samples using 18sRNA, which acts as an internal control, and averaged for each group. Data were compared by one-way ANOVA and statistical differences were resolved post-hoc using Tukey-Kramer multiple-comparison test ($P < 0.05$).
Results and Discussion: As shown in figure, the tendency to decrease the expression of RBII-52 in Injured and sham operated animals. But there was no statistical significance. A slight nerve injury was present in our sham operated animals because our sham operation procedure was to tie around ION more loosely. Therefore, RBII-52 mRNA expression might be decreased because of a nerve injury.
Conclusion(s): The relationship between RNA editing of the serotonin 2C receptor and RBII-52 were not clear. The current finding might suggest that RBII-52 was the factor which changed with nerve injury.
Reference:
Nakae A. et al. Euro J Neurosci Vol.27 2373–2379, 2008.

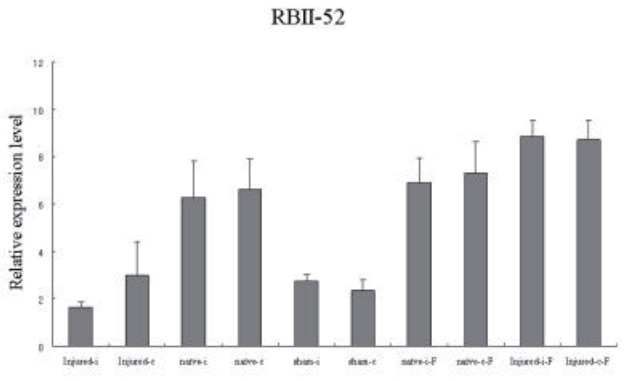


Fig. 1 Differential RBII-52 expression in spinal cord samples from the sites Ipsilateral and contralateral to the injury. Spi, ipsilateral spinal site; Spc, contralateral spinal cord site; F, fluvoxamine treated

14AP4-3

Effect of NR2B-PKC pathway in spinal cord on the generation of bone cancer pain in mouse

Z. Ma, X. Zhou

Department of Anesthesiology, Affiliated Drum-Tower Hospital of Medical College of Nanjing University, Nanjing, Jiangsu, China

Background and Goal of Study: Plenty of researches have showed that the activation of 'NR2B-Protein Kinase C' pathway in the spinal cord was involved in different pain model such as neuropathic pain and inflammatory pain. The aim of this study was to investigate the effects of 'NR2B-PKC' in spinal cord on the generation of bone cancer pain in mouse.

Materials and Methods: The mouse model of bone cancer pain was induced by intra-right-femur inoculations of osteolytic sarcoma NCTC 2472 cells in tumor group while sham mice were injected with α-MEM. Ifenprodil, a selective NR2B inhibitor, was injected intrathecally 14 days after inoculation. Pain ethology indexes such as the spontaneous lifting behaviors (SLB), the paw withdrawal mechanical threshold (PWMT) and the paw withdrawal thermal latency (PWTL) were observed to evaluate pain behaviors. RT-PCR and immunohistochemistry were applied to analysis the mRNA and protein expression of PKCγ and PKCε.

Results and Discussion: It appeares significant pain behaviors in the mouse model of cancer pain (SLB: 13.16 ± 1.78, PWMT: 0.42 ± 0.15, PWTL: 10.6 ± 1.4)compared with the baseline (SLB: 2.33 ± 0.10, PWMT: 1.80 ± 0.28, PWTL: 17.6 ± 0.9) ($P < 0.05$). The 3 pain ethology indexes were all significantly attenuated by intrathecal administration of ifenprodil (SLB: 10.40 ± 2.07, PWMT: 1.43 ± 0.29, PWTL: 16.2 ± 1.4) ($P < 0.05$). At the same time, the mRNA and protein level of PKCγ in spinal cord were down-regulated obviously ($P < 0.05$), while that of PKCεε was unchanged. Present studies have confirmed that activation of NR2B encourages development of pain. Ifenprodil attenuated bone cancer pain by inhibitting the activity of NR2B, which blocks the positive feedback between NR2B and PKC. PKCγ does crucial contribution in the circulation.

Conclusion(s): NR2B-PKC pathway in spinal cord plays significant role in the development of bone cancer pain in mouse.

14AP4-4

The role of neuronal nitric oxide synthase and inducible nitric oxide synthase in the development of bone cancer pain

Z. Ma, J. Zhang

Department of Anesthesiology, Affiliated Drum-Tower Hospital of Medical College of Nanjing University, Nanjing, Jiangsu, China

Background and Goal of Study: Neuronal nitric oxide synthase (nNOS) and inducible nitric oxide synthase (iNOS) were thougt to be involved in the development and maintenance of hyperalgesia in models of both acute and chronic pain. The aim of this study was to explore the role of nNOS and iNOS in the development of bone pain cancer in mouse.

Materials and Methods: Osteosarcoma NCTC 2472 cells were implanted into the intramedullary space of the right femurs of mice to induce mouse model of bone cancer pain. Reverse transcriptive polymerase chain reaction was applied to analysis the expression of nNOS and iNOS mRNA in spinal cord. All mice were observed the changes of pain behaviors such as paw withdrawal mechanical threshold and paw withdrawal thermal latency at 7 d, 10 d, 14 d after implantation and 2 h, 12 h and 24 h after intrathecal administration of L-NMMA, the inhibitor of NOS.

Results and Discussion: 10 d after implantation, the mRNA of nNOS in spinal cord of tumor mice were increased ($P < 0.05$), but the level of nNOS mRNA between tumor and sham mice had no different at day 14; iNOS mRNA increased at day 10 and increased further at day 14 in tumor mice; The pain behaviors at 14 day were attenuated by intrathecal administration of 50 μg L-NMMA.

Conclusion(s): nNOS in spinal cord may participate in the development of bone cancer pain in the early time, and the maintenance of bone cancer pain may depend on iNOS.

14AP4-5

CaMKII in primary afferent neurons: The effect of painful nerve injury

V. Zoga, T. Kawano, D. Weihrauch, M. Liang, C. Sarantopoulos

Anesthesiology, and Pharmacology & Toxicology, Medical College of Wisconsin, Milwaukee, Wisconsin, USA

Background and Goal of Study: Painful nerve injury alters cytosolic Ca2+ signaling as well as various ion channels in injured dorsal root ganglion (DRG) neurons (1). Because cytosolic Ca2+ may regulate membrane channels, synaptic transmission, enzymatic activity, gene expression, or cell death via the Ca2+/Calmodulin (CaM)/Ca2 ± CaM-dependent kinase II (CaMKII) pathway (2,3), we investigated the levels of phosphorylated CaMKII in DRG neurons dissociated from control versus hyperalgesic rats after nerve injury.

Materials and Methods: Male rats, subjected to spinal nerve ligation (SNL) or sham skin (SS) operation, were tested to distinguish those responding with hyperalgesia after SNL, or controls after SS. DRG (L4 and L5 from controls, or axotomized by SNL L5) were dissociated, cryoprotected, sectioned (12 μm) and post-fixed on slides. These were incubated in monoclonal mouse antibody to Neurofilament (NF) 200 and polyclonal rabbit antibody to Phospho-CaMKII (Thr286), and then with goat anti-rabbit IgG Texas Red and goat anti-mouse IgG Alexa Fluor488. For negative controls, only the secondary antibodies were applied. Slides were examined under a confocal microscope with laser scanning software under the same conditions. Intensity of phospho-CaMKII immunofluoresence was measured by Metamorph. Specificity of phospho-CaMKII antibody was validated by Western blotting, showing a single band at 50kD.

Results and Discussion: We studied 392 control and 599 neurons from rats with hyperalgesia after SNL. 57% of control and 44% of SNL cells were NF200+ (corresponding to large myelinated neurons). The prevalence of phospho-CaMKII positive amongst the NF200+ neurons was 94.2% in control and 88.6% in DRG from SNL rats ($p = 0.04$). The prevalence of phospho-CaMKII positive amongst the NF200-neurons was 78.9% in control and 56.1% in axotomized DRG from SNL rats ($p < 0.01$). Intensity of fluorescence was s less in axotomized neurons compared to controls in both NF200+ and NF200-subgroups (74.7 ± 1.9 versus 109.4 ± 2.1, $p < 0.01$, and 61.6 ± 1.8 versus 77.8 ± 2.8, $p < 0.01$, respectively) (mean ± SEM).

Conclusion(s): 1. Both myelinated and unmyelinated DRG neurons express CaMKII. This is a novel finding, in contrast to previous reports (4). 2. Decreased activity of phospho-CaMKII may be associated with a variety of signaling alterations after nerve injury that may subsequently lead to increased excitability and pain.

Acknowledgements: Supported by NINDS 5KO8NS049420-04 grant.

References:

1 Br J Anaesth 2001; 87:12.
2 Science 1995; 268:239.
3 Cell Calcium 2001; 29:1.
4 J Comp Neurol 2002; 448:102.

14AP4-7

Nocistatin, nociceptin and their precursor peptide in post traumatic and diabetic neuropathic pain

E. Liu, H. Neo, C. Li, M. Govindaswamy, S. Tachibana

Anaesthesia, National University of Singapore, Singapore, Singapore

Background and Goal of Study: Nocistatin (NST) and nociceptin (N/OFQ) are two novel peptides that have opposing effects in nociception, learning and memory, and locomotion. They are both derived from the same precursor, prepronociceptin (ppN/OFQ), and may be involved in chronic pain. As diabetic and post traumatic neuropathic pain have different mechanisms, we studied these peptides in two rat models of neuropathic pain.

Materials and Methods: We used Sprague Dawley rats for all work. We applied three 4/0 catgut ties to partially constrict the left sciatic nerve to produce the post traumatic neuropathic pain model. We injected streptozocin i.p. to cause diabetes (blood glucose > 10 mmol/L) and diabetic neuropathy. In both groups, we selected rats with mechanical allodynia at 3 weeks, by testing for

reduced force threshold for foot withdrawal with an automated von Frey's apparatus compared to baseline readings. Control rats had no treatment and had no change in thresholds. We obtained serum and brain tissue under terminal anaesthesia. We raised polyclonal antibodies to NST and ppN/OFQ in rabbits and used commercial antibody to N/OFQ. After confirming standard curves with synthetic peptides, we carried out competitive radioimmunoassay for NST, N/OFQ and ppN/OFQ in the serum and blood.

Results and Discussion: The post traumatic neuropathic rats had higher brain levels of NST (0.030 vs. 0.022 pmol/mg protein), N/OFQ (0.726 vs. 0.272), and lower levels of ppN/OFQ (0.229 vs. 0.522), compared to control rats. The diabetic neuropathic rats had no difference in the brain levels of NST, N/OFQ and ppN/OFQ compared to control rats. Serum levels of NST and ppN/OFQ were similar in all rats, but diabetic neuropathic rats had higher serum N/OFQ compared to control rats, 20.4 vs. 11.1 pg/ml. Earlier work showed that i.t. N/OFQ was more antinociceptive in rats with post traumatic compared to diabetic neuropathic pain [1]. Our results support this work, suggesting that these peptides are processed differently in the CNS in the two types of neuropathic pain. Serum N/OFQ may not reflect CNS peptide processing, and the significance of the increase in diabetic rats is unclear and may not be related to pain.

Conclusion(s): Brain NST and N/OFQ are increased in post traumatic neuropathy, and are processed differently in diabetic neuropathy. This may be important in any application of NST, N/OFQ, and their receptors as diagnostic markers of pain or therapeutic targets.

Reference:

Pain 2004;110:236.

14AP5-1

Antinociceptive interaction between intrathecally administered morphine and epibatidine in rats

T. Nishiyama

Anesthesiology and Critical Care, Kamagaya General Hospital, Kamagaya, Chiba, Japan

Background and Goal of Study: A nicotinic acetylcholine receptor agonist, epibatidine has strong antinociceptive effects, but also toxic. To have effective antinociception with decreasing toxicity, synergistic effects might be useful. The interaction between intrathecal epibatidine and midazolam or clonidine showed some antagonistic effects. The present study investigated the interaction between intrathecally administered morphine and epibatidine in two different nociceptive models in rats expecting synergistic effects.

Materials and Methods: Sprague-Dawley rats with lumbar intrathecal catheters were tested for their thermal tail withdrawal response using the tail flick test and for their paw flinches by formalin injection after intrathecal drug administration. The combination of each 1/2, 1/4, 1/8, or 1/16 50% effective dose (ED50) was administered. The ED50s of epibatidine and morphine were derived from our previous studies. The interaction was tested by an isobolographic analysis. Eight rats were used in each dose group. Behavioral side effects were also investigated.

Results and Discussion: The ED50 of the combination was significantly lower than the ED50 of each single agent in both the tail flick test and the formalin test. Motor disturbance and allodynia observed with morphine or epibatidine was not seen in combination treatment.

	ED50		
	Tail flick	Formalin phase 1	Formalin phase2
Morphine (μg)	1.4 (1.1–1.9)	7.1 (5.5–9.0)	3.7 (2.5–5.3)
Epibatidine (ng)	32.0 (22.5–45.6)	37.4 (21.5–65.1)	26.8 (6.2–115.8)
Morphine in combination (μg)	0.09 (0.06–0.14)	0.04 (0.005–0.28)	0.04 (0.004–0.28)
Epibatidine in combination (ng)	2.0 (1.3–3.0)	0. 03 (0.0001–5.41)	0. 03 (0.00–29.6)

ED50 values are shown as mean and 95% confidence interval (in parenthesis). The values of epibatidine or morphine alone were derived from our previous studies (not published).

Conclusion(s): Intrathecal morphine and epibatidine had synergistic antinociceptive effects on thermal induced acute nociception and inflammatory induced acute and facilitated nociception.

14AP5-2

Hyperalgesia in rats induced by in vivo fentanyl treatment: Does ketamine inhibit it?

I. Asouhidou, E. Kouvaras, E. Asprodini

Laboratory of Pharmacology, School of Medicine, University of Thessaly, Larissa, Greece

Background and Goal of Study: Clinical studies in human and animals models have led to the observation that long-lasting treatment with mu-opioid agonist might result in hyperalgesia. Enhanced intraoperative fentanyl administration increases the postoperative pain level and morphine requirements. Ketamine-NMDA antagonist has been reported to be effective in preventing hyperalgesia when given prior to fentanyl administration. The rationale is that fentanyl, like other opioids, activate NMDA receptors. To the best of our knowledge the present study represents a unique investigation of the effects of fentanyl 24 hours after it's administration in vivo, at in vitro hippocampal slices.

Materials and Methods: Animals were treated either with saline or fentanyl (4 × 80 mg/kg, s.c./15 min), or ketamine 10mg/kg sc and 30 min after, fentanyl (4 × 80 mg/kg, s.c./15 min). Intracellular in vitro recordings were obtained, 24 h after treatment, from CA1 pyramidal neurons.

Results and Discussion: The results of this study show that fentanyl in vivo treatment does not alter the basic membrane characteristics of CA1 pyramidal neurons, while reducing GABAA and GABA? mediated synaptic inhibition. Fentanyl treatment also causes long-lasting (24h) disinhibition in the CA1 area of the hippocampus but has no demonstrable effect on NMDA-mediated synaptic response. However, ketamine reduces hyperalgesia and extends the analgesic strength of opioids even though the exact mechanism remains poorly defined.

Conclusion(s): Future clinical and experimental investigations should focus on the revision of the pharmacological profile of opioids, regarding their antinociceptive capacities and also their role in facilitating or preventing central pain sensitization.

References:

1 Kouvaras E, Asprodini EK, Asouchidou I, et al. "Fentanyl tretment reduces GABAeric inhibition in the CA1 of the hippocampus 24h after acute exposure to the drug". Neuropharmacology. 2008;55(7) :1172–82.

2 Célèrier E, Rivat C, Jun Y, Laulin JP, Larcher A, Reynier P, Simonnet G. Long-lasting hyperalgesia induced by fentanyl in rats: preventive effect of ketamine. Anesthesiology. 2000 Feb;92(2):465–72.

14AP5-3

Subcutaneous injection of plasmid encoding siRNA targeting NMDA receptor NR1 subunit reduces formalin-induced nociception in rat

P. Tan, L. Yang

Department of Anesthesiology, E-DA Hospital/I-Shou University, Kaohsiung, Taiwan

Background and Goal of Study: N-methyl-D-aspartate receptor (NMDAR) activation, at the level of the skin has been shown to play an important role in the facilitation of nociception in several animal models. Recent discoveries have revealed that the transfection of small interfering RNAs (siRNAs) into animal cells results in the potent post-transcriptional silencing of specific genes. However, the siRNA-Knockdown technology has the limitation of transient gene silencing nature. Thus, we examined the effect of plasmid continuously encoding siRNA of NR1 subunit of NMDAR injected subcutaneously (sc)for abolishing formalin-induced skin pain in this study.

Materials and Methods: Plasmid encoding siRNAs targeting NR1 subunit was examined for the efficiency in silencing the NMDAR in sc tissue. Plasmid encoding siRNA of NR1 of 5, 10, or 20 μg were injected sc into left hindpaw in rats of experimental groups. Rats from control groups received plasmid encoding GAPDH or without significant homology to any known rat gene or saline. Behavior test was performed with formalin test. The analysis of mRNA and protein used real time-polymerase chain reaction (RT-PCR), western blot, and immunohistochemistry staining.

Results and Discussion: Dose of 20 μg was more effective in silencing the expression of NR1 than doses of 5 and 10 μg. The decreased expression of NR1 mRNA and protein were noted from 7th day to 21th days and recovered at 28th days after injection of 20 μg plasmid. The peak effect of inhibition of NR1 mRNA and protein was shown on 7–14 days after injection of 20 μg plasmid. The nociceptive response induced by formalin was also decreased during the period of down regulation of NR1 protein. Significant reduction of NR1 immunoreactivity in the sc tissue were detected after 7 days treated by sc plasmid encoding NR1 siRNA.

Conclusion(s): This study of sc injection of plasmid encoding siRNA targeting NR1 complexed with cationic polymer transfection provided the evidence of application of subcutaneous plasmid encoding siRNA in the investigation of skin functional gene expression and pain relief in the context of whole animal behavior. The depression of expression of gene lasted for 21 days.

Acknowledgements: Supported by grants 94-2314-B-214-004- from National Scientific Council, Taiwan.

14AP5-4

Pain-induced genomic changes in the hippocampus: A microarray study

E. Liu, A. Lee, J. Sidhapuriwala, M. Bhatia, S. Khanna

Anaesthesia, National University of Singapore, Singapore, Singapore

Background and Goal of Study: Several lines of evidence implicate the involvement of the hippocampal formation in nociception in both human and animal, but to date, there has been a lack of information regarding mRNA gene expression changes in the hippocampus during pain. We explored the genomic changes that occur in the hippocampus and medial frontal cortex overlying the corpus callosum which includes the anterior cingulate cortex in two different models of pain, the formalin model of persistent pain and the chronic constriction injury (CCI) model of neuropathic pain. The effect of environmental novelty on hippocampal gene expression was also evaluated to verify the methodology.
Materials and Methods: Animals (adult male SD rat) were used for the experiments. The animals were sacrificed and the relevant tissues harvested 15 min after exposure to novel environment or following right hind paw injection of formalin (1.25%, 0.1ml, s.c.). In the CCI model of neuropathic pain the tissues were harvested about 14 days after ligation of left sciatic nerve. Blood was also collected at time of sacrifice and assayed for serum cortisol level. The total RNA was extracted from the harvested hippocampal and cortical tissues using a guanidinium thiocyanate-phenol-chloroform extraction method. Illumina's RatRef-12 Expression BeadChip microarray was used for gene expression analysis following RNA amplification and labeling as per the manufacturer's protocol. The microarray data was analyzed with Genespring GX 10 ($p < 0.05$ with Benjamini and Hochberg False Discovery Rate multiple testing correction).
Results and Discussion: An increase in serum cortisol was observed in animals exposed to novelty and those subjected to CCI. Exposure to novel environment also resulted in the upregulation of several genes such as the IEGs proto-oncogene *c-fos* (both hippocampus and cortex) and *Arc* (cortex). However, minimal changes in mRNA expression were observed in the hippocampus and the cortex of the animals subjected to formalin test and the CCI.
Conclusion(s): Brief period of pain in the formalin model and chronic pain in the CCI model does not seem to affect gene regulation much in both the hippocampus and the overlying cortex. In comparison, novelty affected levels of genes related to molecular plasticity. However, the time course of gene change with pain, if any, remains unclear and the consequence of pain on cortical molecular plasticity remains to be clarified.
Acknowledgements: Supported by grant from NUS Yong Loo Lin School of Medicine.

14AP5-5

The metabotropic glutamate receptor 5 (mGlu5) antagonist fenobam is analgesic in mice

L. Cavallone, M. Montana, R. Gereau IV

Department of Anesthesiology and Pain Center, Washington University School of Medicine, Saint Louis, Missouri, USA

Background and Goal of Study: Glutamate is the primary excitatory neurotransmitter, and is also released in response to inflammation at multiple levels of the pain neuraxis. Activation of the group I metabotropic glutamate receptor mGlu5 occurs in many nociceptive modalities. Administration of mGlu5 antagonists (e.g. MPEP) produces analgesia in animal models. Research into the efficacy of mGlu5 antagonists in the treatment of human pain conditions would be enhanced by an antagonist that has proved to be pharmacologically active in humans. The clinically validated anxiolytic fenobam is a potent and selective antagonist of mGlu5. We tested the ability of fenobam to act as an analgesic in two separate inflammatory pain models in mice. We also sought to confirm that the analgesic properties of fenobam are related to its antagonist activity at mGlu5 and looked for possible side effects.
Materials and Methods: We observed wild type (WT) and mGlu5 deficient (knock out, or KO) mice in several experimental conditions. WT mice were pretreated with intraperitoneal injection of fenobam (3, 10, or 30 mg/kg), MPEP (30 mg/kg), or vehicle (DMSO) and then given an intra-plantar injection of 2% formalin (10 ul), after which formalin-induced spontaneous behaviors were observed. In a second set of experiments, the efficacy of fenobam (30 mg/kg) and MPEP (30 mg/kg) in reducing thermal hypersensitivity following the induction of inflammation via an intraplantar injection of Complete Freund's Adjuvant (CFA) was tested in WT mice. The effects of fenobam (3, 10, 30 mg/kg) on locomotor behavior and motor coordination were also tested by observing mice moving freely in an open field and maintaining their balance while running on an accelerating Rotarod.
Results and Discussion: The mglu5 antagonists Fenobam and MPEP were both found to decrease formalin-induced spontaneous behavior and relieve CFA-induced thermal hypersensitivity in mice. Experiments on mGlu5 KO mice demonstrated that fenobam has an improved selectivity for mGlu5 as compared to MPEP. Fenobam did not alter motor coordination, however, at analgesic doses, it increased locomotor activity in the open field task.
Conclusion(s): Our data support the hypothesis that the mGlu5 antagonist fenobam is an effective analgesic in mice in two inflammatory pain models. Furthermore, fenobam displays an improved selectivity for mGlu5 over the prototypical antagonist MPEP. Fenobam may represent a promising pharmacological agent for the treatment of inflammatory pain in humans.
Reference:
1 Porter et al. JPET 315:711–721,2005.

14AP5-6

The antinociceptive effect of intrathecal CB_2 cannabinoid receptor agonist (JWH015) in rats with chronic compression of the dorsal root ganglia

Z. Ma, C. Shi

Department of Anesthesiology, Affiliated Drum-Tower Hospital of Medical College of Nanjing University, Nanjing, Jiangsu, Christmas Island

Background and Goal of Study: CB_2 receptor-selective agonists inhibit nociception without producing central nervous system side effects, suggesting that they are promising candidates for the treatment of pain. To date, there has been virtually few information regarding the mechanism of CB_2 receptor-mediated inhibition of pain responses. Here, we test the hypothesis that CB_2 receptor activation may block injury-induced NMDA receptor NR_2B subunit Tyr-1472 phosphorylation, which has been associated with the development of persistent pain. The present study tested whether activation of CB_2 receptor would induce antinociception and investigated the role of intrathecal JWH015 in the modulation of Tyr-1472 phosphorylation of the spinal NR_2B subunit in a model of neuropathic pain.
Materials and Methods: Rats underwent chronic compression of the dorsal root ganglia (CCD), with intrathecal injection of JWH015 and assessment of paw withdrawal mechanical threshold (PWMT) and paw withdrawal thermal latency (PWTL). Spinal expression of Tyr-1472 phosphorylated NR_2B subunit was determined by immunohistochemistry.
Results and Discussion: The data revealed obvious decrease in PWMT and PWTL and increased expression of Tyr-1472 phosphorylated NR_2B subunit in the superficial dorsal horn of the spinal cord in CCD rats. In addition to marked suppression of thermal hyperalgesia and mechanical allodynia, intrathecal administration of JWH015 caused obviously decreased expression of Tyr-1472 phosphorylated NR_2B subunit in the superficial dorsal horn of the spinal cord in CCD rats.
Conclusion(s): These data indicate that intrathecal administration of CB_2 receptor agonist may provide analgesic effect, which is probably attributed to the decreace in Tyr-1472 phosphorylation of the spinal NR_2B subunit.

14AP5-7

Activation of spinal ERK but not MAPK p38 contributes to mechanical hyperalgesia after plantar incision in the rat

I. van den Heuvel, S. Reichl, P. Zahn, E. Pogatzki-Zahn

Department of Anaesthesiology and Intensive Care medicine, University Clinic of Muenster, Muenster, Germany

Background and Goal of Study: Mitogen-activated protein kinases (MAPKs) have been implicated in spinal nociceptive processing and hyperalgesia in several animal pain models. Using a rat incision model we and others have demonstrated substantial differences in mechanisms of incisional compared to inflammatory or neuropathic pain. Here, we investigated the role of spinal p38 and ERK activation on primary mechanical and heat hyperalgesia after incision injury in the rat.
Materials and Methods: In behavioural experiments, plantar incision was made in 64 rats with lumbar intrathecal (IT) catheters one hour after or 2 hours before IT injection of SB 203580 (SB, p38 inhibitor, 10 mcg) or PD 98059 (PD, ERK1/2 inhibitor, 10 mcg) or vehicle (V, 10% DMSO, $n > 4$ per group). Withdrawal thresholds (WT) to calibrated von Frey filaments applied adjacent to the wound and paw withdrawal latencies (PWL) to thermal stimuli (Hargreaves Box) were measured in separate rats before and after incision. In separate experiments, expression of phosphoERK and phosphop38 was examined in spinal cord tissue (L2–L6) of naïve rats (C) and rats 15 min, 4 hours (hrs), 1day (d) and 5d after incision by Western Blot.
Results and Discussion: In V treated rats ($n = 7$), median WT decreased from 419 before to 35, 35, 35 and 18 mN 1, 2, 3, and 4 hrs after incision. In rats administered IT PD before incision ($n = 7$), WT were 419 before and 209, 124, 124 and 70 mN after, resp. ($p < 0.05$ vs. vehicle). PWL in rats receiving preoperative PD were similar before and after incision compared to V treated rats. Postoperative IT PD did not affect WT and PWL. Treatment with SB 1 hr before or 2 hrs after incision did not modify WT and PWL compared to V. Western Blots showed an 1.5 fold increase in spinal expression of pERK 15 min after incision relative to C ($n = 4$/group). Spinal expression of p38 was not increased at any time.
Conclusion(s): Different to most other animal pain models, there is no spinal phosphorylation of p38 after incision; in congruence, SB was without effect on hyperalgesia suggesting that spinal p38 does not play a role for spinal

sensitization and hyperalgesia after incision. However, ERK1/2 is phosphorylated 15 min after incision indicating that a spinal ERK-dependent nociceptive facilitation process is induced. This is supported by the fact that preincisional (but not postincisional) administration of PD is able to prevent reduced WT after incision.
Acknowledgements: Supported by the Else Kroener-Fresenius Foundation to E. Pogatzki-Zahn (P61/05//A34/05).

14AP5-8

Intrathecal amiloride reduces peripheral nerve injury-evoked spinal neurons and microglia activation and neuropathic pain behavior in rats

W. Zeng, P. Wang, X. Chen, H. Ou-Yang

Department of Anesthesia, Cancer Center, Sun Yat-sen University, Guangzhou, China

Background and Goal of Study: Accumulating evidence suggests that amiloride inhibits sodium channel, calcium channel, Na^+/H^+ and Na^+/Ca^{2+} exchangers[1]. Our objective is to investigate the treatment effect of intrathecal amiloride on neuropathic pain and the expressions of Fos protein and p-p38 MAPK in the spinal dorsal horn (SDH).
Materials and Methods: L5 spinal nerve was ligated to develop the peripheral neuropathic pain in male Sprague-Dawley rats (250–300g). The rats received injection of saline (20μl), or amiloride (12.5, 25, 50, 100μg) respectively, which had been implanted with lumbar intrathecal catheters for 6 days. The mechanical withdrawal threshold was measured and the percentage of the maximum possible effect (%MPE) was calculated to estimate the antihyperalgesia effect. The expressions of Fos protein and p-p38 MAPK in the L5 level of SDH were detected with immunohistochemistry in saline and amiloride 100μg groups.
Results and Discussion: Compared to saline group, intrathecal amiloride produced significant dose- and time-dependent analgesic effects [Figure 1]. The expressions of Fos-IR and p-p38-IR decreased in the superficial laminae of ispilateral SDH in amiloride 100μg group, whereas there was no statistical significancy in the contralateral side (Table 1). Time course of%MPE of intrathecal amiloride in the mechanical allodynia tests. $^*P < 0.05$, $^{**}P < 0.01$ compared with saline group.

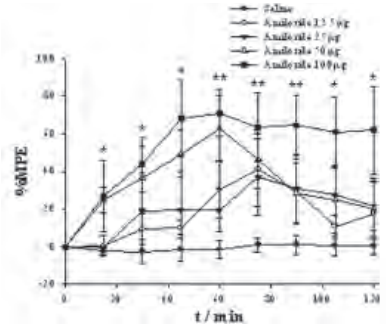


Table 1. The number of Fos-IR in the superficial laminae (I, II) of SDH and the percentage of p38-IR in total SDH area in rats.

	number of Fos-IR		p-p38-IR% of total SDH area	
	Ispilateral	Contralateral	Ispilateral	Contralateral
Saline	49.5 ± 3.08	21.17 ± 2.94	4.4 ± 0.43	1.61 ± 0.34
Amiloride	19.15 ± 2.75	17.3 ± 2.85	1.55 ± 0.41	2.12 ± 0.46
p-values	<0.01	>0.05	<0.01	>0.05

Conclusion(s): Intrathecal amiloride reduces neuropathic pain behavior probably through modulating spinal neurons and microglia activation in rats.
Acknowledgements: Supported by National Natural Science Foundation of China (30571794/C03030301).
Reference:
1 Tang, C.M., F. Presser, and M. Morad, *Amiloride selectively blocks the low threshold (T) calcium channel.* Science, 1988. 240(4849): p. 213–5.

14AP6-1

Clinical database of acute postoperative pain: Prospective analysis of 4695 consecutive patients

E. Del Rosario, N. Esteve, M. Baena, I. Gimenez, J. Aguilar

Anesthesiology, Son Llatzer Hospital, Palma de Mallorca, Spain

Background and Goal of Study: Good postoperative pain control is an important part of adequate postoperative care, improves outcome, prevents development of chronic pain and reduces care resources (1). Acute Pain Units provide control and surveillance of patients to optimize treatment and detect early adverse events (2). The aim of the present study was: –To compare the quality of pain relief between different techniques. –To evaluate the incidence of adverse events. –To compare our results with extracted data from literature of reference.
Materials and Methods: We analysed prospectively collected data on 4695 patients from May 2004 to December 2007 documented by the acute pain service team in a computer databased system.
Results and Discussion: 2147 received patient-controlled epidural analgesia (PCEA), 2005 intravenous patient-controlled analgesia (IV PCA) and 543 patient-controlled peripheral nerve blocks (PCPNB). Mean dynamic pain scores (VAS 0–10) were significantly lower ($p < 0.001$) for regional analgesia. The incidence of adverse events was significantly higher ($p < 0.001$) with epidural analgesia, although 78% were fully solved. We found an incidence of 1.5% of misuse, 0.3% of medication errors and 0.2% of respiratory depression. A severe neurological complication (poliradiculopathy) after PCEA occurred in one patient.
Conclusion(s): PCEA, IV PCA and PCPNB are safe and efficient. Regional analgesia provides superior pain relief at movement. Serious complications are rare, but it is necessary dairy surveillance of patients. Clinical database allows us to assess our results and improve our clinical practice.
References:
1 Pöpping DM, et al. Effectiveness and safety of postoperative pain management: a survey of 18 925 consecutive patients between 1998 an 2006: a database analysis of prospectively raised data. BJA Advance Access published October 22, 2008-11-18.
2 Liu SS., et al. A lovely idea: Forming an ASRA Acute Postoperative Pain (Acute POP) Database. Regional Anesthesia and Pain Medicine 2006; 31: 291–293.

14AP6-2

Comparison of the analgesic action of the combination of gabapentin, ketamine and parecoxib and parecoxib alone in laparoscopic cholocystectomy patients

G. Kotsovolis, K. Karakoulas

Postgraduate Education on Medical Research Methodology, Aristotle University, Thessaloniki, Greece

Background and Goal of Study: Multimodal analgesia is suggested by many authors as the best way of treating acute postsurgical pain. The purpose of this study is to examine whether the combination of gabapentin, ketamine and parecoxib has a better analgesic action than parecoxib alone and whether this combination causes fewer opioid-related complications.
Materials and Methods: A double blind randomized controlled clinical trial was performed. 28 patients who were scheduled for laparoscopic cholocystectomy at the 424 Military Hospital participated. The patients were randomly allocated to three groups. The 9 group A patients were given 1200mg gabapentin 4 hours before the surgery and 24 hours later, 0,1mg/kg ketamine just before the induction of anesthesia and 24 hours later and 40mg parecoxib just before induction of anesthesia, 12 and 24 hours later. The 9 group B patients took 40mg parecoxib just before induction of anesthesia, 12 and 24 hours later and the 10 group C patients were given placebo (5ml normal saline) at the same time intervals. All the patients were operated under general anesthesia, were administered 0,5mg/kg morphine just before the end of the surgery and were given a PCA device with 1mg/ml morphine solution, 1ml bolus dose and 10 minutes lockout period. VAS score (maximum 100) and morphine consumption were recorded at the following time: Just after full recovery, 1, 6, 12 and 24 hours later. Also the total consumption of morphine was recorded, the integrated morphine-VAS score and the frequency of opioid related complications.
Results and Discussion: The mean morphine consumption and VAS score for every group was: Group AA = 8,55(5,3) and 13,5(7,4) Group BB = 10(7,1) and 23,4(12) Group C = 16,3(4,7) and 22,7(13,1). Groups A and B were significantly different than control group (group C) regarding total morphine consumption within 24 hours ($p < 0,05$) but there was no difference between each other. No statistically significant difference was found between any group regarding VAS score at any time, morphine consumption between recording times and integrated score. Group C patients reported vomiting significantly more frequently than other groups but the small number of participants doesn't allow safe conclusions. No other complication-related differences were found.
Conclusion(s): The combination of gabapentin, ketamine and parecoxib does not have better analgesic action than parecoxib alone neither does it reduce the opioid-related complications. A study with more patients is necessary in order to conclude in safe results

14AP6-4

Evaluation of effect of magnesium sulphate in perioperative treatment of patients undergoing thoracic surgery

J. Kogler

Department of Anesthesia and Intensive Care, Clinic for Thoracic Surgery, Hospital for Pulmonary Diseases Jordanovac, Zagreb, Croatia

Background and Goal of Study: Thoracic surgery is associated with the potential of severe pain, further impairment of lung function, delayed recovery and occurence of chronic pain syndrom. Magnesium can act as an adjuvans in analgesia due to it s properties as calcium channel blocker and N-methyl D-aspartat antagonist and could play an important role in postoperative pain, senzitization processes and hyperalgesia. The aim of our study was to asses whether the addition of intravenously given magnesium sulphate resulted in reduced intraoperative analgetic, anaesthetic and muscle relaxants requirements, postoperative opioid consumption, stress hormon levels and incidence od postoperative shivering.
Materials and Methods: Sixty eight patients scheduled for elective thoracotomy procedure were enrolled. After induction patients were randomly assigned in a double blind fashion to one of two groups: magnesium-group received intravenously bolus dose of 30–50mg/kg 10% $MgSO_4$ following by continuous infusion of 500mg/h $MgSO_4$. Control group received the same volume of isotonic saline. During their 48h stay in ICU all patients received continuous infusion of fentanyl with bupivacain through epidural catheter. The magnesium group was also given continuous infusion of 10%$MgSO_4$ 500mg/h following first 24 hours after operation and the control group isotonic solution. VAS and TORDA scales were used to assess pain every 4 hours.
Results and Discussion: Statistical data were analyzed using Student 's *t* test, Mann-Whitney *U* test, Kruskal-Wallis ANOVA and Tukey posthoc HSD test. A P value of <0.05 was considered statistically significant. Fentanyl consumption in magnesium group during operative procedure was significantly less ($P < 0.005$). Propofol consumption was less in Mg-group. Cumulative dose of rocuronium was slightly higher in control group. The level of cortisol was higher in control-group. Postoperative shivering was recorded in only 26 patients. Postoperative VAS scores were similar in both groups. The last TORDA score from 40–48h was statistically higher in control group. The main result demonstrate that 10%Mg SO4 given as a bolus before skin incision followed with infusion induces an analgesic-sparing effect by activation of pain pathways stimulating NMDA receptors or acting as calcium channel antagonist.
Conclusion(s): Cumulative dose of fentanyl was statistically lower in magnesium group. Combination of local anesthetic an opioid could effectively control static postthoracotomy pain. We confirmed the need for better control of dynamic posthoracotomy pain.

14AP6-5

Transdermal buprenorphine in the treatment of postoperative pain in major orthopaedic surgery

M. Iannotti, M. Pace, P. Sansone, M. Passavanti, C. Aurilio

Department of Anaesthetics, Surgical and Emergency Sciences, Second University of Naples, Naples, Italy

Background and Goal of Study: The aim of this study was to evaluate the efficacy of Buprenorphine TDS in postoperative pain control after major orthopaedic surgery and to demonstrate that Buprenorphine TDS is a good option compared with the standard analgesic treatments.
Materials and Methods: The study was approved by Ethical Committee and written informed consent was obtained from all subjects. 142 patients (79 F and 63 M, from 18 up to 65 years of age, ASA II–III), undergoing prosthesis surgery, were randomly divided into two treatment groups. A 52.5 µg/h Buprenorphine TDS patch was applied to the first group (TTDS) after surgery, and an epidural catheter was positioned through which levobupivacaine (1,25 mg/ml) and suphentanyl (0,5 µg/ml) were administered using an elastomer system (6ml/h). The epidural infusion was planned for the first 24 hours after surgery. The second group (NOTDS) received epidural infusion only, at the same dosages, but the treatment was planned for the first 96 hours after surgery. In both groups, a rescue dose of ketorolac (30mg iv) could be administered on patient's request. The severity of the pain was considered the primary parameter of efficacy, and was assessed at every control on a 100 mm visual analogue scale (VAS), (0 = no pain, 100 = the worst imaginable pain). The secondary parameter of efficacy was the level of the patient's satisfaction, on a numerical scale from 0 to 10 (0 = no satisfaction, 10 = the highest possible satisfaction). Tolerability and safety were assessed by a non-invasive monitoring of some clinical parameters: heart rate, blood pressure, respiratory rate, SpO_2.
Results and Discussion: a good pain control was obtained in both groups. There was a significant difference between the two groups in the level of satisfaction of the analgesic treatment received: the patients in TTDS group were more satisfied than in NOTDS group (8.8 ± 0.7 vs. 6.3 ± 0.7) ($p < 0.001$). The use of rescue medication was similar in the two groups: in TTDS group 5 patients received 90 mg of ketorolac, in NOTDS group 4 patients received 90 mg. The monitored parameters showed no statistically significant variations in the two treatment groups.
Conclusion(s): Our results seem to demonstrate that Buprenorphine TDS 52.5 µg/h was able to control postoperative pain. The use of Buprenorphine TDS in postoperative pain management may be favourable, both in terms of risk/benefit ratio and acceptability/compliance.

14AP6-6

Psychological dimensions of acute postoperative pain

M. Papaioannou, S. Kyzirakou, C. Zolindaki, N. Maragos, A. Palgimesi

Anaesthesiology Department, General Hospital of Nikaia, Athens, Greece

Background and Goal of Study: There is an extensive literature attempting to show relationships among psychologic factors, mainly affective, related to pain and postoperative pain. The present study aimed at investigating the relationship between sociodemographic variables (age, gender, marital status), psychological variables (anxiety, depression) and pain outcomes (pain intensity and analgesia use) in the perioperative setting.
Materials and Methods: On the day before surgery, 61 consenting patients completed the Greek version of the Hospital Anxiety and Depression Scale (HADS). On postoperative days 1 and 2, pain intensity (at rest and during activity) on the Verbal Rating Scale (VRS) as well as intravenous patient-controlled analgesia (PCA) fentanyl use were assessed. Exclusion criteria included known psychiatric or mental disorder, severe systemic disease, drug or alcohol abuse and mother language other than Greek.
Results and Discussion: Descriptive data pertaining to sociodemographic variables, psychological factors and postoperative pain outcomes are shown in the Table. No statistically significant associations were found between the sociodemographic variables and the psychological variables or the postoperative pain outcomes. Anxiety, depression and postoperative pain reports at rest and during activity were significantly interrelated ($p < 0.05$). Analgesic use was not significantly affected by anxiety or depression.

Descriptive data

Measures	NN =	Measures	Mean	SD
Gender		Psychological factors		
Female	36 (59%)	HADS (0–42)	15.85	5.89
Male	25 (41%)	HADSa (0–21)	9.89	2.98
		HADSd (0–21)	5.97	4.16
Marital status		Pain intensity		
Married	35 (57%)	POD 1 pain at rest (1–5)	1.81	0.67
Unmarried	11 (18%)	POD 1 pain during activity (1–5)	2.45	0.73
Divorced	8 (13%)	POD 2 pain at rest (1–5)	1.25	0.40
Widowed	7 (12%)	POD 2 pain during activity (1–5)	1.60	0.60
		Pain at rest (1–5)	1.53	0.52
		Pain during activity (1–5)	2.03	0.64
Age		Analgesia use		
20–40	16 (23%)	POD 1 fentanyl use (µg)	667.37	396.24
40–60	25 (41%)	POD 2 fentanyl use (µg)	579.93	376.52
≥60	20 (33%)	Total analgesic use (µg)	1247.30	771.28

HADS, Hospital Anxiety and Depression Scale; HADSa, HADS anxiety subscale; HADSd, HADS depression subscale; POD, postoperative day.

Conclusion(s): The pattern of findings suggests that taking a broader view of the postoperative pain experience could be of some value in managing patients successfully.

14AP6-7

Procedure-specific postoperative pain management: Evaluation of results. Observational database of 5021 patients

M. Baena, N. Esteve, R. Yañez, F. Montero, J. Aguilar

Servicio de Anestesiología y Reanimación, Hospital Son Llatzer, Palma de Mallorca, Baleares, Spain

Background and Goal of Study: Existing general guidelines for perioperative pain management do not consider procedure-specific differences in analgesic efficacy or applicability of a given analgesic technique. For the clinician, an evidence-based, procedure-specific guideline for perioperative pain management is therefore desirable. This work review the results on postoperative pain management in two types of surgical procedures (Knee Replacement and Colo-rectal Surgeries, KRS and CRS respectively) at our Institution and determines evidence-based procedure-specific results. Objectives: To evaluate our procedure-especific results in Knee replacement and Colo-rectal surgery and to compare them with our total APU (acute postoperative pain unit) results.
Materials and Methods: Daily record of follow-up variables, in patients controlled by the APU following stratification in KRS and CRS. The analgesic

procedure-specific results are measured, assessed and compared with previous the remainig surgical procedures results in our APU. Following these, improvement measures are elaborated.

Results and Discussion: The results are depicted in figure 1.

Conclusion(s): It seems to be desirable to examine procedure-specific outcomes, whenever possible, to ensure that postoperative pain management protocols are optimized and allow us to detect specific improvement areas.

References:

1 Procedure-specific postoperative pain management. Kehlet, H. Anesthesiol. Clin. North America. 2005;23(1):203–10.

2 Postoperative pain management and outcome after surgery. Bonnet, F., Marret, E. Best Pract. Res. Clin. Anaesthesiol. 2007;21(1):99–107.

3 Predicting postoperative analgesia outcomes: NNT league tables or procedure-specific evidence? Gray, A., Kehlet, H., Bonnet, F., Rawal, N. BJA 2005;94 (6): 710–14.

14AP6-8

Predictive factors of effective postoperative analgesia after major orthopedic surgery: Continuous perineural block versus intravenous analgesia

P. Jacquemin, A. Steyaert, M. De Kock, P. Lavand'homme

Anesthesiology, St Luc Hospital UCL Medical School, Brussels, Belgium

Background and Goal of Study: The intensity of postoperative pain as well as the need for postoperative analgesics is influenced by multiple factors (Kalkman et al. Pain 2003; Thomas et al. Pain 1998). Most of the studies have considered all the patients as a group without taking into account the type of postoperative analgesia. The present study evaluated the relationship between preoperative factors that have been reported to predict postoperative pain and postoperative pain in patients managed by either perineural block (CPNB) or intravenous analgesia (PCIA) after major orthopedic surgery.

Materials and Methods: Adult patients scheduled for hip or knee arthroplasty or spine surgery under general anesthesia were included. All the patients were managed with multimodal analgesia including either CPNB or PCIA to ensure optimal recovery. Factors like gender, age, obesity (BMI > 30), preoperative pain, preoperative opioids intake and anxiety were recorded during the preoperative evaluation. Postoperative pain scores were assessed in recovery room (PACU), at rest and with movement at day 1 and day 2 post-surgery as well as analgesic needs (CPNB and PCIA use). Statistical analysis used unpaired t-test and multiple linear or logistic regressions. $P < 0.05$ was significant.

Results and Discussion: Sex ratio and ASA scores were similar. CPNB patients were older (73 ± 7yrs) than PCIA patients (59 ± 11yrs). Intraoperative analgesics like sufentanil (0.2 ± 0.1 µg/kg) or ketamine (0.3 ± 0.3 mg/kg; 74% in CPNB vs 60% in PCIA patients) did not differ. Absence of intraoperative ketamine predicted insufficient analgesia in PACU for CPNB patients only. In CPNB group, independent factors predictive of pain at movement were insufficient analgesia observed during PACU stay ($P = 0.03$) and preoperative opioids intake ($P = 0.04$). Use of local anesthetics in CPNB was decreased in obese patients ($P = 0.007$). PCIA consumption was increased by preoperative anxiety ($P = 0.027$) and younger age ($P = 0.005$).

	CPNB (n = 42)	PCIA (n = 35)	P value
Insufficient analgesia in PACU	57%	43%	0.39
VAS (0–100) movement day1	52 ± 20	59 ± 22	0.27
VAS (0–100) movement day2	45 ± 20	47 ± 19	0.79

Conclusion(s): These preliminary results seem to show that different pre-/intra-operative factors may account for the success of postoperative analgesia according to the use of either perineural technique or systemic opioids after major orthopedic surgery. Taking into account these predictive factors might help to improve postoperative pain management.

14AP6-9

Postoperative pain treatment following gynecologic surgery, using different doses of transdermal buprenorphine a double-blind, randomized study

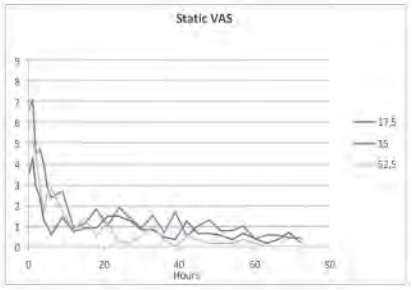
Y. Leykin, T. Setti, F. Sanfilippo, C. Ambrosio, S. Furlan

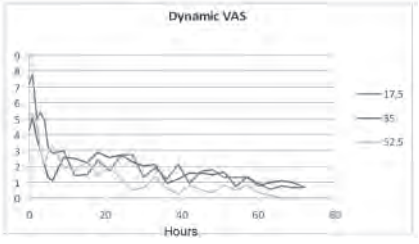
Anesthesia, Intensive Care and Pain Treatment, "Santa Maria degli Angeli" Medical Centre, Pordenone, Italy

Background and Goal of Study: The aim of this randomized, double-blinded clinical study was to verify the correlation between different doses and efficacy in postoperative pain of transdermal buprenorphine (TDB) following laparotomic hysterectomy.

Materials and Methods: 30, ASA I–II female patients, aged 18–60 years, undergoing elective laparotomic hysterectomy were randomized in 3 groups (n = 10). Exclusion criteria included: BMI > 27; hypersensitivity to buprenorphine; use of opioids, antidepressants, hypnotics and/or NSAIDs; compromised respiratory function and psychiatric disorders. 12 hours preoperatively and for 72 postoperative hours, group A received 17.5 µg/h TDB; B-35 µg/h and C-52.5 µg/h. Anesthesia was induced with propofol 2 mg/kg; rocuronium 0.6 mg/kg and fentanyl 2 µg/kg and maintained with propofol and remifentanil based on BIS values (40 – 60) and haemodynamic parameters. During the first 6 postop. hours the rescue dose of 2 mg of morphine and between 7–72 hours 30 mg of ketorolac, were administrated intravenously, in case of VAS > 4. Side effects and patient satisfaction on discharge were evaluated.

Results and Discussion: There were no demographic and baseline differences among groups. The static and dynamic VAS detected during post-operative period are shown in figures 1 and 2. The medium consumptions of morphine were in group A-15.6 mg, B-3.2 and C-3.6 while for ketorolac were respectively 96 mg, 8 and 6 for group A, B and C. The level of patient's satisfaction was 1.4 for the group A, 3.4 for B and 3.8 for C.





Conclusion(s): Transdermal buprenorphine resulted effective in the treatment of postoperative pain after laparotomic hysterectomy. TDB 35 µg/h was significantly more effective than 17.5 µg/h, and equivalent to 52.5 µg/h. Patients satisfaction was low in group A, while high and similar between groups B and C.

Reference:

1 Evans HC, Eastope SE. Transdermal buprenorphine. Drugs 63(19): 1999–2010, 2003.

14AP6-10

Postoperative analgesia in four university hospitals – Analysis of main determinants of patients satisfaction with postoperative quality of life and gender differences in postoperative pain perception

E. Copaciu, E. Ursache, S. Copotoiu, M. Popescu, D. Tulbure

Anesthesiology and ICU Department, University Hospital, Bucharest, Romania

Background and Goal of Study: Suboptimal pain management influences postoperative quality of life (QoL) and this is a rather frequent finding, despite evidence that aggressive postoperative pain control improves outcomes. In order to initiate the activities of four acute pain services in our country we systematically applied postoperative analgesia protocols specifically designed for this study using for data colection an electronic database and an electronic chart available online to all four hospitals.
Materials and Methods: 1434 (48% male/52% female) patients were included in a prospective observational study. Resting and paroxysmal pain scores where monitored using VAS. We also used a sedation scale, a four steps patient satisfaction and incidence of medication induced-side effects. Database was done using EpiData v3.0 and was analised using. SPSS v13 for Mac OS X (1989–2006); Spearman rho test with p significant <0,01 (two tailed). Multivariate comparisons were analised using linear regression with R square = 0.395.
Results and Discussion: Resting pain score was the main determinant of patient satisfaction during the first 48 postoperative hours. The patients most satisfied with their postoperative QoL had significant paroxysmal pain scores, but very low resting pain scores. Patients most unsatissfied with QoL had the highest resting pain scores. Both pain scores (resting and paroxysmal) where the main determinant of QoL., followed by analgetic medication side effects like nausea and vomiting, but not pruritus (for opioid use) and motor blockade-for epidural analgesia. We noticed significant gender differences. Women had higher resting pain scores (with the highest statistical significance in the first 2 hours after leaving the OR) and had a lower appreciation with their QoL than men, while men experienced higher paroxysmal pain scores, asked more frequently for supplemmental analgesia, but overall were more satissfied than women with postoperative QoL. When analysing data from women suffering different types of surgery, OG patients had the highest pain scores during the first 8 postoperative hours and had the lowest appreciation for the first 24 hrs of all surgical specialties.
Conclusion(s): Resting pain scores management should be a major goal of postoperative care, besides control of paroxysmal pain and medication induced side effects. Significant gender differences may influence postoperative pain management and allow improvement of QoL.

14AP6-11

Total intravenous anaesthesia with caudal extradural morphine for pain relief following lumbar spine surgery

M. Kobayashi, N. Kurokouchi, K. Tanaka, N. Ando, K. Kawakami

Dept. of Anaesthesiology, Hata General Hospital, Higashi-Chikuma-gun Hatamachi, Nagano-ken, Japan

Background and Goal of Study: Postoperative pain is uncomfortable for patients (pts) undergoing lumbar spine surgery (LSS). Balanced anaesthesia describes most anaesthetic administration in today's clinical practice. The practice of combining several drugs to administer anaesthesia may be safer than the use of only one or two drugs (1). We reported general anaesthesia combined with caudal extradural (CE) morphine for LSS relieved postoperative uncomfortable condition (2). In this study, we compared the postoperative outcome between two balanced anaesthesia method combinations of gaseous and intravenous (GIV) or total intravenous (TIV) anaesthesia with CE block.
Materials and Methods: After institutional approval and informed consent, 46 pts (ASA PS: I–II) scheduled for LSS were randomly allocated to the GIV group and the TIV group (each 23 patients). Group GIV: oxygen-nitrous oxide (60%)–propofol (3–8 mg/kg/hr)–ketamine (0.5 mg/kg). Group TIV: remifentanil (<0.5 μg/kg/min)–propofol–ketamine. After induction of general anaesthesia, each pt was placed on a prone position and the CE space was administered with 5 mg morphine in 9 mL of 0.2% ropivacaine prior to the surgical incision. Pain intensity by the verbal rating scale (VRS: 0–10) was assessed every three hours during the first 24 hrs and every six hrs during the next 24 hrs postoperatively. Respiratory and cardiac complications were observed. Data were analyzed with χ^2-test with Yates correction and Mann-Whitney U test; $p < 0.05$ significant. Data are means ± SD.
Results and Discussion: The demographic data were similar both groups. No pt had major complications. VRS in GIV (2.5 ± 2.4) was lower than in TIV (3.7 ± 3.3) in just arrival to the ward (p = 0.24). In six to 30 hrs and 36 to 48 hrs postoperative period, VRS in TIV were lower (p = 0.09–0.8), and significantly lower (p = 0.04–0.01) than that in GIV, respectively. Every mean VRS was below 4. Time between the end of surgery and of anaesthesia in TIV (21 ± 5 min) is shorter than that in GIV (26 ± 9 min) (p = 0.04). Discussion: Morphine, low lipid solubility opioid, diffuses readily in cerebrospinal fluid and is effective for relief of post-LSS pain when injected at the CE level. GIV and TIV were similar postoperative course, but TIV was faster awakeness from anaesthesia and slightly lower VRS of pain.
Conclusion(s): Although total intravenous anaesthesia with CE block in LSS is preferable, further studies are needed.

References:
1 JAMA 1988; 260: 2859–63.
2 ANESTH ANALG 2000; 90, 2S: S320.

14AP7-1

Capsicum plaster at the Hegu point reduces postoperative analgesic requirement after orthognathic surgery

K. Kim, K. Kim, K. Hwang, C. Park

Department of Anesthesiology, Hanyang University Hospital, Seoul, Korea

Background and Goal of Study: Capsicum plaster at classical Chinese acupoints is an alternative to acupuncture, which has been used as an effective method for preventing postoperative nausea and vomiting (PONV), sore throat and pain. This study investigated the postoperative analgesic efficacy of capsicum plaster at Hegu (LI 4) acupoints in patients after bilateral sagittal split ramus osteotomy (BSSRO).
Materials and Methods: A double-blind, sham-controlled study was conducted with 84 patients undergoing orthognathic surgery, and who were randomly assigned to 3 treatment regimens (n = 28 each): Hegu group = capsicum plaster at Hegu acupoints and placebo tape on the shoulders as a nonacupoint, Sham group = capsicum plaster on the shoulders and placebo tape at Hegu acupoints, and Control group = placebo tape at Hegu acupoints and on the shoulders. The capsicum plaster was applied before induction of anesthesia and maintained for 8 h per day for 3 postoperative days.
Results and Discussion: The total amount of patient-controlled analgesia (PCA), containing 6.5 mg/ml fentanyl and 1.2 mg/ml ketorolac, administered in the first 24 h after the operation was decreased in the Hegu group (26.8 ± 3.4 ml) compared with the Control (44.2 ± 7.3 ml) and Sham (42.1 ± 6.9 ml) groups ($P < 0.01$). The incidence of PONV and the need for rescue medication were reduced, and the overall satisfaction score was greater in the Hegu group compared with other groups ($P < 0.01$).

Table 1. Postoperative Analgesic Consumption

	Control group (n = 28)	Hegu group (n = 28)	Sham group (n = 28)
Total PCA volume (ml) delivered			
0 – 6 h	11.4 ± 3.4	6.7 ± 1.6*	10.6 ± 3.2
6 – 24 h	32.8 ± 6.6	20.1 ± 2.9*	31.5 ± 6.5
24 – 48 h	29.5 ± 2.7	24.7 ± 1.3*	28.8 ± 2.4
Number of PCA requested			
0 – 6 h	5.4 ± 2.1	0.7 ± 0.4*	4.6 ± 1.8
6 – 24 h	14.8 ± 5.4	2.1 ± 0.8*	13.5 ± 5.2
24 – 48 h	5.5 ± 2.8	0.7 ± 0.2*	4.8 ± 2.5
Number of supplemental analgesic requested			
1st day	2.1 ± 1.4	0.6 ± 0.3*	1.7 ± 1.2
2nd day	1.7 ± 1.2	0.6 ± 0.4*	1.6 ± 1.1
3rd day	1.2 ± 0.7	0.2 ± 0.1*	1.2 ± 0.6

Values are mean ± SD. PCA = patient controlled analgesia. *P < 0.01 compared with control and sham groups.

Conclusion(s): The capsicum plaster at the Hegu acupoints decreased the postoperative opioid requirements and opioid-related side effects in patients after orthognathic surgery.

Reference:
1 Kim KS, Nam YM. The analgesic effects of capsicum plaster at the Zusanli point after abdominal hysterectomy. Anesth Analg 2006;103:709–13.

14AP7-2

Modulation of quantitative sensory testing by an implanted spinal cord stimulator in a patient with primary Raynaud syndrome

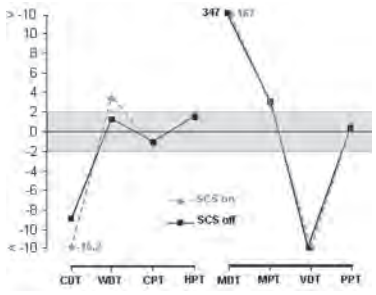
T. Münster, N. Tiebel, C. Maihöfner

Department of Anaesthesiology, University of Erlangen, Erlangen, Germany

Background and Goal of Study: Spinal cord stimulation (SCS) is effective as an antinociceptive treatment of various neuropathic pain syndromes. Beside antinociceptive action it may modulate overall somatosensory perception. This case report targets the question if SCS has an effect on quantitative sensory testing (QST) in a patient with primary Raynaud syndrome.
Materials and Methods: We report on a 44-year old female patient with primary Raynaud syndrome and an implanted SCS (cervical and lumbar electrodes). QST was performed following the standardised protocol of the German research network "neuropathic pain" including cold (CDT) and warm (WDT) detection threshold, cold (CPT) and heat (HPT) pain threshold, tactile detection (MDT) and mechanical pain (MPT) threshold, vibration detection threshold and pressure pain threshold (PPT).[1] We tested the hand of the patient with engaged

and disengaged SCS. Test results were normalized by calculating the Z-transformation based on data from a control group.

Results and Discussion: QST results are presented in the figure. The patient showed a sensory loss in perception of cold and vibration and a sensory gain of warm, tactile detection and mechanical pain stimuli. The SCS influenced the perception of cold, warm and tactile detection, whereby cold and warm detection thresholds were amplified and mechanical detection threshold was attenuated.



Conclusion(s): SCS modulated the quantitative sensory testing battery in a patient with primary Raynaud syndrome. These effects were pronounced in qualities involving Aβ and Aδ nerve fibers. Further investigations may help to understand the mechanisms of action of SCS.

Reference:

1 Rolke R, Baron R, Maier C, et al. Pain 2006;123:231–43.

14AP7-3

Gabapentin reduces opioid consumption in severe burned patients: A case series

S. Quevedo, P. Egipto, M. Coelho, A. Rodrigues

Burn Unit, Department of Plastic and Reconstructive Surgery, Faculty of Medicine, University of Porto, Hospital S. João, Porto, Portugal

Background and Goal of Study: Pain due to burn injury is multifactorial and often difficult to manage. Opioids and anti-inflammatory drugs are the cornerstones in pain treatment but frequently insufficient to control wound pain. There is growing evidence that gabapentin (Gp) is effective not only in neuropathic pain but also in inflammatory pain, with established efficacy in animal and human experimental burn models. We describe a case series of severely burned patients in whom Gp was introduced with the objective of improving analgesia.

Materials and Methods: Gp was initiated after the reanimation phase in 5 patients with 2nd and 3rd degree burns. They received 1200mg of oral Gp daily in addition to standard pain therapy. Cumulative opioid, other analgesic and sedative consumption were assessed during 7 days before (pre-treatment phase) and 7 days after (treatment phase) the introduction of Gp. The number of wound dressing changes and surgical procedures were recorded.

Results and Discussion: All five patients were male, mean age was 48,8 years (ranging from 30–76) with total body surface burn area of 42,8% (ranging from 18–75). The number of procedures (wound dressing and surgery) was similar for each patient during the period of the study. Opioid and sedative consumption was considerably smaller in the treatment phase compared to the pre-treatment phase (mean values of decrease of 258mg of morphine and 303,1mg of midazolam). One patient had complaints of severe itching in pre-treatment phase that was abolished after institution of Gp; no other itching complaints were mentioned by the other patients. Gp was well tolerated with no adverse reactions.

Conclusion(s): The observations from this study revealed a significant opioid-sparing effect and prevention of itching, supporting the future use of Gp in the management of acute pain and pruritus following burn injury. Further research is needed to establish the definite role of Gp in burned patients.

14AP7-4

Intraoperative remifentanil dosing for total intravenous anesthesia during CABG surgery determines time course of postoperative hyperalgesia

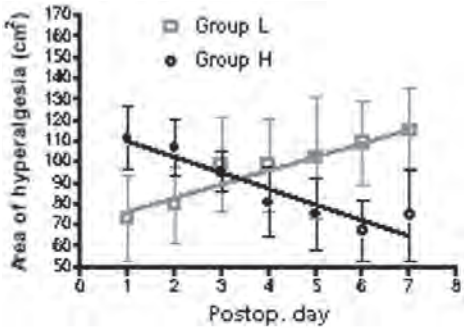
J. Fechner, H. Ihmsen, J. Schmidt, T. Strecker, C. Jeleazcov

Department of Anesthesiology, Friedrich-Alexander-University of Erlangen-Nuremberg, Erlangen, Germany

Background and Goal of Study: Studies in animals and human volunteers show that even short time administration of opioids can result in so called opioid-induced hyperalgesia (1). A clinical investigation postulates a clear dependency of the amount of secondary postoperative hyperalgesia and the amount of postoperative pain from the intraoperative remifentanil dosing (2). As influence of dosing and clinical relevance of these findings are not clear, we have studied patients after sternotomy for coronary artery bypass graft (CABG) surgery to evaluate the effect of two distinct intraoperative remifentanil concentrations on postoperative pain and hyperalgesia.

Materials and Methods: 16 male patients undergoing first time CABG surgery without renal insufficiency, neurologic disease or diabetes were included in the study. Patients were randomized to receive a total intravenous anesthesia with propofol and a target-controlled infusion with either 4 (group L) or 8 (group H) ng ml^{-1} target concentration of remifentanil, which was kept constant from start of induction until last suture. A morphin PCA was used for 48 H postopertively to quantify morphin consumption. NRS of pain was monitored. Area of secondary mechanical punctuate hyperalgesia on the right side of the sternal wound was estimated by a blinded investigator using a Von-Frey-hair of 256 Nm each day from day 1 to day 7. Morphin consumption and pain were compared (MWU-test). Time course of area of hyperalgesia was estimated using linear regression, and the slope of both regression lines were compared (t-test).

Results and Discussion: From day 1 to 7 in group L the area of hyperalgesia continuously increased, in group H it continuously decreased. Slopes of regression lines, 6.8 ± 0.9 cm^2 day^{-1} in L and -7.5 ± 1.2 cm^2 day^{-1} in H were significantly different ($p < 0.005$). Morphin consumption or 48 H was significantly higher in L, but pain scores were not significantly different.



Conclusion(s): Intraoperative remifentanil dosing significantly influences postopertive hyperalgesia and morphin consumption. Based on our results during surgery a higher remifentanil dosing should be preferred.

References:

1 Angst MS et al., Pain 2003; 106: 49–57.
2 Joly V et al., Anesthesiology 2005; 103: 147–155.

14AP7-5

Evaluation of the effect of ketamine in laparoscopic gynaecological surgery according to the preoperative presence or not of a positive temporal summation

F. Lois, P. Lavand'homme

Anesthesiology, St Luc Hospital, Université Catholique de Louvain, Brussels, Belgium

Background and Goal of Study: Interindividual differences in the modulation of endogenous perception and transmission of pain place patients at more or less risk of developing severe postoperative pain[1]. Glutamatergic system and NMDA receptors play an important role in central hyperexcitability. Wind up phenomenon and its clinical correlate temporal summation (TS, an enhanced response to repeated application of a nociceptive stimulus)express CNS excitability and rely on NMDA receptors activation[2]. Efficacy of ketamine in gynaecological surgery remains unclear and its use is controversial [3]. The study evaluates the postoperative effect of intraoperative ketamine (NMDA receptor antagonist) according to the presence or absence of a positive preoperative TS.

Materials and Methods: Patients (ASA I and II) scheduled for laparoscopic gynaecological non-malignant surgery were included. Pricking pain score (VAS, 0–100) was recorded after single application and after the last application of a train of 10 machanical stimuli (rate 1 Hz) with a 180 g von Frey filament. TS was the calculated difference between both VAS scores and was considered positive if >15/100. All patients received ketamine (0.3 mg/Kg) at the anesthesia induction (standardized protocol). Pain scores (VAS 0–100) at rest, movement (cough) and visceral pain (abdominal cramps) were evaluated one hour and 24 hours post-surgery. Analgesic needs (piritramide) were noted. Patients were divided into 2 groups according to presence or not of a preoperative TS

(TS+ and TS – groups). Statistical analysis used t-tests non-paired, Spearman correlation, $p < 0.05$ significant.

Results and Discussion: 85 patients were included. TS – :66% (value = 2,9 ± 4,3). TS+:34% (value = 31,2 ± 15,4). TS+ patients had lower VAS scores for visceral pain ($p = 0.04$) and for movement ($p = 0.039$) at 1h and also 24 h postoperatively ($p = 0.07$) than those with TS – . Piritramide needs were equivalent in the 2 groups.

	VAS rest pain	VAS movement pain	VAS visceral pain
TS + at 1 h	41 ± 24	48 ± 20*	27 ± 26*
TS – at 1 h	43 ± 17	57 ± 18	40 ± 27
TS + at 24 h	20 ± 20	46 ± 22	29 ± 27
TS – at 24 h	23 ± 19	55 ± 21	19 ± 25

(*) $p < 0.05$ between TS + and TS – groups

Conclusion(s): The present results seem to show that ketamine is more effective in patients with a positive TS, i.e. some state of activation of their endogenous excitatory systems.

References:

1 Edwards RR. Neurology 2005;65(3):437–43.
2 Eide PK. Eur J Pain 2000;4(1):5–15.
3 Aubrun F., Gaillat C., Rosenthal D. et al. Eur J Anaesth 2008;25 :97–105.

14AP7-6

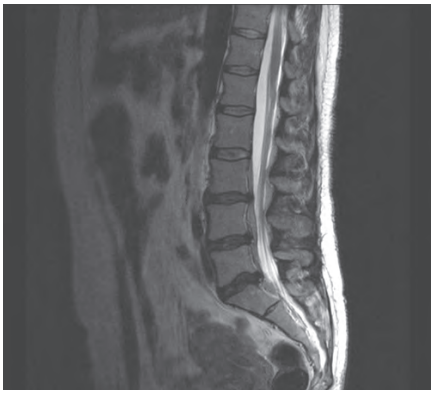
Epidural abcsess post diagnostic facet joint injection

F. Desmond, D. Harney, P. MacEnaney

Dept of Anaesthesiology and Pain Medicine, Mercy University Hospital, Cork, Ireland

Background and Goal of Study: We describe the case of a young female who developed a known but rare complication post facet joint injection, which could have dire consequences if not managed effectively. We believe this to be one of the only cases of paraspinal and epidural abscess formation post facet joint injection to be documented in the literature. The diagnosis of iatrogenic abscess formation is often delayed as the signs and symptoms develop insidiously and diagnosis is often much delayed.

Materials and Methods: Facet joint injections are used commonly in cases of known facet joint syndrome. They are relatively safe but have been known to have a number of complications as it is an invasive procedure. A young female patient was diagnosed with facet joint syndrome and after injection of the facet joint space with local anaesthestic and steroid solution it was noted that her pain significantly worsened. An immediate MRI displayed a paraspinal and an epidural abscess. She was managed medically with intravenous antibiotic therapy which was successful and surgical intervention was avoided.



Results and Discussion: This patient's condition worsened significantly post facet joint injection. MRI showed a paraspinal and an epidural abscess, which did not warrant surgical intervention and intravenous antibiotic therapy was adequate. Serial MRIs were used in the management of this patient in order to ascertain that the patient was indeed improving, both radiologically and indeed clinically. Serial MRIs were invaluable in the management of this patient.

Conclusion(s): Epidaral and paraspinal abscess formation are known complications post facet joint injection, but they are indeed rare. We decribe case of a young female patient who developed such complications and we describe her management and recovery. We believe this to be one of the only documentated cases of spinal abscess formation post facet joint injection. Serial MRIs were also invaluable in the management and decisions regarding further treatment strategies for these patients.

14AP7-7

In patients with Crohn's disease quantitative sensory test results show significant differences between patients with high and low postoperative morphin consumption

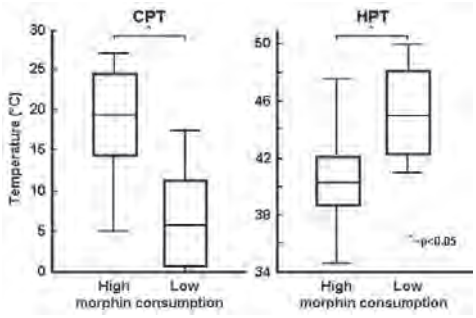
T. Münster, N. Tiebel, A. Winterpacht, K. Hühne

Department of Anaesthesiology, University of Erlangen, Erlangen, Germany

Background and Goal of Study: Crohn's disease (CD) is a painful inflammatory bowel disease with a heterogeneous clinical appearance. In CD patients undergoing major abdominal surgery a notably higher postoperative morphine requirement compared to patients with comparable surgery is observed. Quantitative sensory testing (QST) is used to evaluate large and small fibre sensory functions and permits the creation of distinct patient groups according to sensory profiles. The aim of the study was to investigate if there are any differences in QST results between CD patients with high or low postoperative morphine consumption.

Materials and Methods: After approval of the local ethics committee and written informed consent we enrolled 35 CD patients in this study. The patients underwent ileocecal resection and morphine consumption of the first 48 postoperative hours was assessed using patient controlled analgesia. QST was applied to every patient 3 month after surgery according to a standardized protocol[1] including cold (CDT) and warm (WDT) detection threshold, cold (CPT) and heat (HPT) pain threshold, mechanical detection (MDT) and pain (MPT) threshold, vibration detection and pressurepain threshold (PPT). Based on the postoperative morphine consumption patients were divided into groups of high (>75th percentile) and low (<25th percentile) morphine requirement. QST results of the high and low morphine group were compared using Mann-Whitney-U test and results were considered significant if p-value was less than 0.05.

Results and Discussion: The median postoperative morphin consumption was 0.04 mg kg^{-1}h^{-1} (25th percentile 0.027, 75th percentile 0.052). Comparison of QST data between high (n = 9) and low (n = 8) morphine consumption group demonstrated significant differences in CPT and HPT. No differences were found in any of the other parameters.



Conclusion(s): In patients with CD the subgroup with high postoperative morphine requirements showed a significant difference in QST parameters evaluating C fibre connected nociceptive perception compared to the subgroup with low morphine consumption. Further research is necessary to investigate possible underlying mechanism for these findings.

Reference:

1 Rolke R, Baron R, Maier C, et al. Pain 2006;123:231–43.

14AP7-8

Quantitative sensory testing of analgesic and antihyperalgesic effects of locally applied lidocaine (Versatis) in healthy volunteers

A. Wehrfritz, B. Namer, C. Müller, A. Leffler, W. Koppert

Department of Anesthesiology, University Hospital Erlangen, Erlangen, Germany

Background and Goal of Study: Systemic medication often does not provide adequate pain relief or has to be stopped due to side effects. Locally applied lidocaine is a new option for treating neuropathic pain with few side effects. Already topical administration on the aching skin leads to pain reduction. Systemic side-effects are extremely rare. Aim of the study was to verify the analgesic and antihyperalgesic effects of locally applied lidocaine in healthy individuals. To quantify subcutaneous nerve fibres we extract parts of epidermis by using a suction blister method (1). Versatis will be applied in order to evaluate the time-course of somatosensory effects of locally applied lidocaine. Results of

this study may lead to a better understanding of longer-lasting antinociceptive effects of lidocaine.

Materials and Methods: After IRB approval, 20 healthy volunteers were enrolled in this double-blind and placebo-controlled study. The pain patches (700 mg lidocaine) were applied for 42 days. Over a period of 70 days 10 readings were done which also registered the long-term progress after discontinuing the medication. By means of the QST measuring touch, pain threshold, wind-up and pressure pain were recorded; by using the TSA-method cold-, warm-, heat pain and heat-pain tolerance threshold were determined. Skin blister roofs were collected 12 hours after removing the patch using the suction method. Density of nerve fibres was assessed in 5 defined volumes per skin patch with a confocal microscope.

Results and Discussion: After applying a lidocaine patch for 42 days, the pain threshold in the QST was decreased from 100% to 48%. The heat-pain and the heat-pain tolerance threshold in the TSA-experiment had increased significant to 140%. The nerve fiber density was significantly reduced to 52% (wilcoxon matched pair). In the placebo group no significant changes were observed. No significant change in the length of the nerve fibers expressed as the ratio of nerve fiber count and intersection point count could be found.

Conclusion(s): Longterm topical application of lidocaine can reduce the nerve fiber density in the epidermis. Thus topical lidocaine application exhibits a neurotoxic effect comparable to that of local capsaicin application. The degeneration of the nerve fiber endings in the skin could explain the loss of pain sensation as we were able to show in the TSA and QST test. The same analgesic effect occurs with patients with neuropathic pain due to a peripheral generator of spontaneous activity.

Reference:

1 Nolano M. et al., Pain 1998 May;81(1–2):135–45.

14AP7-9

Genetically variation influence the skin conductance response to nociceptive pain in anesthetized patients

H. Storm, P. Klepstad, R. Støen, F. Skorpen, J. Ræder

The Simulation Lab, Medical Faculty, University of Oslo, Rikshospitalet University Hospital, Oslo, Norway

Background and Goal of Study: Anesthetized patients have different responses from standardized nociceptive stimuli. Changes in skin conductance (SC) monitor responses to nociceptive pain. The purpose of this study was to examine if the noxious response monitored by SC is associated to the gene's nociceptive pain sensitivity.

Materials and Methods: Sixty patients, given propofol to a BIS level of 40–50, were stimulated with a tetanic stimulus, 50 mA. During tetanic stimulus clinical stress (CS), scored with: large muscle movement, coughing, eye opening, sweating in the forehead, tears, face muscle reaction, and systolic blood pressure >130 mm Hg. SC variables were measured by area under curve (AUC) and peaks per sec. CS and SC scores were compared between polymorphisms in candidate genes related to pain sensitivity. The genes included were the opioid receptor mu, delta and kappa genes, the catechol-O-methyltransferase gene, the P-glycoprotein gene, the neurokinin 1 receptor gene, the gene beta arrestin 1 and 2 genes, the UDP2B7 gene, the serotonin 5 HT 2a, 3a, 3 b, 3d, 3 e, 1a and 4 receptor genes, the dopamine D2 and D3 receptor genes and the alpha-2-adrenergic receptor gene. Kruskal-Wallis test was used for polymorphisms in which three variants were observed and Mann Whitney U-test was used if only 2 genotypes were observed.

Results and Discussion: During tetanic stimulus 87% reacted according to the CS and 67% according to the SC variables. The peaks per sec and the area under the curve correlated with the CS with respectively, $r = 0.53$ and $r = 0.44$ ($p < 0.001$).

Table 1. The following polymorphisms were associated to the SC and/or CS following nociceptive stimuli as presented by p-values for differences between genotypes.

	SC Peaks per sec	SC AUC	Clinical Stress
Opioid receptor k rs7815824	0.037 (n = 40)	0.207 (n = 40)	0.100 (n = 43)
P-Glycoprotein rs1128503	0.045 (n = 40)	0.441 (n = 40)	0.554 (n = 43)
Neurokinin 1 receptor rs6546952	0.061 (n = 52)	0.032 (n = 52)	0.033 (n = 55)
UDG2B7 rs82881	0.021 (n = 40)	0.029 (n = 40)	0.588 (n = 43)
Dopamine receptor D3 rs9817063	0.046 (n = 53)	0.048 (n = 53)	0.55 (n = 57)
Beta arrestin 2, rs 1045280	0.026 (n = 53)	0.048 (n = 53)	0.013 (n = 56)

Conclusion(s): This exploratory study suggests that genetic variability is related to the responses to nociceptive stimuli measured by the skin conductance changes.

Education, Research and Presentation

15AP1-2

Improvement of education in pain management according to "Pain Free Hospital"

M. Zackova, A. Bellocchio, P. Capelli, S. Gualdani

Neurosciences Department, Ospedale Bellaria, Bologna, Italy

Background and Goal of Study: We promoted the pain surveying activity in all involved units (9 hospitals in Bologna's area)and the adoption of therapeutic protocols for acute and chronic pain. Since 2003 we organised a basic level course on pain management opened to all Departments. This course is part of the Health Authority Catalogue, thus improving its importance. Our aims were to assess the efficacy and attendants' perceptions about the quality of pain management course.

Materials and Methods: 820 doctors and nurses who completed a 8 h interactive course of pain management, were asked to anonymously complete a 15-point questionnaire about the contents, quality, importance and many other parameters of the course, evaluated like excellent, good, sufficient or insufficient. Also second 20-points questionnaire was used about theoretic and practice knowledge of pain management during the course and 6 months later.

Results and Discussion: 82% of attendants considered the importance and quality of course excellent. Most of them (83,5%) answer correctly questions related to side effects induced from opioids and NSAIDs and their treatment during the course and even later. The same trend was observed for questions about correct evaluation of pain (VAS, VQS etc.)and its application in the hospital. But after 6 months, only less than 40% of attendants answer correctly the questions regarding pharmacokinetics of opioids and knowledge of multimodal treatment of pain.

Conclusion(s): The good information about pain treatment is essential for improvement of quality of hospital care and better outcome. But it's necessary to find the continuous way of refresher courses for pain therapy and the short questionnaire could be test often in our Departments.

Reference:

1 Comley AL and De Mayer E.J Pain Symptom manage 2001;21:27–40.

15AP1-3

Medical students' attitudes towards interprofessional learning after a programme in emergency medicine

L. Niemi-Murola, J. Hallikainen, O. Väisänen, P. Rosenberg

Department of Anaesthesiology and Intensive Care Medicine, Helsinki University Hospital, Helsinki, Finland

Background and Goal of Study: The aim of this survey was to study the long-term efficacy of a voluntary, elective inter-professional educational programme for 5^{th}–6^{th} yr medical students in Emergency Medicine (1).

Materials and Methods: A questionnaire was distributed to those recently graduated 113 physicians who, as medical students had attended the programme during its 9-year existence. Part of the teaching was given as full-scale simulation. In the questionnaire, there were 16 items concerning perceptions of the programme and 18 items about interprofessional learning (2). The questions were answered using Likert scale (1 = totally disagree, 7 = totally agree). Factor loading of the questionnaire was made using maximum likelihood analysis and varimax rotation. Five scales were constructed (*Interprofessional, Teamwork, Learning, Feasibility, Wish for more*). Cronbach's alpha was adequate (0.821). A subgroup of 29 students answered these questions (2) before and after the programme. Statistics: Student's t-test, ANOVA, Pearson Correlation.

Results and Discussion: The questionnaire was returned by 78 participants (70%), 52.6% of them female. Ninety-three percent of them plan to get a specialist degree: 42.1% in anaesthesiology, 21.1% in surgery, 24.6% in internal medicine/primary care and 12.3% in some other specialty. The participants found the course content relevant for their work (mean 6.03, SD 0.97). The newly graduated participants appreciated scales *Interprofessional* ($p < 0.05$) and *Teamwork* ($p < 0.01$) more than the older ones. A minority of respondents did not appreciate interprofessional collaboration and this affected negatively their attitudes towards scales *Interprofessional* ($p < 0.001$), *Teamwork* ($p < 0.001$), *Learning* ($p < 0.01$), *Feasibility* ($p < 0.05$), *Wish for more* ($p < 0.05$). The students appreciated training by simulation (mean 5.60, SD 1.28).

Conclusion(s): The programme seems to encourage the students to choose specialty training in anaesthesiology. However, it did not change the students' perceptions concerning interprofessional collaboration. The interest and usefulness in simulation in interprofessional training was substantiated.

References:

1 Hallikainen J et al. Acta Anaestesiol Scand 2007; 51; 372–377.
2 Reid R et al. Med Educ 2006; 40: 415–422.

15AP1-4

Teaching surgical airway using fresh cadavers and confirming placement non-surgically

R. Latif, N. Chhabra, C. Ziegler, A. Turan

Paris Simulation Center, Office of Medical Education, University of Louisville, Louisville, Kentucky, USA

Background and Goal of Study: Surgical airway remains the final option on all failed intubation algorithms but studies indicate that anesthesiologists lack formal training in performing surgical airway[1, 2]. We hypothesize that teaching cricothyrotomy on fresh cadavers will improve confidence with neck anatomy, patient position, procedural steps, familiarity with kit and performing on real patients when indicated. Correct placement can be confirmed non-surgically with fiberoptic scope passed through the cricothyrotome to visualize the carina.

Materials and Methods: We measured comfort levels in 25 subjects **pre** and **post** training using a 7-point Likert scale, with 7 being "very comfortable". Training included a PowerPoint presentation followed by an instructional video (provided by Melker). Subjects then performed cricothyrotomy under supervision of an experienced faculty using a Melker cricothyrotomy kit. 4 cadavers were used to teach 25 learners. After each attempt, double sided plastic tape was replaced to give a consistency comparable to the cricothyroid membrane[3]. The correct placement of the cricothyrotome was confirmed with visualization of the carina fiberoptically. Wilcoxon signed-ranks test was used to assess pre- and post-training scores.

Results and Discussion: 16 anesthesiology residents, 1 CRNA, and 8 medical students participated in the study. There was a significant increase ($P < .001$) between pre- and post-training comfort level with identification of neck anatomy, surgical land mark, and patient position (pre, Mean ± SD; 2.6 ± 1.6; post, 5.6 ± 1.2); use of cricothyrotomy kit (pre, 1.7 ± 1.2; post, 5.5 ± 1.3); surgical steps (pre, 1.8 ± 1.2; post, 5.5 ± 1.3); and performance on real patients (pre, 1.6 ± 1.0; post, 4.7 ± 1.6). Omitting medical students, our results again showed a significant increase for the above measures ($P < .001$). In 24 of 25 attempts (96% success rate), the correct placement of cricothyrotome was confirmed by visualization of the carina fiberoptically.

Conclusion(s): Teaching surgical airway is of paramount importance for the anesthesia care provider. Our results demonstrate that training using fresh human cadavers can improve anesthesiology care provider confidence and skill in performing cricothyrotomy, and confirmation of correct placement can be performed non-surgically with the fiberoptic scope.

References:

1 Ezri, T., et al., J Clin Anesth, 2003. 15: p. 418–22.
2 Ratnayake, B. and R.M. Langford, Anaesthesia, 1996. 51: p. 908–11.
3 Vadodaria, B.S., S.D. Gandhi, and A.K. McIndoe, Anaesthesia, 2004. 59: p. 73–9.

15AP1-5

Simulation-based acute care performance assessment for the first year anesthesia residents

M. Ishiyama, K. Nakamura, H. Sato, H. Kawakami, T. Goto

Department of Anesthesiology, Yokohama City University Hospital, Yokohama City, Kanagawa, Japan

Background and Goal of Study: Anesthesia residents are expected to acquire and maintain skills to manage critical anesthetic events. Simulation-based training is a new and rapidly developing area of medical education in our country. The purposes of the current work were to develop simulation scenarios and to evaluate their feasibility in assessing our first-year anesthesia residents.

Materials and Methods: Twenty first-year anesthesia residents participated after their 4 months of anesthesia training. Three intraoperative acute critical scenarios were created using human patient simulator. These 5-min scenarios included (1) ST-segment elevation myocardial infarction (STEMI), (2) Anaphylaxis, (3) Tension pneumothorax. After reviewing a patient history and an anesthetic record for 3 minutes, each participant entered the simulation room alone. Each simulation exercise was recorded using the video from two cameras and audio from ceiling microphones. To successfully manage each event, participants were required to make a rapid diagnosis and acute interventions. Two raters independently checked and scored the time taken for participants to perform each key action, also provided a global score on their assessment of the trainee's performance. The global score system was anchored by the lowest value 0 (unsatisfactory) and the highest value 10 (outstanding).

Results and Discussion: The global score and success rate of the key actions of each scenario were (1) STEMI: 6.2 ± 1.5, 71.3 ± 20.3% (2) Anaphylaxis: 6.3 ± 1.4, 78.3 ± 20.6% (3)Tension pneumothorax: 5.7 ± 2.3, 65.0 ± 20.4%. Success rate to make a diagnosis and required time were (1) STEMI: 90%, 1.5 ± 0.9min (2) Anaphylaxis: 80%, 3.0 ± 1.2min (3) Tension pneumothorax: 55.0%, 2.0 ± 0.8min. In the course evaluation survey, almost all participants rated good score, and hope to have an additional opportunity to join the simulation-based anesthesia training during their training period. *Discussion:* First-year anesthesia residents generally felt good about this simulation-based program using human patient simulator. Tension pneumothorax scenario was more difficult for themajority of participants to recognize and treat than other scenarios.

Conclusion(s): Our scenario appeared to be feasible in assessing the skills of our first year anesthesia residents. Additional studies are needed to determine whether these simulation-based assessments are valid measures of clinical performance.

15AP1-6

Communication skills in difficult situations: Evaluation of a pilot-course with standardized patients for emergency medical physicians

S. Sopka, J. Brokmann, R. Rossaint, A. Pirkl, S. Beckers

Anaesthesiology, University Hospital RWTH Aachen University, Aachen, Germany

Background and Goal of Study: In Germany physicians are an essential part of the preclinical emergency medical system and regulations for their postgraduate education are existing, but unfortunately not standardised nationwide: A compulsory certification course e.g. does not consider psychological disorders to an adequate extent and so called "soft skills" are not incorporated at all. Against this background and in respect of increasing emergency calls with psycho-social indications we considered necessary to develop a specialized postgraduate programme for training purposes.

Materials and Methods: Based on experiences using standardized patients in undergraduate medical education in different specialties like psychiatry, internal medicine etc. learning objectives were defined for the new format. In the conducted pilot course scenarios as acute psychosis, suicidal tendency and bringing bad news were compiled and performed using a standardized procedure including structured video-feedback.

Results and Discussion: Overall 17 physicians participated and evaluated the pilot-course with a standardized questionnaire: All of the physicians found theirselfs realistically in the patient-doctor-interaction, accepted the presented case-scenarios. Totally 76% found video-feedback and in addition, 100% feedback of the standardized patients helpful. The established severity of the cases was confirmed by 59% of the participants and 94% felt their day-to-day practice influenced by the training with standardized patients. Future work of research will have to evaluate the impact of these educational interventions on physicians' confidence as well as influence on patient outcome.

Conclusion(s): The gathered data of evaluation approved the created and realized programme concerning content as well as feasibility. Besides, important areas for improvement were detected and in addition a further implementation of the program to greater extend was encouraged by participants.

15AP1-7

An audit of theatre and emergency staff awareness of the use and administration of Intralipid

T. Duggan, S. Ghambir

Department of Anaesthesia, Southern General Hospital, Glasgow, United Kingdom

Background and Goal of Study: Clinical staff working in areas where large doses of local anaesthetic are administered should be aware of local anaesthetic toxicity and its appropriate treatment and management. Intralipid has been shown to reverse local anaesthetic induced cardiac arrest in animal models[1] and in human case reports[2]. The AAGBI have produced guidelines[3] on the management of severe local anaesthetic toxicity, including the use of Intralipid. The aim of our audit was to assess the awareness of the use of Intralipid among theatre and emergency staff and if any improvement was made following education.

Materials and Methods: A questionnaire based on AAGBI guidelines for the management of severe local anaesthetic toxicity was distributed to emergency staff and to theatre staff including anaesthetists, nurses, anaesthetic assistants and surgeons. The questionnaire was then redistributed following education promoting the guidelines.

Results and Discussion: 50 forms were completed.

Number Aware (%)

	Pre-education	Post-education
AAGBI Guidelines	34%	80%
Circumstances Intralipid considered	16%	60%
Initial dose	16%	40%
Administration of Intralipid	30%	50%
Reporting of Intralipid	64%	90%
Where Intralipid stored	20%	64%

Conclusion(s): Following education, there was a marked improvement in clinical staff awareness of Intralipid, its use in local anaesthetic toxicity and the AAGBI guideline. Regional anaesthesia and analgesia techniques are regularly used in clinical practice, therefore, clinical staff must be able to recognise, manage and treat local anaesthetic toxicity as it can be fatal.

References:

1 Weinburg G, Ripper R, Feinstein D, et al. Reg Anesth Pain Med 2003;28:198–202.
2 Litz RJ, Popp M, Stehr SN, et al. Anaesthesia 2006;61:800–1.
3 Guidelines for the Management of Severe Local Anaesthetic Toxicity. The Association of Anaesthetists of Great Britain and Ireland, 2007.

15AP1-8

Students' self-evaluation of transversal competencies in anaesthesiology

E. Moret, R. Garcia-Guasch, B. Oller, A. Escudero, J. Canet

Anaesthesiology and Surgery, Universitat Autònoma Barcelona, University Hospital Germans Trias i Pujol, Badalona, Barcelona, Spain

Background and Goal of Study: According to the Bologna Declaration, transversal competencies should be improved in undergraduate education. In our optional anaesthesiology course we have applied problem-based learning (PBL) since 2001. The aim was to measure students' self-evaluation of their transversal competencies and to analyze their progress in our course.

Materials and Methods: Prospective, descriptive study with 5th-year medical students. Informed consent was asked. We designed a questionnaire on the students' instrumental (7), interpersonal (6) and systemic (10) competencies, as described in the Tuning Project [1]. The questionnaire was filled in by every student on the first and last days of class. Each competency was scored on a Likert scale from 0 (unable) to 5 (excellent).

Results and Discussion: All students (13 women and 1 man; mean age 23.7 yr) filled in the questionnaire. The mean improvement in self-assessed competence was 0.9. The best evaluated baseline competencies were the ability to take decisions and to work independently. The best evaluated one after the course was the motivation to pursue learning objectives, followed by the ability for teamwork. English knowledge and the ability to do research were deficient. The instrumental competencies improved the most during the course (0.42), compared with the interpersonal (0.17) and the systemic competencies (0.31); in particular, the ability to search for information, the oral and written expression, and work management showed the best progression in our course. In the following table, the improvements in the 3 self-assessed transversal competencies are presented as mean (minimum-maximum) and absolute values (n).

COMPETENCIES	FIRST DAY	LAST DAY	IMPROVEMENT
Instrumental (7)	3.52 (3.0–4.1)	3.92 (3.3–4.2)	0.42
Interpersonal (6)	3.94 (3.5–4.1)	4.07 (3.4–4.3)	0.17
Systemic (10)	3.57 (2.9–4.3)	3.88 (3.5–4.2)	0.31
TOTAL (23)	10.97	11.87	+ 0.9

Conclusion(s): The use of the English language and the ability to do research should be improved among our students. In the future, new tools for objective evaluation of transversal competencies are needed. It is important to know the baseline profile of our students with regard to transversal competencies when designing a competency-based syllabus. PBL and self-evaluation help us to improve these transversal competencies in our classes.

Reference:

1 Cumming A, Ross M. The Tuning Project for Medicine: learning outcomes for undergraduate medical education in Europe. Med Teach. 2007 Sep; 29(7):636–41.

15AP1-9

Face and initial construct validity of the Mediseus epidural simulator

T. van Zundert, R. Lee, A. van Zundert, J. van Koesveld, R. Stolker

Anesthesiology, Intensive Care and Pain Therapy, Catharina Hospital, Eindhoven, Netherlands

Background and Goal of Study: The aim of this study was to establish content, face and concurrent validity of the Mediseus epidural simulator in order to determine the usefulness of this device in training basic dexterity for epidural needle skills.

Materials and Methods: The validation started with the explanation of the goals, content, and features of the simulator (content validity). 6 groups of 10 participants (novice: no experience with epidural needle insertion, 1st and second year residents, 3rd and fourth year residents, fellows, consultants, and regional-specialist anaesthesiologists) from three different medical centres participated in the research. Firstly, the participants received a 'hands-on' tour of the virtual reality (VR) simulator, and asked to answer 10 questions on the applicability of the device (face validity). Subsequently the participants performed 20 simulated epidural needle insertions and were scored on the success of the insertion, bone collisions, nerve contact and time.

Results and Discussion: The Mediseus epidural simulator scored well with all candidates for its simulation of the procedure. The loss of resistance, especially, was highly regarded (4.7/5.0), as was the simulation of the ligamentum flavum (3.6/5.0). The simulation of the bone however was considered unrealistic (2.6/5.0). Most candidates regarded the simulator as applicable for basic introduction to the epidural procedure (91%). In construct validation, there were fewer faults by the experienced groups (1.6/20 failures) (1st year to regional specialist) compared to the novice group (4.5/20 failures) ($p < 0.05$). However, there were no discernable differences in failures in the medical professional group. Bone contact was more prevalent in unsuccessful insertions for all groups ($p < 0.05$). Failed attempts were on average longer for all groups, except the regional specialist anaesthesiologists. The 3rd and 4th year residents were the on average the slowest at performing the insertion, and slower than both novices and regional specialists ($p < 0.05$).

Conclusion(s): The Mediseus epidural simulator seems an appropriate training device for initial introduction to epidural needle insertions. However, for medical professionals with procedural knowledge the simulation of the in-vitro environment is not realistic enough. There were differences in the needle insertion speed between groups, and this may point to a trade-off between ease of the insertion and skill level.

15AP1-10

Preliminary evaluation of a mixed interface simulator for learning spinal anaesthesia

Z. Kulcsar, E. O'Mahony, E. Lovquist, G. Iohom, G. Shorten

Department of Anaesthesia and Intensive Care Medicine, Cork University Hospital, Cork, Ireland

Background and Goal of Study: We hypothesised that haptic computer technology can be used to create an effective teaching tool for spinal anaesthesia technique (1, 2). The aim of the study was to evaluate the influence of a simulation-based preparatory programme on the initial performance of intrathecal puncture by medical interns.

Materials and Methods: Naive medical interns -within 12 months of graduating as medical doctors- were recruited and randomly assigned to a conventional (C) or simulator based (S) teaching course of spinal anaesthesia. SenseGraphic Immersive workbench and a modified Phantom desktop with Shutterglasses was used to create a teaching environment for the procedure. Outcomes were tested in two sections within three weeks following the teaching course. The first section consisted of a written examination (MCQs) and testing on the simulator. A global rating score and a task-specific scoring system was used. The second section consisted of testing the clinical aspects of performing the procedure in a theatre environment. The candidates were observed by independent blinded experts and their performance was rated on a predefined scoring scale. Student t-test was used to compare the outcomes. $P < 0.05$ was considered significant.

Results and Discussion: Thirteen candidates were recruited to group C and 14 to group S. All completed the written test successfully scoring 70% or higher with no difference between the groups. Ten candidates from group C and 13 from group S completed the testing on the simulator. They performed similarly in terms of the global rating scores. According to the task specific checklist, there was a trend towards higher scores in group S compared to group C, although this did not reach statistical significance (mean, SD 83.2 ± 14.5 vs 69.0 ± 27.7, $p = 0.06$). Five candidates in group C and six in group S proceeded to clinical testing. On the global rating scale, interns in group S scored higher than those in group C (mean, SD 20.0 ± 2.8 vs 15.4 ± 3.8, $p = 0.02$). They performed similarly according to the task specific checklist.

Conclusion(s): This preliminary evaluation demonstrates a potential benefit of a simulation based preparatory programme on the initial performance of intrathecal puncture by medical interns. Further testing is necessary for its validation prior to implementation into a formal curriculum.

Acknowledgements: The authors wishes to thank Dr. Annette Aboulafia (Interaction Design Centre, University of Limerick) for her contribution, advice and commentary on the study.

References:
1 Kulcsar Z et al. EJA 2008; 25:1026–31.
2 www.medcap.eu.

15AP2-1

A comparison of Glidescope Ranger, Truview Evo2 and AirTraq laryngoscopes in simulated trauma difficult airway management – A manikin study

J. Jakubiak, T. Gaszynski, W. Gaszynski

Anaesthesiology and Intensive Therapy, Medical University of Lodz, Lodz, Poland

Background and Goal of Study: Intubation in trauma patient may be difficult because of face destruction, oedema of tongue and neck immobilization. There are several new devices designed for difficult airway management, ex.: Glidescope Ranger videolaryngoscope, Truview Evo2 laryngoscope and optical laryngoscope AirTraq. They are considered to be a good alternative to standard direct laryngoscopy intubation in trauma patients and are recommended for use in guidelines for difficult airway management.
Materials and Methods: We evaluated the efficiency of three intubating devices: Glidescope Ranger, Truview Evo2 and AirTraq for management of simulated difficult intubation scenario in manikin. A group of 24 residents working in Barlicki University Hospital in Lodz, Poland, were involved in the study. 14 of them were first year residents, 6 – second and third year, and 4 were senior residents. All of them were asked to intubate the manikin ALS Trauma Head, Simulaids, Woodstock, USA using Glidescope Ranger, Truview Evo2 and AirTraq during simulated scenario of difficult trauma airway. All followed a short training how to use the studied devices. The study consisted of three attempts for intubation with every device. Success ratio and time to intubation was measured for all three attempts and the best results were compared. After the intubation participants were asked to evaluate compared devices.
Results and Discussion: Mean time for success ET intubation was: Glidescope: 27.93 sec. ± 16.5, Truview Evo2: 44 sec. ± 29.6, AirTraq: 17.28 sec. ± 8,11. Success ratio was (for first attempt): 77.5% vs 70.8% and 79.17% respectively. A comparison revealed a statistical difference between mean times for success intubation: Glidescope vs Truview Evo2: $p = 0.045653$, Glidescope vs AirTraq: $p = 0.021679$, Truview Evo2 vs AirTraq: $p = 0.00266$. Because all participants are working residents in anesthesiology unit we assumed that they know how to intubate with standard laryngoscope. They compared their experience with Macintosh blade laryngoscopy to observation of new studied devices. They pointed the Glidescope Ranger videolaryngoscope and AirTraq as the equally useful devices for difficult airway. However, the AirTraq allowed for faster ET insertion which is especially needed in case of emergency patients. The main complain of Truview Evo2 was difficulties in ET insertion although a good vocal cords view.
Conclusion(s): AirTraq may be a useful device for difficult trauma airways, after short training has high success ratio and allows for fast ET intubation.

15AP2-2

Research and audit during anaesthesia training in the United Kingdom: A national survey of experience and opinion of current anaesthesia trainees

D. Ross-Anderson, S. Reddy, S. Setty, R. Moonesinghe

Research and Audit Forum for Trainees, Central London School of Anaesthesia, London, United Kingdom

Background and Goal of Study: Recent reports show a decline in original research publications from UK anaesthetists. Research, audit and research methodology are included in the curriculum but quantity and depth is unspecified. This is the largest survey of UK anaesthesia trainees on this subject.
Materials and Methods: An online survey (www.survsoft.com) of experience and opportunity in audit, research, presentation and publication was emailed to all UK trainees via deanery administrators. A reminder was sent via college tutors.
Results and Discussion: 899 trainees (M:F, 493:406) responsed, from all years of training and all deaneries. 543 (60%) had interest in audit and 473 (53%) in research. 882 (98%) had done audit. 306 (34%) had completed an audit loop and presented the data. The commonest reason for non-completion was moving job on rotation. 72 (8%) had done research. 502 (56%) plan to do research but of these trainees 92% had not organised a placement. 4 in 10 trainees in teaching/specialist hospitals did not know if there is research activity in their department. 463 (52%) were unaware of any funded research posts in their region. 561 (62%) had made a conference presentation or published in a journal. Regional variation was large (42–77%), with the South, Midlands and Northern Ireland having higher presentation/publication rates. Audit is almost universal but only 60% have an audit interest and two thirds have not completed a cycle. Training should emphasise audit quality not quantity. Collaboration between trainees rotating jobs could increase completed cycles. Half of trainees are interested in research. Few have organised a placement. Awareness of local research opportunity is limited. Regional variation may merit further investigation as research and audit are a mandatory aspect of UK training.
Conclusion(s): Despite a high level of interest in audit and research, there are barriers to successful involvement. Regional audit databases may allow collaboration between trainees and increase audit loop completion. Resources such as the Audit Project Assessment Tool could help improve audit quality and relevance. Introduction to research methodology early in training may focus trainees towards organising research opportunities. Improved dissemination of information about posts and funding may encourage research involvement. Departments should publicise current local research undertakings to enthuse and involve trainees.
Reference:
1 Feneck R et al. Anaesthesia 2008, 63, 270–5. http://www.wales.nhs.uk/sites3/Documents/501/Practical_Clinical_Audit_Handbook_v1_1.pdf.

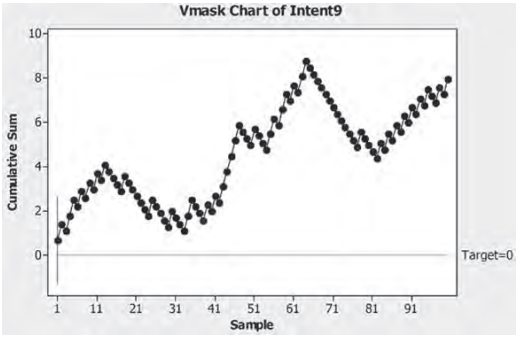
15AP2-3

Residents learning skills in obstetric epidural analgesia in a universitary hospital

E. Guasch, J. Díez, R. Madero, F. Gilsanz

Anesthesia and Statistics, Hospital Universitario La Paz, Madrid, Spain

Background and Goal of Study: Learning skills in anaesthesia have a broad interindividual variability. Some skills have been analyzed previously.(1)(2) Our aim is to estabilish a number of procedures to reach proficiency in obstetric epidural analgesia (OEA) technique, and to analyze supervision needed by consultants and complications done by trainees during the learning period.
Materials and Methods: After local ethics committee approval, we recruited 9 trainees on their third year, in a highly supervision teaching model, to become proficient in OEA to collect their first 100 OEA techniques anonymously in an Excel® database. These data were analyzed with CUSUM® method(3). We took an acceptable first attempt success rate of 80% and a help need of 20%. We used Minitab 15 (Minitab® version 15, Minitab Inc., State College, PA, USA) for all graphical analyses.
Results and Discussion: 765 blocks were analyzed, 84.7 ± 22.8 per trainee with ranges between 47 and 100. Body mass index of women included and studied by trainees are homogeneous (one way ANOVA). Three of the trainees did not complete 100 OEA. Seven trainees acquired proficiency after 23 blocks, with a high interindividual variability and 2 of the trainees did not reach proficiency with 100 attempts (one of them only performed 48 OEA and the other one did not reach target after 100 procedures, and in three of them staff supervision was necessary in more than 20% of cases after the end of the study period. Trainees' collection of data seems to be variable and it can under or overestimate attempts or supervision need. Accidental dural puncture occurred in 6 cases (0.78%) and hematic puncture in 40 cases (5.2%).



Conclusion(s): Although success rate is rapidly reached in some trainees in their third year, we believe that a high degree of supervision is useful to control the learning curve progress in individual cases that need more staff control.
References:
1 Filho GR. Analg 2002; 95:411–6.
2 Naik VN, et al. Can J Anaesth. 2003;50:694–83.
3 Biau DJ, et al. Qual Saf Health Care 2007; 16: 203–207.

15AP2-4

Stir and training of French medical students confronted to "End of Life" decisions

R. Jouffroy, M. Le Guen, M. Levy-soussan, O. Langeron

Anesthesiology and Critical Care Medicine, Hôpital Pitié-Salpêtrière – APHP, University Pierre et Marie Curie, Paris, France

Background and Goal of Study: The question of the end of life has recently received a new legislative framework in France with publication of the Leonetti's law (April the 22th 2005)[1]. The aim of this study conducted among students at the end of their medical course (6th year) was to asses the emotional impact of these decisions and to assess the current training about these questions.[2].
Materials and Methods: An anonymous survey including 17 questions with single or multiple choices constructed by a multidisciplinary approach was proposed to every medical student during their final and national choice of speciality and city before becoming residents. The descriptive statistical analysis presents the results in percentage (with CI95) or mean (with SD) as the criteria considered are qualitative or quantitative.
Results and Discussion: 3187 questionnaires in 4000 (79%) were collected and analyzed. During their clinical practise at hospital, 85% of students were exposed to such situations of end of life decisions. 59% of students expressed a transient feeling of discouragement and even a feeling of gloom for 55%. These situations have led to a change in the professional project for about 10% of them. They shared their difficulties mainly with the medical team members (66%) or their medical friends (61%). 77% of students reported an absence of adequate training for these situations while 82% of them would like to be prepared for their management. In addition, 93% were conscious that initial and continuous training were necessary. Preferred learning with small group are emphasized with "seminars" in 39% of cases or "round table about their personal experience" in 36%.
Conclusion(s): Situations of "End of Life" are encountered frequently in the medical course in France. The psychological impact on young students is significant in more than half of the cases even causing changes in their professional project. This observation should give rise to practionner's attention in his practice. The training of students will probably move towards exchanges of experience in small groups.
Acknowledgements: Pr Dautzenberg for his help in the treatment of collected data.
References:
1 Leonetti's law No. 2005–370 of April the 22th 2005.
2 Order of 29/01/2004 published in the Official Journal 30, February the 5th 2004.

15AP2-5

Influences towards career choice in anaesthesia. A survey of novice anaesthetists

D. Ross-Anderson, C. Swampillai

Department of Anaesthesia, University College London Hospital, London, United Kingdom

Background and Goal of Study: UK anaesthesia traditionally attracts half its trainees from other specialities. Since the introduction of Modernising Medical Careers (MMC) career choice is made in the second foundation year. In 2008 new trainees were either from the foundation program (FP) starting a first specialist post or had postgraduate experience in other specialities prior to MMC.
Materials and Methods: An online survey (www.survsoft.com) of previous anaesthesia and intensive care medicine (ICM) jobs, career choice and plans was sent to 31 novices starting Anaesthesia or Acute Care Common Stem: Anaesthesia (ACCS) in a London School of Anaesthesia in August 2008. Reminders were sent to non-responders.
Results and Discussion: The response rate was 87%; (M:F = 10:17). 15/27 graduated in 2006 and completed FP. 12/27 graduated before 2006 (1998-2005) and had varied postgraduate experience. 5/27 (19%) covered no anaesthesia at medical school. 18/27 (67%) had no previous anaesthetic work experience. Only 6/27 (22%) had no ICM experience. Career influences were experience in anaesthesia/ICM at medical school or early postgraduate period (22/27; 81%) and anaesthetists as role models (19/27; 70%). Career advice at medical school was not helpful. 16/27 (59%) expressed an interest in pursuing ICM in the future. 10/16 were not on the ACCS programme and had not completed general medical competencies needed for ICM accreditation. Experience in and contact with anaesthesia/ICM at medical school and during early postgraduate training are the strongest influences towards a career in anaesthesia. ICM experience is more common than anaesthesia and ICM is popular amongst novice anaesthetists. Career advice could ensure potential ICM trainees understand the need to gain medical competencies, and ICM program directors must note the need for medical posts during training.

Timing of career decision

Grad Year	Medical School	FP/house officer	SHO/SpR other spec
2006	3, 20%	12, 80%	–
Pre2006	2, 17%	3, 25%	7, 58%

Conclusion(s): Exposure to anaesthesia at medical school is not compulsory. With career decisions being made within 2 years of graduation, we advocate increased exposure to anaesthesia and ICM during the undergraduate and early postgraduate years to ensure continued recruitment of high-quality applicants. ICM is becoming common during the FP, but anaesthesia posts may need to be increased.
References:
1 Turner G et al. Br J Anaesth 2005; 95: 332–8. Meikle A et al. Anaesth News 2008; 247: 27–9. Watts RW et al. Anaesth Intensive Care 1998; 26: 201–3

15AP2-6

Heart transplantation in Coimbra University Hospital – A five years database review

P. Nascimento, M. Teijeiro, M. Carreira, M. Antunes

Centre of Cardiothoracic Surgery, Coimbra University Hospital, Coimbra, Portugal

Background and Goal of Study: Heart transplantation (Htx) is a widely accepted therapy for the treatment of end-stage congestive heart failure. Our Htx program started in 2003. We reviewed the existing database, analysing age and sex distribution, aetiology, pre-transplant left ventricle ejection fraction (LVEF), graft ischemic time (GIT), extracorporeal circulation (ECC) time, anaesthetic management and the overall survival rate. The goal was to review the cases and results of this program, in order to improve the perioperative management of this delicate procedure.
Materials and Methods: Between November 2003 and November 2008, a total of 132 patients underwent primary orthotopic Htx. There were 98 male and 34 female patients ranging in age from 4 to 71 years (mean: 52.3 ± 12.7). The indication for Htx during this period was idiopathic dilated cardiomyopathy (CMP) in 66, ischemic CMP in 41, valvular CMP in 11, hypertrophic CMP in 5, restritive CMP in 5 and other causes in 4. All patients were in NYHA functional class III or IV at the time of Htx. LVEF ranged from 12 to 46% (mean: 20.4 ± 8.0). Total (bicaval) transplantation was performed in all patients. Mean GIT was 88.9 ± 32.7 min and mean ECC time was 89.3 ± 17.0 min. In all cases, anaesthesia was induced with etomidate and fentanyl and maintained with sevoflurane. Muscle relaxation was obtained with pancuronium or vecuronium and thiopental was administered during ECC. The inotropic agent of choice was dobutamine in 98% of all cases. For hemodynamic monitoring an arterial line, central venous catheter and a catheter in the left atrium was placed.
Results and Discussion: The operative and in-hospital mortality was 6.1% (8 patients) and late mortality was 7.6% (10 patients), owing to infection (6), rejection (4), tumour (2), stroke (2), DIC (1), embolism (1), pancreatitis (1), MODS (1) and suicide (1). None of the deaths were related to the anaesthetic management. The overall survival rate was 95% at 1 year and 86% at 3 years. According to the most recent data of the Registry of the International Society of Heart and Lung Transplantation, the current survival rates for Htx are around 80% at 1 year, 65% at 5 years and 50% at 10 years.
Conclusion(s): The beginning of the Htx program in Coimbra University Hospital became a quantitative and qualitative jump in Portugal's Htx history, especially regarding the international survival rates. Nevertheless, we believe improvements can and will be made, namely in the amount of information included in the database. The 5 years survival rate is still to come.

15AP2-7

References in anaesthesia journals: A quantitative study

S. Sathish Kumar, B. Netke, G. Chandan

Department of Anaesthesia and Critical Care Medicine, Stafford General Hospital, Stoke School of Anaesthesia, Stafford, United Kingdom

Background and Goal of Study: References cited by the articles in a journal forms the integral part of the article itself. There are studies about the accuracy of reference citation in anaesthesia related journals[1]. But there are no studies about the distribution of references cited by anaesthesia journals. Therefore we attempted to analyse the references quoted by anaesthesia journals.
Materials and Methods: This is a spot study and we analysed all the articles published by the *British Journal of Anaesthesia* issued December 2008. Editorials, correspondance and case report were excluded. The main articles were classified into subspecialty section as published in this journal. The references cited by these articles were analysed and the source of each reference is identified. The journal of origin of these references were classified into specialty wise: anaesthesia, critical care, medicine, surgery, basic sciences and others which included the books and websites.
Results and Discussion: A total of 450 references cited by seventeen articles were analysed. About 42% (191) of the references were from non-anaesthesia

Abstract 15AP2-7 – Reference distribution and their journal origin

	Review article	Critical care	Obstetric anaesthesia	Paediatric anaesthesia	Pain and Regional anaesthesia	Respiratory and Cardiovascular anaesthesia	neuro and other clinical pracitice
Anesthesiology	3	0	0	2	12	2	24
Anaesthesia	3	0	0	0	2	13	2
BJA	0	0	3	6	20	11	10
Anesthesia & Analgesia	7	0	0	0	11	7	6
Other anaesthesia journals	18	0	2	1	30	23	12
Critical care journals	0	14	0	0	0	12	3
Medicine journals	4	4	0	3	3	17	25
Surgery journals	7	1	7	0	26	13	7
Basic sciences journals	0	4	1	8	4	2	37
Others (Books, Websites, Guidelines)	1	0	3	0	4	2	8

journals. The major anaesthesia journals; British Journal of Anaesthesia, Anaesthesia, Anesthesiology and Anesthesia & Analgesia contributes to 144 of them (32%).

Conclusion(s): It is important to link other specialities to anaesthesia for the future progress of anaesthesia practice. One way to seal is link is to collect evidence and references from all the specialities when anaesthetists are involved in research. Our study shows the influence of non-anaesthetic specialty through reference citations. Further qualitative study over a longer period invoving major anaesthesia journals is needed for in-depth analysis to identify individual speecialty influence on anaesthesia publications.

Reference:

1 Nishina K, Mikawa K, Asano M, et al. J Anesth.1995;9;387–9.

15AP2-9

A virtual care patient for everyone – The CRITICAL Project

M. Kreuzer, J. Wright, D. Newton, G. Schneider, E. Kochs

Department of Anaesthesiology, Klinikum rechts der Isar der TU München, Munich, Germany

Background and Goal of Study: Training of intensive care staff is of great importance to ensure high qualified staff in Intensive Care Medicine. Until today the training usually takes part on the bedside or for a small number of learners on high fidelity simulators. Training on these simulators is very expensive and there are only a few simulators in Europe. The four partner groups from France, Germany, Spain and the UK, participating in the CRITICAL project aim to develop a cheap "virtual ITU patient", accessible for everyone.

Materials and Methods: A Virtual Intensive Care Patient (VIP) is realised using the EduCAT software [1], a simple toolset, that is designed not for programmers, but for teachers. They can easily create or modify their own interactive material, that was developed with EduCAT. The four project partners will deliver the VIP, that can be reconfigured for a variety of pathophysiological scenarios. Four scenarios of shock will be initially provided by the project partners. The VIP can be accessed from everywhere over the internet via login and password and one can work with a readily available, low cost example of the management of various disease states.

Results and Discussion: Learners, that are working with the VIP will be able to try different alternative treatments and observe patient outcomes faster than in "real life" without danger to patients. They can access the VIP over the internet and it will be at low cost.

Conclusion(s): European experts in intensive care will develop medical scenarios which are rigorously tested, evaluated and refined throughout the project life-cycle. The result will be software simulation of a patient, in 4 languages (English, French, German and Spanish). The teacher will be able to reconfigure and customise the VIP. The project website (www.critical-project.net) will further provide a collaborative forum, where educators can develop the model and share the latest best practise. In an earlier project learning tutorials for the EduCAT software were developed. These tutorials, available on www.inspire-project.com will support tutors to learn quickly how to use EduCAT and to generate new contents.

Acknowledgements: The CRITICAL and INSPIRE project are supported by the Leonardo da Vinci program of the European Commission

Reference:

1 Br J Anaesth 2003 68: 421P.

Patient Safety

17AP1-1

The influence of surgical urgency on data recording patterns in anesthesia

A. Varosyan, M. Mardiyan, G. Mkhoyan, M. Yeghiazaryan

Anesthesiology and Intensive Care Medicine, Yerevan State Medical University, Yerevan, Armenia

Background and Goal of Study: Urgent surgery presents particular challenges to the anesthetist, one of which is the time limit. It was hypothesized that manual data recording patterns could be affected by the urgency of anesthesia and surgery. The goal of this research was to investigate and compare the volume of manually recorded anesthesia related data in elective and urgent surgical cases.

Materials and Methods: In a retrospective study 122 elective and 78 urgent surgical cases performed under different anesthetic techniques with anesthetist's participation were randomly selected to investigate and compare the volume of anesthesia related data manually recorded pre- and intraoperatively during urgent and elective surgery in a tertiary care university hospital. As an indicator of recorded data volume, per case mean values of the sum of different recorded parameters of administrative and clinical character in preanesthetic records and anesthesia charts were chosen. Statistical difference between two groups was confirmed by independent samples t-test.

Results and Discussion: Mean values of the sum of recorded per case parameters with their standard deviations are presented in the table. In urgent surgical cases data describing the patient status recorded at preanesthetic visits was significantly less than that of recorded before elective surgery, however, no statistically significant difference was found between data manually recorded intraoperatively in anesthesia charts.

Type of Documents and Surgery	Elective	Urgent
Presanesthetic records	8,65 ± 0,64*	3,48 ± 1,36*
Anesthesia charts	12,86 ± 1,12	11,4 ± 2,35

*Statistically significant difference ($p < 0.05$) between both groups

Conclusion(s): Preanesthetic data recorded by anesthetist is significantly affected by the urgency of surgery, which is expressed by the less amount of data related to patients status recorded in preanesthetic records or charts before urgent surgery in comparison with relevant data recorded at preanesthetic visits before elective surgery. Unlike preanesthetic data intraoperatively recorded data volume is not markedly affected by urgency. This finding possibly can be explained by the shortness of time to record all necessary data before urgent surgery. Whether preanesthetic examination is also affected along with preanesthetic data recording remains to be investigated.

17AP1-2

Consequences of human errors in TCI pump programming

R. Docking, M. Staber, J. Prinzlin

Department of Anaesthesia, Inverclyde Royal Hospital, Inverclyde, United Kingdom

Background and Goal of Study: New "open" target controlled infusion pumps (TCI) allow the infusion of Remifentanil or Propofol without tagged syringes. Both drugs display different pharmacokinetics. Is there a potential for patient harm if the operator chooses the wrong pharmacokinetic model for the intended drug?

Materials and Methods: Two user errors were simulated with the TIVAtrainer software using two different patient profiles: a 40 year old, 80 kg male and a 90 year old, 60 kg female. Both received Propofol 1% infusions using the Marsh model and Remifentanil (50 mcg ml^{-1}) infusions using the Minto model.
Results and Discussion: ***Error 1: Programmed drug Propofol – infused drug Remifentanil***. 40 year old male: "Propofol" 6 µg ml^{-1} for 3 min followed by 3 µg ml^{-1} for 27 min. 90 year old female: "Propofol" 4 µg ml^{-1} for 3 min followed by 1.5 µg ml^{-1} for 27 min. On starting the TCI pump bolus doses of Remifentanil of 540 mcg and 500 mcg were delivered with corresponding plasma levels of 33 ng ml^{-1} and 28 ng ml^{-1}. In the maintenance phase steady states were not reached and plasma and effect site concentrations approximated 8 ng ml^{-1} in the male and 6 ng ml^{-1} in the female patient. Short washout curves occured at the end of the infusion. The large initial bolus doses are of major concern as they may lead to deleterious cardiovascular responses, particularly in the elderly population. ***Error 2: Programmed drug Remifentanil – infused drug Propofol***. 40 year old male: "Remifentanil" 6 ng ml^{-1} for 30 min. 90 year old female: "Remifentanil" 5 ng ml^{-1} for 30 min. Initial boluses of Propofol 41 mg and 34 mg were delivered at the beginning of the infusion. Peak plasma levels of 1.6 µg ml^{-1} and 1.3 µg ml^{-1} were reached after 30 minutes without achieving steady state. The wash-out time was prolonged. These settings may be sufficient to induce anaesthesia depending on additional drugs used and the pharmaco-dynamic response. However, lower than expected plasma levels may lead to intraoperative awareness, particularly in younger patients.
Conclusion(s): Errors in programming multi-drug "open" TCI pumps may have clinically significant consequences ranging from cardiovascular collapse to risk of awareness during anaesthesia. Patient safety could be improved by introducing "smart" pumps with automatic drug recognition.

17AP1-3

Can use of technology-based system to prevent drug errors impact on the anaesthetist's perceptions and attitudes towards drug errors during anaesthesia?

R. Mahajan, J. Russell, R. Evley, A. Merry

Anaesthesia, University of Nottingham, Nottingham, United Kingdom

Background and Goal of Study: Drug errors cause significant problems in health care[1]. A technical *system* has been developed in New Zealand; this incorporates organised drug layout, labelling, and bar coded electronic double checking[2]; We qualitatively compared the anaesthetists who regularly use *the system* for their perceptions and attitudes towards drug errors during anaesthesia compared with those who do not use it regularly.
Materials and Methods: Two focus groups (FG) were conducted with participation from anaesthetists in Auckland, working predominantly either in hospitals in which *the system* is being used regularly (FG 1; n = 9), or not (FG 2; n = 8). Some consultants who had personal interest and bias for *the system* were invited to a separate FG (FG 3, n = 5). The FG discussions were tape-recorded and transcripted. The transcripts were checked by an independent researcher for accuracy, and analyzed using grounded theory. The emerging themes were categorized and validity of categories independently verified by 2 different researchers.
Results and Discussion: Participants from all the FGs were consistent that the drug errors occurred; however, the non-users of the system (FG 2) felt that the errors were 'infrequent', 'clinically insignificant' and 'over-rated'. In contrast, FG 1 participants felt that the drug errors occurred 'more frequently than acknowledged', 'they often go unreported', and perhaps were not perceived as a great problem because of rarity of the actual harm. FG 3 participants shared the views of the FG 2, but perceived the drug errors to be a major problem because of the associated harm. In terms of attitude, non-users of the system felt that the current practices were 'safe enough' and that 'any technology could not improve it further'. In contrast, FG 1 participants felt that *the system* enhanced their awareness of drug errors and, though not perfect, helped in preventing drug errors in their practice. FG3 added that more could be done for *the system* to be used to its full potential.
Conclusion(s): Interestingly, the perception and attitudes of the anaesthetists differed depending upon whether or not they used *the system* designed to prevent drug errors. The study highlights the overall importance of overcoming individual perceptions and attitudes in order to advance patient safety, and the possible role of technology-based systems in this regard.
Acknowledgements: The participants.
References:
1 Department of Health, *The NHS*. 2000, London: Stationery Office.
2 Merry, A.F., C.S. Webster, and D.J. Mathew. Anesth Analg 2001; 93. 385–90.

17AP1-4

Critical incident reporting system: Short-term accomplishments after introduction into the anaesthesiology department of a university hospital

E. Moret, M. Janeiro, M. Homs, G. Moreu, J. Canet

Anaesthesiology, University Hospital Germans Trias i Pujol, Badalona, Barcelona, Spain

Background and Goal of Study: Patient safety is the primary focus of a critical incident reporting (CIR) system. Our aim was to analyze the first 50 reported incidents, the difficulties that staff encountered in filling in the CIR form, and to find out if a CIR system would be easily accepted by the staff and would be suitable for introducing measures for improvement.
Materials and Methods: A voluntary, anonymous, structured CIRS questionnaire form was designed according to the recommendations of the World Alliance for Patient Safety. After presentation and distribution throughout the department this CIR form was implemented in clinical practice. After 6 months' experience, the application of the CIR system was discussed in a departmental session. Prospectively collected data were analyzed and are presented as percentages.
Results and Discussion: Fifty reports were received over a period of 6 months; 72% of them were observed by the anaesthesiologist responsible for the patient, 12% by a second anaesthesiologist helping in the case, 8% by a resident, and 3% by a nurse. 82% of the incidents happened under general anaesthesia, while 10% occurred under a regional technique. In 70% of the cases the incident was detected by clinical observation in combination with other methods (e.g., pulse oximetry [27%], capnography [15%], etc). Most of the incidents took place during maintenance (42.5%) or induction (22.5%) of anaesthesia. Equipment dysfunction and respiratory problems accounted for 70% of the cases. The main contributing factors were missing checklists, lack of equipment and communication problems. In 50% of the cases the incident affected the patient but no harm was caused. 62% of the cases were declared preventable. The main difficulties the staff had in using the reporting form were work overload and lack of time, the large variability in their notions of "critical incident", and the fear of blame and punishment. During this study 4 improvement actions were started in consequence of a structured analysis.
Conclusion(s): We concluded that a CIR system can be reliably introduced in our department. Preconditions for the implementation of an effective CIR system are support from the department head, anonymity, feedback after analysis and the authority to initiate changes. It is necessary to present a clear definition of "critical incident" to the staff and to improve the educational value by discussing events at a departmental meeting. Correctly introduced, a CIR system provides valuable information leading to risk reduction in anaesthesia.

17AP1-5

Accuracy of reporters' assignment of patient harm in anaesthetic critical incidents from the UK National Reporting and Learning Scheme

M. Baird, A. Smith

Department of Anaesthesia and Lancaster Patient Safety Research Unit, Royal Lancaster Infirmary, Lancaster, United Kingdom

Background and Goal of Study: The UK National Patient Safety Agency (NPSA) set up the National Reporting and Learning System (NRLS) to identify and learn from adverse incidents nationally. Its on-line reporting system contains guidance on classifying harm to patients. The goal of this study was to assess the accuracy of allocation of degree of harm caused and if incidents are correctly classified as 'anaesthetic'.
Materials and Methods: The NPSA provided a spreadsheet containing anonymised anaesthetic incidents for the first quarter of 2006. We analysed the database (1) to check that incidents labelled as anaesthetic were relevant (2) to establish the spread of degrees of harm to patients and (3) to check that the classification of patient harm was correct. We scrutinised the free text of all incidents classified as 'death', 'severe', and 'moderate' and random samples of 'low' and 'no harm' then attempted to reclassify the harm caused according to the NPSA's guidance. Incidents were accepted as 'anaesthetic' if they were related to anaesthesia, recovery or intensive care.
Results and Discussion: Of 4900 reports 3795 (77.4%) were classified as 'no harm', 789 (16.1%) as 'low', 248 (5.1%) as 'moderate' and 52 (1.1%) as 'severe' harm with 16 (0.3%) deaths. Patient harm was misclassified in one quarter of incidents analysed with overestimation more likely than underestimation. The free text suggested that this was often due to reporting potential rather than actual harm. Of the deaths, 12 appeared to be unrelated to a patient safety incident.

Classification of incidents by degree of patient harm and clinical specialty

Harm category & number analysed	Classification correct	Harm more than assigned	Harm less than assigned	Harm unclassifiable	Non anaesthetic
No harm 250	121 48%	24 10%	–	6 2%	99 40%
Low 250	66 26%	8 3%	70 28%	9 4%	97 39%
Moderate 248	48 19%	6 2%	63 26%	17 7%	114 46%
Severe 52	2 4%	3 6%	19 37%	11 21%	17 32%
Death 16	4 25%	–	12 75%	0	0
Total 816	241 30%	41 5%	164 20%	43 5%	327 40%

Conclusion(s): There is substantial misallocation of the degree of patient harm in the database. As degree of harm is often used to decide which incidents are investigated and shared, this risks loss of learning potential. Misclassification by clinical specialty is common. Our findings have implications both for the reporting and the analysis of NRLS incidents in anaesthesia.

Acknowledgements: We would like to thank the NPSA for their assistance.

17AP1-6

Shortened pre-operative anaesthetic visit times may compromise patient understanding and quality of consent

E. Hulse, D. Birt

Anaesthetics Department, Military Defence Hospital Unit Derriford Hospital, Plymouth, Devon, United Kingdom

Background and Goal of Study: Pre-operative visiting is a cornerstone of anaesthetic care: establishing a rapport between Anaesthetist and patient, providing an explanation of the procedure and obtaining appropriate consent. Anaesthetists at Derriford Hospital, UK, subjectively felt that increased surgical same-day admissions had shortened pre-operative anaesthetic visits and compromised this process. The aim of this audit was to compare our pre-operative anaesthetic visits with the Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines.

Materials and Methods: A prospective audit was conducted on the dedicated patient admissions ward in November 2008. Patients were invited to complete a questionnaire after their pre-operative anaesthetic visit. They were asked if the Anaesthetist had explained the anaesthetic process and described relevant complications. Opportunities to ask questions, the delivery of general health advice and whether anxiety was subdued were also noted. The qualitative data was collected and entered into a spreadsheet.

Results and Discussion: Ninety-six patients (n = 96) were included in the audit; 92 presenting for General Anaesthesia (GA) and 4 for regional anaesthesia. There were 58 females and 38 males, 65 were between the ages of 30–69. The most common admitting specialties were gynaecology (20) and general surgery (20). Eighty-nine patients felt that the Anaesthetist adequately explained the anaesthetic procedure, with five not understanding the information given to them. Two-thirds of patients were told about the possibility of post-operative nausea, vomiting and pain. Thirteen patients had no complications discussed with them. Of those patients having a GA, the most common concern was of awareness (16), but it was discussed in less than 10% of visits. Three patients felt they were not given an opportunity to ask questions and eleven received general health advice. Despite 73 visits lasting less than 10 minutes and 12 patients stating that their anxiety was not reduced by the visit, most (90) felt that they had had sufficient time to talk with their Anaesthetist.

Conclusion(s): Whilst anaesthetic complications and general health advice could be discussed at a nurse led pre-assessment clinic, we feel it is the duty of the Anaesthetist to reinforce the potential complications of the patient's anaesthetic procedure. Shorter anaesthetic visits, although acceptable to patients, may compromise patient understanding and quality of consent.

Reference:

1 Pre-operative assessment, The role of the Anaesthetist, AAGBI Guideline 2001.

17AP1-7

'Wrong Drug' errors during anaesthesia as reported to the National Reporting and Learning System in the UK

R. Mahajan, L. Mathews, J. Russell, L. Gemmell

Anaesthesia and Intensive Care, Queen's Medical Centre, Nottingham, United Kingdom

Background and Goal of Study: Medication errors during anaesthesia are known to cause iatrogenic harm. In the UK, in 2007, under the programme 'Improvement through Partnership', National Patient Safety Agency (NPSA), Association of Anaesthetists of Great Britain and Ireland (AAGBI) and Royal College of Anaesthetists (RCoA) came together to address the agenda of patient safety in anaesthesia. In order to inform the strategy, we investigated the reported 'wrong drug' errors in the UK between Jan 2005 and March 2008.

Materials and Methods: Based on the recommendations of the Expert Reference Group, the NPSA-AAGBI-RCoA partnership chose minimising drug errors during anaesthesia to be one of its projects. In order to develop a national strategy, a review was undertaken of the drug errors related to the 'wrong drugs' reported to NPSA through National Reporting and Learning System (NRLS) between Jan 2005 and March 2008.

Results and Discussion: In total 157 'wrong drug' errors were identified. Majority of these were related to the administration. Qualitative analysis showed that majority of the mistakes, though significant, did not cause much harm because of immediate identification of the problem and its resolution. Almost all of the errors, such as injection of thiopentone instead of antibiotic or injection of metaraminol instead of bupivacaine for femoral nerve block, were considered preventable had use of double-checking strategies been in place.

Wrong Drug errors during medication process in anaesthesia

Stage during Medication Process	Total	Percentage
Prescribing	12	7.6
Preparation	14	8.9
Administration	126	80.3
Monitoring	5	3.2
Supply	0	0
Total	157	100

Conclusion(s): Interpretation of data from the NRLS should be undertaken with caution. As with any voluntary reporting system, the data are subject to bias and significant under-reporting. A proportion of incidents which occur are not reported, and those which are reported may be incomplete having been reported immediately and before the patient outcome is known. Nevertheless, in absence of any other national data, these reports provided an important starting point for developing a national strategy. Most importantly, they provided convincing evidence that most 'wrong drug' errors occur during administration and that they can be prevented by double-checking strategies.

Acknowledgements: NPSA for providing access to the NRLS data.

17AP1-8

Quality and safety indicators in anesthesia: A systematic review

G. Haller, J. Stoelwinder, P. Myles, J. McNeil

Department Anaesthesiology, Pharmacology and Intensive Care, University Hospitals of Geneva, Geneva, Switzerland

Background and Goal of Study: Clinical indicators are increasingly used to measure quality and safety of patient care. Which of these clinical indicators relate to anesthesia, what they exactly measure, how they should be used and what level of validity they have is currently unclear. The aim of this systematic review was to assess the number of clinical indicators currently available for patient quality and safety measurement in anesthesia, the level of evidence for their validity and the recommended method for their use.

Materials and Methods: We performed a systematic review of all available indicator programs and publications on clinical indicators. We searched PubMed (1970–Dec 2005), EMBASE (1970 – Dec 2005), CINAHL (1980 – Dec 2005) and the Cochrane library – DARE (1990 – Dec 2005) for all English language articles relating to the development or use of a clinical indicators. Quality initiatives, governmental agencies, professional organizations or accreditation bodies' Web sites and publications were also sought for additional unpublished clinical indicators. We assessed clinical indicators for relevance to anaesthetic care, dimension measured, method of use and level of scientific validity. The overall process was performed by two assessors during a consensus meeting. Both were medical doctors with health services research and anesthetic training respectively.

Results and Discussion: We identified 108 anesthetic clinical indicators of which 53 measured also surgical or postoperative ward care. Most were process (41%) or outcome (57%) measures assessing the safety and effectiveness of patient care. External benchmarking (comparison with other hospitals) followed by professional peer review was the primary method recommended to identify possible quality issues with the help of clinical indicators. For 60% of the clinical indicators identified, validity relied on expert opinion. The level of scientific evidence on which prescriptive indicators ("how things should be done") were based was high (1a–1b) for 38% and low (4–5) for 62% of indicators. Despite the large number of indicator programs developed across countries, only a limited number of them address quality and safety issues in anesthesia and the level of evidence for their validity is often limited.

Conclusion(s): We conclude that a limited number of clinical indicators address quality and safety issues in anesthesia and their validity is often limited. Significant effort should be put into their development and validation.

17AP2-1

A review of the first year of data from a bi-speciality anaesthetic allergy clinic in the West Midlands, UK

H. Church, K. Kong, J. North

Anaesthesia Department, Birmingham City Hospital, Birmingham, West Midlands, United Kingdom

Background and Goal of Study: The referral of patients to a bi-specialty anaesthetic allergy clinic is now considered to be desirable follow up for anaesthetic anaphylaxis. We have recently established such a clinic in the West Midlands, UK, bridging a gap in services locally. In this paper we examine the nature of our patients and their problems, identify the most common causative agents, and aim to establish if our clinic is making a difference to the local population. We also compare our results to the published European series.
Materials and Methods: A retrospective analysis of the first year of clinic data from September 2007 to August 2008 was performed.
Results and Discussion: 31 patients were investigated for a suspected anaphylactic reaction. 46% of patients were referred to the clinic within 6 months of the initial reaction. The mean time between patient referral and the patient being seen in clinic was 2.6 months. Prompt diagnosis of the causative agent of an anaphylactic reaction is important as there may be a need for a further anaesthetic at any time. We removed a subset of 10 dental referrals from the following results; of the remaining 21 patients, 71% had a positive diagnosis of anaphylaxis, and 67% of reactions were of grade 3 or 4 severity. Of these 19% did not receive their initial planned surgical procedure and 21% went to critical care post operatively. Muscle relaxants were the commonest cause of anaphylaxis within our data set, followed by antibiotics. This is consistent with much larger French study. The Danish data demonstrates markedly different results.

Table 1. A comparison of causative subsets of anaesthetic anaphylaxis between France, Denmark and the West Midlands.

FRANCE	WEST MIDLANDS	DENMARK
NMBDs 58%	NMBDs 70%	Other 25%
Latex 17%	Antibiotics 13%	Opioids 18%
Antibiotics 15%	Latex 4%	Chlorhexidine 13%
Colloids 4%	Propofol 4%	Latex 12%
Hypnotics 3%	Lignocaine 4%	Antibiotics 10%
Opioids 1%	Adrenaline 4%	NMBDs 9%
Others 1%		Local Anaesthetics 6%

Conclusion(s): Our aim is to continue to provide safer patient care for future anaesthesia. The fact that we identified the culprit drug in greater than 70% of cases means that we are meeting patients' needs. The number of patients seen per clinic has doubled since establishment last year, and the distances travelled by patients definitely justify the existence of this new service within our region.

17AP2-2

Safety of hydroxyethyl starch (HES 130/0.4) in patients undergoing cadaver kidney transplantation

M. Pavlidis, S. Poulou, C. Palumbi, A. Mantzioka, K. Tsinari

Department of Anesthesiology, Laiko General Hospital, Athens, Greece

Background and Goal of Study: The renal effect of hydroxyethylstarch (HES) solutions remains controversial. In this retrograde study we investigate the effect of HES 130/0.4 – Voluven in early postoperative graft function after cadaver kidney transplantation.
Materials and Methods: 33 patients, men and women, of mean age 42,1 ± 12,6, were included in our study. All underwent in cadaver kidney transplantation. The intraoperative volume replacement in 19 cases was done with crystalloid solution (Normal Saline 0,9%–4200 ± 830 ml). In the rest 14 cases combination of crystalloid and colloid solution (Normal Saline 0,9%–3100 ± 610 ml and Voluven–860 ± 240 ml) was given. The needs of haemodialysis, urine output and the values of serum Creatinine levels for the first 14 days were recorded for all cases. The statistical analysis of collected data was done with the use the independent T-test. Statistically significant was considered the values of $p < 0,05$.
Results and Discussion: The demographic characteristics of all patients were similar. The need for haemodialysis in the patients who received only crystalloid solution was 15,7% (3/19) compared to 14,3% (2/14) of the patients who received the combination of crystalloid and colloid solution. No statistically significant difference in early graft function as far as urine output and serum Creatinine levels in the first 14 postoperative days between the two groups were observed.
Conclusion(s): The intraoperative co administration of HES 130/0.4 – Voluven for fluid management in cadaver kidney transplantation does not affect the early postoperative graft function of the recipients and can be used with safety.

References:

1 Peter Schnuelle, Fokko Johannes van der Woude. European Society for Organ Transplantation 19 (2006) 947–959.
2 An Deman, Patrick Peeters, Jacques Sennesael. Nephrol Dial Transplant (1999)14: 1517–1520.

17AP2-3

The effect of prone positioning on intraocular pressure in anesthetized patients

Y. Bessho, K. Kageyama, M. Shibasaki, Y. Nakajima, T. Mizobe

Department of Anesthesiology, Kyoto Prefectural University of Medicine, Kyoto, Japan

Background and Goal of Study: Proposed intraoperative risk factors of perioperative visual loss include prone positioning of the patient, long operative times, hypotension, anemia, and blood transfusion. Ocular perfusion pressure is defined as the difference between mean arterial pressure and intraoperative pressure (IOP). IOP is known to show postural variation that we investigated IOP fluctuation in the prone anesthetized patients.
Materials and Methods: After approval by the ethical committee of the university hospital, informed consent was obtained from all patients (ASA PS I–II). Patients scheduled for spine surgery in the prone position (prone group), and for orthopedic surgery in the supine position (control group), were enrolled. IOP was measured with a hand-held tonometer (Tono-Pen Avia) at 6 time points; Point-1; postinduction while mask ventilation as a baseline IOP, Point-2; postintubation, Point-3; supine just before prone positioning, Point-4; supine just after position change at the end of surgery, Point-5; supine 5 min after position change, and point-6; supine 10 min after position change before extubation. Anestheitic protocol was standardized. Standard anesthetic monitors were recorded at the time of tonometer readings. The data were analyzed with repeated-measures analysis of variance, followed by Bonferroni test. Simple regression analysis was used to determine correlations. Data are shown as mean ± SD.
Results and Discussion: Neither of demographic data, hemodynamic nor ventilatory parameters were significantly different between groups. The supine group did not show any significant change in IOP during the study. In the prone group, postoperative IOP (Point-4, 5, 6: 21 ± 9, 16 ± 4, 17 ± 4 mm Hg, respectively) was significantly higher than baseline IOP (Point-1: 9 ± 2 mm Hg) ($p < 0.01$). IOP at Point-4 (21 ± 9 mm Hg) in the prone group was significantly higher than that in the supine group (13 ± 4 mm Hg) ($p < 0.01$). Also, IOP just after position change at the end of surgery (Point-4) in the prone group was correlated with total time spent in the prone position, in minutes ($P < 0.05$, $r^2 = 0.72$, $y = 0.048x + 8.8$). IOP of Point-4 ranged from 7 to 41.5 mm Hg, and total time in the prone position ranged from 105 to 300 min.
Conclusion(s): Prone positioning increases IOP during anesthesia, which might result in the decreased ocular perfusion pressure. As the etiology of postoperative visual loss is probably multifactorial, further work needs to be done regarding possible treatments in prone anesthetized patients.

17AP2-4

The prevalence of post-operative hypoxia at arrival to post anaesthesia care unit

A. Al Shaer, A. Al Nasser, G. Abdullah, Z. Al-Salam

Anaesthesia, Riyadh Military Hospital, Riyadh, Saudi Arabia

Background and Goal of Study: Perioperative hypoxia may result in serious morbidities that can be prevented by continuous cardio-respiratory monitoring and prompt intervention. Postoperatively, anaesthetists decide on need for patient's monitoring and oxygen supplementation during transfer to Post Anaesthesia Care Unit (PACU) based on their clinical judgment. Currently, there is little data in the literature that support general consensus to such practice. Therefore, we designed this study to determine the prevalence of hypoxia at arrival to PACU in patients who had elective surgery under general anaesthesia (GA).
Materials and Methods: This is an observational prospective study of patients who were operated electively under GA over a one month-period (May 2008) at Riyadh Military Hospital, Saudi Arabia. Patients' characteristics and ASA's classification were determined. Percutaneous systemic oxygen saturations (SpO_2) by pulse oximetry at baseline (preoperative) and at arrival to PACU while transferred on room air were compared. We excluded patients who underwent local or regional anaesthesia and patients who were transferred to ICU. Paired *t* and McNemar tests were used where appropriate. Results are presented as mean ± SD or median (IQR).
Results and Discussion: Over the study period, there were 340 patients who met inclusion criteria. The mean age of this cohort was 33 ± 21 years and their median ASA's classification was 1 (1–2). The median time for surgical procedure was 90 min (60–132). At arrival to PACU, there was a statistically

significant drop in SpO_2 from 97.78 ± 1.97 to 96.95 ± 5.99% (paried t-test, $p < 0.001$). In addition, there were significantly more patients who had mild ($SpO_2 < 95\%$) and moderate ($SpO_2 < 90\%$) hypoxia at arrival to PACU than baseline (McNemar test; $p < 0.001$). The percentage of patients who had $SpO_2 < 95\%$ and $SpO_2 < 90\%$ were 16.8 and 6.8%; respectively (vs. 6.2 and 0.0% at baseline; respectively).

Prevalence of hypoxia at baseline and arrival to PACU

	SpO2 < 95%	SpO2 < 90%	P value
Baseline: n (%)	21 (6.2)	0 (0)	<0.001*
PACU: n (%)	57 (16.8)	23 (6.8)	<0.001*

*McNemar test

Conclusion(s): The results of our study suggest that patients, postoperatively, are at risk of significant hypoxia. Due to the prevalence of this condition we suggest routine oxygen administration to all patients if adequate mobile monitoring of SpO_2 during transfer to PACU can not be achieved. Further studies are needed to examine the effectiveness of this approach.

17AP2-5

Activation of beta-herpesviruses in patients undergoing general or regional anaesthesia

B. Mamaja, S. Chapenko, S. Donina, A. Sultanova, M. Murovska

Anaesthesiology & Reanimatology, Riga Stradins University, Riga, Latvia

Background and Goal of Study: The **aim** of this study was to investigate the frequency of beta-herpesviruses activation in patients under long-lasting general or regional anesthesia.

Materials and Methods: 25 patients (10–65 yr) were undergoing major reconstructive microsurgical procedures. All patients had complicated previous history (7–15 surgical procedures under general anesthesia [GA] during 1-yr) from initial trauma until long lasting reconstructive free flap surgery. For 11 patients GA and for 14 patients regional anesthesia (RA) was used. Operating time was 4–7h. Peripheral blood samples for the detection of latent/persistent and active viral infection and peripheral blood CD_4^+, CD_8^+, CD_{38}^+, and CD_{16}^+ positive cells were taken before and at the 14th day after surgery.

Results and Discussion: Before surgery 24 out of 25 patients had latent/persistent beta-herpesviruses infection. CMV in 7/25 (28.0%), HHV-6 in 12/25 (48.0%), HHV-7 in 23/25 (92.0%). One 10 yr old child (RA gr.) did not have any beta-herpesviruses infection. Active viral infection was revealed in 6/24 (25.0%) patients: HHV-6 in one and HHV-7 in five patients. In both gr. frequency of latent/persistent and active beta-herpesviruses infection was similar. The rate of the beta-herpesviruses activation became 1.7 times higher in patients after surgery (10/24; 41.7%) in comparison to that before (6/24; 25.0%). In GA gr. active viral infection after surgery was detected in 7 patients, 3 from them had active viral infection before operation and infection remained active after surgery but in 4 patients – reactivation of the viruses had been detected. In RA gr. the reactivation of beta-herpesviruses after surgery was found in only one patient (HHV-7). Should be point out that active HHV-7 infection which was revealed in one patient before surgery was not detected after surgery. In RA gr. two patients who had active viral infection before surgery viral infection remains active after surgery. Beta-herpesviruses reactivation after surgery was observed more often in the patients with GA (in 4/10 patients with GA and in 1/13 patients with RA). Simultaneous activation of HHV-6 + HHV-7 was revealed in 1 patient GA gr. after surgery.

Conclusion(s): Long lasting major reconstructive surgery may cause beta-herpesviruses activation, general anaesthesia could significantly increase frequency of virus reactivation to compare with regional anaesthesia and that may cause more difficult postoperative period and patients recovery.

17AP2-6

A survey of the testing procedure used to evaluate the accuracy of pulse oximeter devices in the United Kingdom

S. Dugani, A. Wilkes, I. Hodzovic

Department of Anaesthetics and Intensive Care Medicine, School of Medicine, Cardiff University, Cardiff, United Kingdom

Background and Goal of Study: The use of a pulse oximeter is one of the minimum requirements for monitoring during anaesthesia (1). There are no guidelines at present regarding the testing of pulse oximeters before and during clinical use. The aim of this survey was to determine the testing procedures used in the UK to evaluate the accuracy of pulse oximeter devices.

Materials and Methods: We contacted the Biomedical Engineering departments in 203 National Health Service (NHS) trusts. Information was obtained on the tests conducted on pulse oximeter devices before and during clinical use, the protocol for rejection, testing procedure for the oximeter probe light emitting diode (LED) wavelength accuracy and the accepted percentage of inaccuracy for rejection of the probes.

Results and Discussion: Biomedical Engineering departments were present in 189 out of 203 NHS trusts. The response rate was 75% (142/189). A total of 135 trusts (95%) conducted tests at the time of purchase while seven did not (5%). One hundred and eight of the 142 trusts (76%) had a protocol to reject pulse oximeters. The criteria for rejection varied: 56/142 (39%) trusts cited failure to meet the manufacturer's recommendation; 32/142 (23%) cited error detected by pulse oximeter tester and 26/142 (18%) had no defined criteria. The accepted percentage of inaccuracy to reject the oximeter sensor probe varied with a majority quoting ± 2% and two quoting ± 10%. This survey highlights a wide variation in the testing procedure utilised. The International Standard describes the various testing procedures for pulse oximeter devices and their associated limitations (2).

Tests conducted on the pulse oximeter devices	
Pulse oximeter simulator in isolation	24 (18%)
Pulse oximeter simulator combined with	
Electrical safety checks	68 (50%)
LED wavelength accuracy	5 (4%)
Other tests (pulse oximeter simulator not used)	
Electrical safety check	41 (30%)
Test on own finger	12 (9%)
LED wavelength accuracy	3 (2%)

A number of respondents conducted more than one test. Values are numbers (percentage of the total of 135)

Conclusion(s): Pulse oximeters are used to guide therapeutic interventions and variation in accuracy can be detrimental to patients. Introduction of guidelines regarding the testing procedure would ensure a uniform practice.

References:

1 AAGBI 2007: Recommendations for standards of monitoring during anaesthesia.
2 ISO 9919:2005 Medical electrical equipment–particular requirements for the basic safety and essential performance of pulse oximeter equipment for medical use.

17AP2-7

Possible allergic reactions during anaesthesia in Estonia

S. Ress, K. Ress

Anaesthesiology and Intensive Care Clinic, Tartu University Hospital, Tartu, Estonia

Background and Goal of Study: Allergic reactions occurring during anaesthesia are quite rare, but remain a major cause of concern for anaesthesiologist since these reactions are usually unpredictable and when they do occur, they may be serious and potentially life-threatening. Incidence of perioperative allergic reactions has not been investigated in Estonia. The aim of this retrospective survey was to investigate the possible allergic reactions during anaesthesia.

Materials and Methods: Data were collected retrospectively from anaesthetic charts for patients in whom surgical procedures were performed under anaesthesia between January 1st in 1997 and December 31st in 2006. During this period of time in total 121125 surgical procedures were performed under anaesthesia.

Results and Discussion: During this 10-year period 247 cases of possible allergic reactions during anaesthesia were documented, constituting 7% of all complications occurring during anaesthesia. From patients with suspected allergic reactions 105 were female (42,5%) and 142 (57,5%) male, showing slight male predominance. Age varied from 8 days to 94 years (median 47 years). In clinical picture the cutaneous symptoms were the most common features, followed by bronchospasm and anaphylactic or anaphylactoid reaction. The prevalence of possible allergic reactions during anaesthesia was 1:490 and prevalence of anaphylactic/anaphylactoid reactions was 1:24225, that is somewhat lower than reported earlier in other countries. Patient-reported history of allergic disease was prevalent in 0,06% of all anaesthesias and in 16,2% of patients having possible allergic reaction.

Table 1. Demographic characteristics for patients with possible allergic reactions

Patient data	Number (n = 247)	Percentage
Sex		
Female	105	42,5%
Male	142	57,5%
Age		
Median	47 yrs	
Range	8 d – 94 yrs	
History of allergy		
Yes	40	16,2%
No	207	83,8%

Conclusion(s): Possible allergic reactions during anaesthesia are quite rare in Estonia. Lower incidence comparing to data reported by others might be associated with lower total allergy prevalence in Estonia. So far the documentation and clinical investigations of possible allergic reactions during anaesthesia and their causative agents in Estonia have been scarce and reports of allergic reactions are based mostly on observations and guesses made in the emergency situation. Therefore further prospective studies are needed in order to evaluate real incidence of suspected allergic reactions during anaesthesia in Estonia.

Perioperative Care of the Elderly

18AP1-1

Medical causes of delay in fractured neck of femur surgery – Room for improvement?

H. Alexander, P. Hudson, J. Danks

Department of Anaesthetics, Russells Hall Hospital, Dudley, United Kingdom

Background and Goal of Study: Surgery for Fractured Neck of Femur (FNOF) is increasingly common and associated with high risk. It has been demonstrated that operative delay beyond 48 hours after admission increases the odds of 30 day all cause mortality by 41%[1]. We looked at all medical causes of delay in FNOF surgery to try and identify those causes which occur commonly and where improvements could be made.

Materials and Methods: We audited all patients admitted for FNOF surgery to a District General Hospital in the UK for a one year period. We established whether surgery was delayed (not done within 48 hours) and whether the cause was medical or logistical (i.e. lack of theatre time). For those patients with medical delays we examined the notes to determine the exact reason. We then audited their pre-operative course, looking at admission investigations, time to senior review, adequacy of note keeping and implementation of management plans.

Results and Discussion: 481 patients were admitted with FNOF in one year, of which 72% received their operation within 48 hours. 28% of delays were due to medical causes, representing 7% of all patients. Reasons for delay are shown below. Admission investigations were done in the majority of cases, 100% had a full blood count and renal profile, 90% a clotting screen, 86% an ECG and 84% were group and saved. However < 50% of patients were seen by a senior surgeon within 24 hours and only 80% of patients had the reason for cancellation documented and a management plan for further action made. This plan was followed in only 60% of cases. Of patients with haematological reasons 10 were due to a raised INR due to warfarin therapy (2 for valve replacement 8 for AF) with a mean time to operation of 6 days (range 2–14). None of these patients received treatment for reversal of anticoagulation on the day of admission. The reasons for cancellation on renal grounds were electrolyte disturbance (4 hyponatraemia, 1 hypokalaemia), dehydration and chronic renal failure.

Reasons for Delay

Organ System	Number (%)
Haematology	13 (43%)
Renal	7 (23%)
Respiratory	4 (13%)
Cardiovascular	1 (3%)
Neurological	1 (3%)
Microbiological	2 (7%)
Miscellaneous	2 (7%)

Conclusion(s): 7% of all FNOF patients were cancelled on medical grounds mainly for haematological or biochemical reasons. We believe that improved documentation and guidelines for the pre-operative management may reduce delay to surgery.

Reference:

Shiga, T et al. Is Operative Delay Associated With Increased Mortality Of Hip Fracture Patients?. Can J Anesth 2008; 55: 135–9.

18AP1-2

Hip fracture in the U.K., why the delay to surgery from admission?

A. Shannon, S. White, J. Holloway, R. Griffiths

Department of Anaesthesia, Peterborough and Stamford Hospitals Foundation NHS Trust, Peterborough, United Kingdom

Background and Goal of Study: In 2007 the National Hip Fracture Anaesthesia Network was created to promote evidence-based practice, and to encourage audit and research amongst anaesthetists. Surgical repair within 48 hrs of admission has been recommended[1]. A systematic review gave additional strength to the negative relationship between operative delay and mortality[2]. The odds of a 30-day all-cause mortality increased by 41% following an operative delay beyond 48hrs. However, there is little information detailing how such operative delays occur. We present the first audit data from the HIPFA Network in the U.K., defining the degree and nature of operative delay observed and analysis of the 30-day all-cause mortality.

Materials and Methods: Local volunteers collected audit data during January and February 2008. Providing a snapshot of 1021 patients, across 20 NHS Trusts. We calculated the admission to operation time, and classified the cause of any delay greater than 48hrs into five categories, unavoidable medical or surgical management, anaesthetic investigation, organisational delay or unknown/other.

Results and Discussion: The mean operative delay was 55.13 ± 62.62 hrs, 376 (37%) of patients had an admission to operation time exceeding 48hrs. The reason was unknown/other in 91 cases. However, 30 patients experienced two or more categories of delay, giving rise to 319 patient episodes (see table). Unavoidable medical causes included appropriate management advised by anaesthetists. 30-day all-cause mortality was not different between the two groups (admission to operation time < 48hrs and > 48hrs) being 9.28% and 9.02% respectfully. Despite this, we have shown 30% of delays over 48hrs were due to organisational issues (or 56% of all the avoidable causes). This data is likely to be representative throughout the UK. More work is needed to investigate what factors are important in delay.

Unavoidable Medical	Unavoidable Surgical	Organisational	Anaesthetic Investigation
165	23	124	7

Conclusion(s): This audit has identified an unacceptable delay in admission to operation time across 20 NHS Trusts, with a high proportion of delays represented by poor organisation of resources.

Acknowledgements: All members of the network.

References:

1 Fractured neck of femur. Prevention and management. Summary and recommendations of a report of the Royal College of Physicians. J R Coll Physicians Lond 1989;23:8–12.

2 Shiga T et al. Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression. Can J Anaesth 2008 Mar;55(3):146–54.

18AP1-3

Perioperative hypothermia in patients undergoing operative repair of fractured neck of femur: Current management and future developments

R. Hogg, C. Bryson, N. Sims

Department of Anaesthetics & Intensive Care Medicine, Queen's University, Belfast, Northern Ireland, United Kingdom

Background and Goal of Study: The National Institute for Health and Clinical Excellence (NICE) issued guidance in April 2008 on preventing hypothermia in patients in the perioperative period. Hypothermia is defined by NICE as a core body temperature of less than 36°C. Patients who develop hypothermia are more likely to suffer serious perioperative morbidity. The main emphasis of the guidelines are to identify patients at risk of developing hypothermia with subsequent delay of induction of anaesthesia if temperature less than 36°C. The use of forced air and fluid warmers intraoperatively and continued warming in the postoperative period have also been recommended.

Materials and Methods: We conducted a retrospective audit of 80 trauma patients who had undergone operative repair of fractured neck of femur. Our audit aimed to review our current management of temperature in the perioperative period and to identify areas of practice that could be improved. A number of variables were recorded including temperature (preoperatively on ward, on admission to recovery, and on discharge to the ward), anaesthesic technique, surgical procedure, use of fluid or hot air warming devices and fluid administration during the perioperative period.

Results and Discussion: All of our patients were at high risk of perioperative hypothermia as defined by NICE criteria and underwent general or spinal anaesthesia at the discretion of the anaesthetist in charge of the list. Mean age at time of procedure was 79 years. 22 patients (27%) were classed as hypothermic on admission to recovery. Statistical analysis (Chi Squared Test) demonstrated that

the eldest patients (>75 years) were significantly more likely to demonstrated a decrease in body temperature during the procedure. There was no significant difference between anaesthetic technique or surgical procedure and a risk of temperature reduction. Overall 30 day mortality was 6% with 80% of these patients suffering a perioperative decrease in temperature.

Table 1.

	Pearson Chi-Square	Significance
Surgical Procedure	0.567	0.451
Anaesthetic Technique	0.131	0.718
Age	7.665	0.022

Comparison of the effect of patient variables on body temperature

Conclusion(s): All patients undergoing operative repair of fractured neck of femur are at risk of perioperative hypothermia, with the most elderly patients at significantly higher risk of associated morbidity and subsequent mortality. We have advised staff in our unit of these findings and treat hypothermia agressively in those patients at highest risk.

18AP1-5

Crystalloid/colloid versus crystalloid intravascular volume administration before spinal anesthesia in elderly patients: The influence on cardiac output and stroke volume

A. Riesmeier, A. Schellhaass, S. Suttner, S. Suttner

Anesthesiology and Intensive Care Medicine, Klinikum Ludwigshafen, Ludwigshafen, Germany

Background and Goal of Study: Hypotension is the most common cardiovascular response to spinal anesthesia. We compared the effects of crystalloid/colloid versus crystalloid administration before spinal anesthesia on cardiac output (CO) in elderly patients undergoing transurethral resection of the prostate.

Materials and Methods: Sixty male ASA I–III patients were randomized to one of three groups the control group received no intravascular volume preload, the saline group received 500 mL saline, and the hydroxyethyl starch (HES) group received 500 mL of saline plus 500 mL of 6% HES 130/0.4 within 20 min before spinal anesthesia. Mean arterial blood pressure (MAP) and heart rate, CO, and stroke volume were recorded with a thoracic electrical bioimpedance device.

Results and Discussion: MAP significantly decreased from baseline in the control group (from 104 ± 20 mm Hg to 88 ± 11 mm Hg [P = 0.005]) and was significantly lower than in the HES group (from 107 ± 13 mm Hg to 97 ± 12 mm Hg [P = 0.001]). In the saline group, MAP decreased (103 ± 14 mm Hg to 92 ± 17 mm Hg) with no significant differences compared with the control and HES groups. CO decreased significantly in the control group (from 4.9 ± 1.6 L/min to 3.8 ± 0.9 L/min [P = 0.002]) and was significantly lower than in the HES patients in whom CO increased significantly after volume preload (from 5.2 ± 1.23 L/min to 6.2 ± 1.43 L/min [P = 0.003]) and remained at baseline level until the end of the study.

Conclusion(s): Intravascular volume preload with saline plus HES prevented a decrease of CO, but did not prevent spinal anesthesia-induced hypotension in elderly patients undergoing transurethral resection of the prostate.

18AP1-6

Anaesthesia for fractured neck of femur patients on anti-platelet agents – A survey of current practice in Northern Ireland

S. McGuirk, E. Lappin, C. Nutt, C. McCartney, M. Shields

Department of Anaesthetics, Queens University Belfast, Belfast, Northern Ireland, United Kingdom

Background and Goal of Study: There are increasing indications for the use of anti-platelet agents, in particular clopidogrel. As a consequence there are more patients presenting with fractured neck of femur (FNOF) on these medications. Operative delay of more than 48 hours is associated with increased short-term and mid-term mortality[1] and therefore it is essential to obtain definitive surgical management promptly. Patients on anti platelet agents may be unnecessarily delayed. The aim of this survey was to establish what current anaesthetic practice is for FNOF patients on anti-platelet agents.

Materials and Methods: A questionnaire was distributed to all anaesthetic consultants in Northern Ireland with regular trauma lists. It consisted of six questions analyzing the routine anaesthetic management for FNOF surgery and how this was affected by the presence of anti-platelet agents.

Results and Discussion: A total of 67 (100%) responses were received. The majority of respondents 79% (53/67) routinely perform spinal anaesthesia for FNOF surgery. 16% perform general anaesthesia and 5% use a femoral nerve block with sedation. 94% (63/67) of respondents would perform a spinal anaesthetic on patients taking aspirin 75 mg compared with 55% (37/67) for patients continuing on aspirin 300 mg. The preferred times for clopidogrel to be discontinued before performing a spinal was 0–2 days in 12% of respondents, 3–5 days in 33% and 6–10 days in 49%. When presented with a hip fracture patient continuing on clopidogrel, 69% would perform anaesthesia immediately, of which 84% would perform general anaesthesia, 12% would use a spinal anaesthetic and 4% femoral nerve block with sedation. The remaining 31% would prefer to discontinue clopidogrel for a period before administering an anaesthetic.

Conclusion(s): This survey shows that there is a wide variation in anaesthetic practice for FNOF patients on anti-platelet agents in particular clopidogrel. Further work is required to establish the optimal peri-operative management of these patients.

Reference:

1 Shiga et al. Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression. Canadian Journal Anaesthesia March 2008.

18AP1-7

Addition of epinephrine to intrathecal ropivacaine in elderly patients scheduled for orthopaedic surgery prolongs sensory blockade and post-operative analgesia

R. Patroni, Z. Karkavitsa, E. Lykogianni, P. Didachos, K. Filos

Anaesthesiology, St. Andrews General Hospital, Patras, Achaia, Greece

Background and Goal of Study: The duration of intrathecal (i.t.) ropivacaine anaesthesia is shorter compared to bupivacaine. Drugs like clonidine, dexmedetomidine and epinephrine provide neuraxial analgesia via alpha-adrenergic receptors and are used mainly as adjuvants to neuraxial local anaesthetics and opioids. Animal studies did not reveal any neurotoxic effects following i.t. ropivacaine or epinephrine administration [1]. The present study is the first clinical trial estimating the effectiveness of i.t. ropivacaine with two doses of epinephrine.

Materials and Methods: Fourty-five elderly patients, ASA ιι and ιιι, scheduled for orthopaedic surgery, were randomly assigned to 3 groups (gr.) in order to blindly receive either 15 mg of isobaric ropivacaine (n = 15, gr. 1) or 15 mg ropivacaine +100 μg epinephrine (n = 15, gr. 2), or ropivacaine +200 μg epinephrine (n = 15, gr. 3), over 30 s through a 25-G Quincke needle at the L4–5 level in the sitting position. Onset and duration of sensory block, motor blockade, duration of postoperative analgesia, haemodynamics and side-effects were recorded.

Results and Discussion: Data (mean ± SD) are shown in the table. The intra-op quality of analgesia was excellent in all 3 groups. No early or delayed complications were detected.

Onset and duration of sensory, motor block as well as duration of post-op analgesia

Variable	15 mg ropivacaine	15 mg ropivacaine + 100 μg epinephrine	15 mg ropivacaine + 200 μg epinephrine
Peak Sensory Level:	Th10 ± 2.1	Th8 ± 2.0	Th5 ± 1.1 *** $$
Onset of sensory block (min):	23.5 ± 20	15.3 ± 9.4	12 ± 7.5 * $
Time of sensory block to: Th12 (min)	114 ± 34	171 ± 55*	235 ± 30 *** $$
Duration of motor blockade to: Bromage – 3 (min)	84 ± 24	107.1 ± 30	103 ± 32
Duration of post-op Analgesia (VAS: 30 mm) (min):	159 ± 25	249 ± 18 ***	378 ± 124 *** $$$

*P < 0.05, **P < 0.01, ***P < 0.001 for comparisons between group 1 versus groups 2 and 3, $ P < 0.05,$$ P < 0.01,$$$ P < 0.001 for comparisons between group 2 versus group 3, respectively.

Conclusion(s): Addition of 100 or 200 μg of epinephrine to isobaric ropivacaine leads to a significant increase in the duration of sensory blockade and of post-op analgesia, but not of motor blockade. No delayed complications were observed.

Acknowledgements: Dept. of Anaesthesiology and Intensive Care Medicine, School of Medicine, University of Patras, 26500 Patras, Greece.

Reference:

1 Kristensen J. D., Karlsten R., Gordh T. Acta Anaesthesiol Scand 1998; 42: 685–90.

18AP2-1

The relationship between aging and Bispectral Index (BIS) during propofol administration

H. El Beheiry, J. Wong, J. Wong, P. Mak

Department of Anesthesia, University of Toronto, Toronto, Ontario, Canada

Background and Goal of Study: Although the algorithm for BIS index is derived from a database of predominantly healthy adults, it is assumed that such algorithm is still applicable to the elderly. Such assumption has yet to be established by studying the relationship between BIS values and age during anaesthetic administration. Hence, we hypothesize that BIS values are lower in the elderly compared to young patients during propofol administration. This hypothesis is based on the known aging-induced potentiation of propofol hypnotic actions[1].
Materials and Methods: Ten young (< 65 yrs) and ten elderly (> 65yrs) ASA I–III patients having general anaesthetic gave informed consent. BIS (BIS-XP, Aspect, USA) values were digitized and recorded during the administration of two successive doses of propofol (0.5 and 1.5 mg/kg). The second dose was given after BIS values returned to awake levels monitored just before the administration of the first dose. After the peak effect of the second propofol dose was evident, the attending anaesthesiologist continued with the induction of general anaesthesia according to her/his discretion. Respiratory rate, blood oxygen saturation, blood pressure and heart rate were monitored during the study period. Unpaired two-tailed student t-test compared the BIS values obtained between young and elderly patients.
Results and Discussion: There was a significant difference between the ages of the young and elderly group. The awake as well as the post propofol BIS values were not statistically different between both groups (table 1). Because of a known negative correlation between propofol requirements and age[1], BIS values in elderly patients are expected to be lower than in younger patients given the same propofol doses. The present results do not confirm such assumption.

Table 1. BIS values in young and elderly patients during propofol IV boluses

	<65 yrs; n = 10	>65 yrs; n = 10	p-value
Age (yrs)	43.5 ± 8.1	71.9 ± 5.4	0.00006
BIS-Awake	95.2 ± 2.7	91.8 ± 4.9	0.07
BIS-Propofol 0.5 mg/kg	82.8 ± 5.0	78.8 ± 9.5	0.33
BIS-Propofol 1.5 mg/kg	47.8 ± 7.6	41.8 ± 6.6	0.08

$p < 0.05$ indicates statistical significance

Conclusion(s): BIS index values determined for elderly patients may under estimate the actual anaesthetic depth in this patient population. If anaesthetic administration is to be guided by using BIS values as pharmacodynamic targets, these target values may have to be higher for the elderly compared to younger patients.
Reference:
1 Acta Anaesthesiol Scand 2004;48:27–34.

18AP2-2

POSSUM and P-POSSUM scores to asses mortality risk in Nonagenarians undergoing non- traumatic emergent surgery

A. Pelavski, A. Lacasta, C. Patricia, M. Rochera, R. Jaume

Anaesthesia Department, Vall d´Hebron University Hospital, Barcelona, Spain

Background and Goal of Study: Nonagenarians in need of emergent surgery often raise cost-benefit ethical questions. Tools to estimate their mortality risk might help in the decision whether to operate or not. Possum and P-Possum scores have accurately estimated the risk of death in other surgeries and populations. This prospective observational study aims to asses the accuracy of Possum and P-Possum scores in predicting the one-month post operative mortality in this population.
Materials and Methods: Data were collected prospectively from 55 nonagenarians who underwent emergent surgery in our Major University Hospital between VI-2006 and VI-2008. Patients were stratified according to their Possum and P-Possum estimated moratlity risk into 10 groups (1–10%, 11–20%, 21–30%, etc). Within each stratum the real number of deaths was compared to the number of deaths predicted by each score, through the Chi-square and Fisher's exact tests. $p < 0.05$ was considered significant.
Results and Discussion: The majority were female, and most of them underwent a general surgery procedure (mostly appendicectomies, cholecystectomies, vowel resections and hernia repair), or a vascular surgery one (mainly embolectomies). A significant different between expected and observed number of death could only be seen among patients with a POSSUM score < 10%.
Conclusion(s): 1. A bigger sample is needed to draw valid conclusions. 2. Preliminary results suggest that POSSUM and P-POSSUM are valid tools to predict one month post operative mortality risk among nonagenarians.

POSSUM & P-POSSUM observed vs. predicted number of deaths

	p value POSSUM	p value P-Possum
0–10%	0.04*	0.29
1–20%	0.39	0.72
21–30%	0.28	0.75
31–40%	0.58	0.5
41–50%	0.42	§
51–60%	0.50	§
61–70%	§	§
71–80%	0.66	§
81–90%	§	§
91–100%	§	§

§: less than 3 patients

18AP2-3

Perioperative management of very aged patients

M. Sumie, K. Tokuda, K. Matsushita, K. Irita, S. Hoka

Anesthesiology and Critical Care Medicine, Kyushu University Hospital, Fukuoka, Japan

Background and Goal of Study: Japan has rapidly become an aging society with the proportion of the very aged (85 years and over) in the total population rising from 0.4% to 2.3% between 1980 and 2005. Thus it was speculated that the number of operations on very old patients would also have been increasing. Because perioperative mortality and morbidity in the very aged is higher than in younger ones1), the former group requires meticulous treatment that accords with their preoperative status and/or type of operation. This study aimed to clarify the characteristics of perioperative management of very aged patients.
Materials and Methods: A retrospective study of the perioperative management of patients over the age of 85 (group G in the classification of age-groups as defined by the Japanese Society of Anesthesiologists) seen in our department from 2002 to 2008 was conducted using medical records.
Results and Discussion: The actual number of patients was highest for surgery and followed by orthopedics, whereas the proportion of the very aged to all patients was highest in urology followed by dermatology (Table 1). This indicated that the very old were thought tolerable to low invasive surgery such as transurethral procedure or skin surgery. These patients had various coexisting preoperative diseases; e.g. hypertension (48%), anemia (21%), and renal dysfunction (20%), with 89% having at least one coexisting disease. This was supported by data showing that half were classified into ASA-PS 3 or 4. However, the proportion of emergency operations on the very aged was less than that in the total patient population (10% vs. 17%). This could indicate that very old patients have little indication for emergency surgery because of the risks involved. During the intraoperative period various complications were observed, especially circulatory system ones. At the point of postoperative 30th day, patients' statuses were: discharged (82%), hospitalized (17%), and deceased (1%).
Conclusion(s): It was seen as important to carefully manage very old patients by evaluating coexisting diseases and the planned operation so that patients could discharge without impairment of their quality of life.

Table 1.

Department	Total of Patients (A)	Patients over 86 (B)	Ratio (B/C)%	Ratio (B/A)%
Surgery	8365	80	45	0.96
Orthopedics	5500	35	20	0.64
Urology	2107	33	19	1.57
Dermatology	811	11	6	1.36
Others	9463	18	10	0.19
Total	26246	177 (C)	100	0.68

Reference:
1 Masui (Jpn J Anesthesiol). 2002; 51: 1285–96.

18AP2-4

Postoperative respiratory complications after sevoflurane in O_2: N_2O or sevoflurane in O_2: Air anaesthesia for major abdominal cancer surgery

S. Kvolik, A. Rakipovic-Stojanovic, D. Vukovic, D. Vidovic, B. Kovacic

Anaesthesiology and ICU, Clinical Hospital Osijek, Osijek, Croatia

Background and Goal of Study: An aim of the study was to find out the incidence of postoperative respiratory complications in abdominal cancer patients undergoing elective surgery, risk factors and correlation with type of anesthesia. We hypothesized that patients ventilated with O_2: air will have less pulmonary complications.

Materials and Methods: 54 elective abdominal cancer patients (37 men, 20 women) ASA 1–4 without present respiratory infection were randomly divided into two groups: balanced sevoflurane anaesthesia in O_2: air (Group A, n = 27, mean age 67.8 years, BMI 30.7) and balanced anaesthesia with O_2:N_2O (group B, n = 27, 64.2 years, BMI 26.8). A lung auscultation, CRP and WBC were done preoperatively, on the 2nd and 4th postoperative day. Outcomes were respiratory failure requiring mechanical ventilation, pneumonia and/or atelectasis, dysphonia and postoperative congestive heart failure. Postoperative pneumonia was confirmed by presence of subjective symptoms and/or abnormal findings on lung examination, and two of following: fever, leukocytosis or high CRP, and positive chest radiograms. Preoperative nasopharyngeal smears and postoperative tracheal aspirates were taken in all patients. Data were analyzed by Man-Whitney and chi-square tests.

Results and Discussion: Demographic data did not differ between study groups. The postoperative pneumonia was registered in three patients in A and four in B group, one patient in both groups required prolonged mechanical ventilation, whereas dysphonia was registered in two patients in A and three in group B. Postoperative congestive heart failure with hypercapnea was registered in three patients in group A and 4 in group B. Subjective symptoms and productive cough without clinical and laboratory signs of respiratory infections were find in 1 patient in group A and two in group B. An overall incidence of all respiratory complications was 11/27 (40.7%) in group A and 15/27 (55%) in group B (ns, $p > 0.05$). Nasopharyngeal smears and or postoperative tracheal aspirates were positive for pathogens in 7 patients in group A and 9 in group B (ns, $p > 0.05$). Risk factors for positive bacterial isolates were BMI > 30 and age > 68, whereas risk factors for congestive heart failure were age > 75, BMI ≥ 34 and ASA status ≥ 3 ($p < 0.05$).

Conclusion(s): Type of anaesthesia did not influence postoperative patient respiratory outcome. Advanced age, higher BMI and ASA status are risk factors for both postoperative respiratory complications and positive pathogen isolates.

Reference:

Am J Respir Crit Care Med. 2005;171:514–7.

18AP2-5

Preoperative risk factors for in-hospital mortality in octogenarians undergoing cardiac surgery

M. Cabellos, E. Claros, A. de Pablo, Z. Lozano, A. Candela-Toha

Anestesia y Reanimación, Hospital Ramón y Cajal, Universidad de Alcalá de Henares, Madrid, Spain

Background and Goal of Study: Octogenarians are a fast-growing population in Europe. Although, cardiac surgery is safe in these elderly patients, costs and resource utilization are clearly increased[1,2]. The goal of this study was to detect preoperative risk factors for in-hospital death in this frailty population.

Materials and Methods: Data from every patient operated between January 1st 2002 and November 30th 2008, were extracted from a prospectively-maintained cardiac anesthesia database. Patients 80 years or older operated of major cardiac surgery were selected. The following preoperative variables were compared between survivors and non-survivors to hospital admission: demographic (age, gender, and body mass index), surgery related (priority: elective vs. non-elective; complexity: simple vs. complex (defined as any cardiac surgery different from CABG or single valve repair or replacement), and previous cardiac surgery) and patient related (Euroscore, comorbidity conditions and preoperative analytical parameters). Statistical analysis: univariate comparison between survivors and non-survivors using parametric and non-parametric tests as appropriate. Significant variables found in the analysis were entered in a logistic regression model with "alive at discharge" as the outcome variable. A $p < 0,05$ was considered significant.

Results and Discussion: Along the study period, 120 patients underwent major cardiac surgery with an in-hospital mortality of 16,7%. Only 19% of patients underwent isolated CABG. The commonest surgery was aortic valve replacement (44%). Variables related with death in the univariate analysis were gender (male), complex surgery, basal hemoglobin (Hb) value, basal creatinine value and glomerular filtration rate estimated by de MDRD simplified equation. In the multivariate analysis only complex surgery (odds ratio (OR): 8,0), gender (OR: 6,4) and preoperative Hb value (OR: 0,55) remained in the model.

Conclusion(s): In our setting, the main risk factors for in-hospital mortality were complex surgery, male gender and the presence of preoperative amenia. Although intraoperative and postoperative factors do play a role, the presence of preoperative anemia should prompt adequate study and treatment in elective cases.

Reference:

1 Chest 2002; 122:1309–1315. 2. Thorac Cardiovasc Surg 2008; 56:14–19.

18AP2-6

Myocardial revascularization in very old population. Can the choice of the strategy influence the outcome?

C. Di Lorenzo, S. De Napoli, D. Albanese, F. Petrini, A. Calafiore

Anaesthesiology and Intensive Care, University of Chieti, Chieti, Italy

Background and Goal of Study: Safety and efficacy of off-pump coronary artery bypass (OPCAB) has been demonstrated in the general population as well as in high-risk patients. This retrospective study was aimed to evaluate if OPCAB can confirm its role in a particular high-risk subset of patients: the octogenarians.

Materials and Methods: From November 1994 to December 2002, 138 patients older than 80 years underwent coronary artery bypass grafting (CABG), 52 (37.7%) on-pump (ONCAB) and 86 (62.3%) off-upmp (OPCAB). The two groups were similar for all investigated preoperative and operative characteristics but emergencies (25.6% OPCAB vs 48.1% ONCAB, $p = 0.007$), diabetes (22.4% vs 7.7%, $p = 0.028$); moreover OPCAB patients showed lower number of diseased vessels ($p < 0.001$). Actuarial survival curves were obtained by means of Kaplan-Meier method.

Results and Discussion: Early mortality and morbidity were 4.3% (3.5% OPCAB vs 5.8% ONCAB, p ns) and 11.6% (11.6% OPCAB vs 11.5% ONCAB, p ns), respectively. In ICU stay was 13 ± 7 OPCAB vs 21 ± 15, $p = 0.023$. Mean follow up time of 7.5 ± 1.9 years. Seven-year freedom from death any cause (60.9 ± 5.5 OPCAB vs 57.9 ± 7.0 ONCAB, p ns), from cardiac death (84.1 ± 4.3 vs 84.2 ± 5.7, p ns), from cardiac events (81.0 ± 4.7 vs 82.3 ± 5.7, p ns) and from any event (57.8 ± 5.7 vs 56.3 ± 7.1, p ns) were not statistically different between the two groups.

Conclusion(s): In octogenarians OPCAB seems not to have any protective effect in the early postoperative time. In long-term period, OPCAB provides outcome, due to any or cardiac causes, similar to the one achieved by more conventional ONCAB. However, OPCAB seems to offer lower in-ICU stay which is surely more comfortable for this older subset of patients higher prone to develop respiratory complications, infection and plague.

18AP2-7

Predictors of early mortality and EuroSCORE in the elderly population

G. Querejeta, E. Terradillos, C. Almaraz, J. Hortal, J. Barrio

Anesthesiology, H.G.U. Gregorio Marañon, Madrid, Spain

Background and Goal of Study: To study inpatient mortality and related factors, in patients over 75 years old undergoing cardiac surgery and to evaluate the efficacy of the EuroSCORE as a risk calculator model.

Materials and Methods: A retrospective analysis was carried out in 493 consecutive patients (45.6% females, 54.4% males) over 75 years old who underwent open-heart surgery from January 1st, 2003 to December 28th, 2007. CABG surgery was performed in 88 patients (17.8%), valve surgery in 284 patients (57.6%), aorta in 19 patients (3.9%), combined surgery in 86 patients (17.4%) and other procedures in 16 patients (3.2%). EuroSCORE efficacy was evaluated through ROC curves.

Results and Discussion: The overall hospital mortality was 14.6%. By treatment groups, the mortality was 13.9% in the CABG group, 30.6% in the combined surgery group, 11.6% in the valve surgery and 21.1% in the aorta group. EuroSCORE was a useful tool (ROC curves: coronary surgery 0,706 (0,533–0,800); valve surgery 0,706 (0,604–0,808); combined surgery 0,628 (0,489–0,768) and aorta surgery 0,857 (0,679–1,036)). Preoperative risks factors were renal failure ($p = 0,021$; OR: 1,61–999), diabetes (p:0,091; OR: 0,81–817,65); peripheral vascular disease ($p = 0,007$: OR: 2,53–333,33), obesity (p:0,019; OR: 1.31–28,57) and emergency surgery ($p < 0.001$) Perioperative factors of early mortality were: prolonged cross-clamping times > 78 min ($p = 0,034$; OR: 1,10–10,75), need for inotropic drugs ($p = 0,007$; OR: 1,76–37,04) and bleeding re-exploration ($p = 0,089$; OR: 1,58–12,50). Median postoperative length of stay was 4 days (IQR: 2–6 d).

Conclusion(s): Cardiac surgery offers acceptable results among patients older than 75 years old, specially if renal failure, peripheral vascular disease, diabetes, obesity or emergency surgery are avoided. Prolonged cross-clamp times, need for inotropic drugs or bleeding re-exploration predict early mortality. For these patients, EuroSCORE appears to be a valid risk calculator.

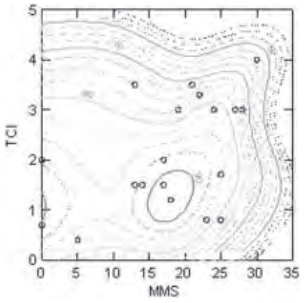
18AP2-8

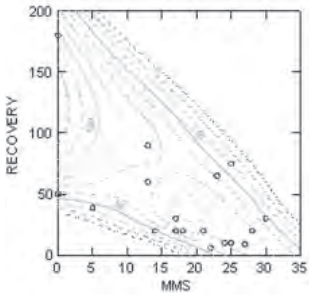
Pre-operative mini mental state and propofol anesthesia in elderly patients

F. Laalou, N. Louvet, M. Guillot, E. Noll, L. Pain

GRERCA/INSERM U666, CHRU de Strasbourg, Strasbourg, France

Background and Goal of Study: A basal forebrain cholinergic dysfunction increased the anesthetic potency of propofol in rats (1) and has been shown to correlate to the extent of cognitive dysfunction during aging in humans (2). We examined how pre-operative cognitive dysfunction may interact with the maintenance and recovery from propofol anesthesia in elderly patients.
Materials and Methods: Nineteen aged patients from 65 to 101 years old undergoing surgery for femoral neck fracture under general anesthesia (GA) were scored for Mini Mental State (MMS), Hamilton anxiety rating scale (H), Activity of Daily Livings (ADL) and Visual Analog Pain Scale (VAPS). A femoral nerve block was performed, then anesthesia was induced by etomidate (20 mg), sufentanil (20 µg) and maintained using a target-controlled infusion (TCI) of propofol (Schnider's model) to set the BIS values between 40–60. The effects of age, sex, MMS, H, ADL, and VAPS and duration of anesthesia on 1/the mean TC of Propofol, and 2/the duration of immediate recovery (to obey a command). Analysis were performed using General Linear Model (Systat 8.0).
Results and Discussion: Sex, age and MMS have significant effects (respectively P = 0.002, P = 0.001 and P = 0.03) on the Mean TC of Propofol during maintenance of anesthesia. We do not observed any significant correlation between age and MMS. MMS has a significant effect (P = 0.032) on the duration of recovery while age has a marginal effect (P = 0.0059).
Conclusion(s): Our results suggest that the 'cognitive reserve' of elderly patient as roughly assessed by the pre-operative MMS is one factor to be taken into account for both the observed propofol anesthesia needs during maintenance of anesthesia and the time delay for immediate recovery.
Reference:
1 Laalou FZ et al. Anesthesiology 2008;108:888–96. 2. Schliebs R et al. J Neural Transm 2006;113:1625–44.





Airway Management

19AP1-1

Tissue injury using emergency airway devices: A comparison of four techniques in a porcine model

N. Salah, I. Elsaigh, N. Hayes, C. Mc Caul

Anaesthesia, The Rotunda Hospital, Dublin, Ireland

Background and Goal of Study: Oxygenation via the cricothyroid membrane (CTM) may be required in emergencies but inadvertent tracheal cannulation may occur. The goal of this study was to compare airway injury between the tracheal and CTM sites for different techniques of airway access.
Materials and Methods: Anaesthetists performed 4 techniques of airway access on excised porcine tracheas. Techniques were: a. Seldinger b. Trochar c. Cannula and d. Scalpel. Participants performed each technique randomly via the CTM or the trachea. Specimens were assessed for tissue damage. Injuries were classified as superficial, penetrating, perforating or fracture.
Results and Discussion: Injury was more frequent at the trachea in both the Trochar and Scalpel (p = 0.02)(figure1). Rank order for injury at the tracheal site was: Scalpel = Trochar > Seldinger > Cannula while the rank order for injury at the CTM was Scalpel = Trochar > Seldinger = Cannula. Posterior injury was more common in the trochar and Scalpel techniques (table1). Incidence of fractures differed by technique at the tracheal site. The rank order of fracture here was Scalpel > Seldinger > Trochar > Needle (p = 0.011).

Table 1. Airway Injury

Technique	Site	Posterior N (%)	Lateral N (%)	Superficial N (%)	Penetrating N (%)	Perforating N (%)	Fracture N (%)
Needle	CTM	1 (10)	0 (0)	1 (10)	0 (0)	0 (0)	0 (0)
	Trachea	2 (20)	1 (10)	2 (20)	1 (10)	0 (0)	0 (0)
Scalpel	CTM	3 (30)	0 (0)	1 (10)	1 (10)	1 (10)	0 (0)
	Trachea	9 (90)	1 (10)	3 (30)	6 (60)	0 (0)	6 (60)
Trochar	CTM	3 (30)	0 (0)	0 (0)	2 (20)	1 (10)	0 (0)
	Trachea	9 (90)	0 (0)	0 (0)	6 (60)	3 (30)	4 (40)
Seldinger	CTM	1 (10)	0 (0)	1 (10)	0 (0)	0 (0)	0 (0)
	Trachea	5 (50)	1 (10)	4 (40)	2 (20)	0 (0)	5 (50)

CTM: Cricothyroid Membrane

Conclusion(s): Airway injury was greater at the tracheal site compared to the CTM. This has implications for emergency airway access in cases where it may be difficult to accurately identify the CTM.

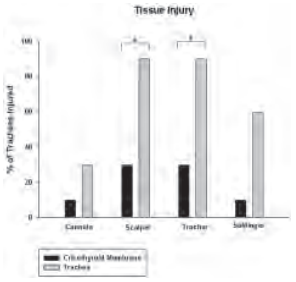


Figure 1.

19AP1-2

Emergency oxygenation via the cricothyroid membrane: A comparison of four different techniques in a manikin

N. Salah, R. Ni Mhuircheartaigh, N. Hayes, C. Mc Caul

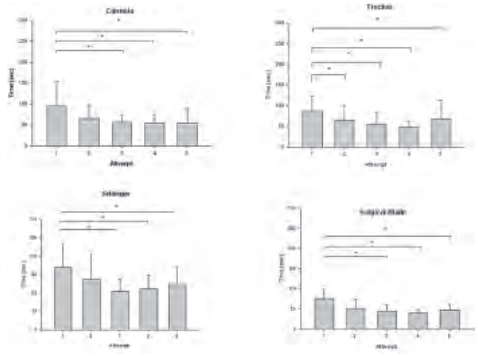
Anaesthesia, The Rotunda Hospital, Dublin, Ireland

Background and Goal of Study: Emergency oxygenation via the cricothyroid membrane (CTM) is a skill which may be required when failure to intubate has occurred. Multiple techniques and types of equipment have been developed but few studies compare the techniques or marketed devices. The goal of the study was to compare 4 different techniques of oxygenation via the CTM.
Materials and Methods: Anaesthetists used different emergency cricothyroidotomy devices on a manikin. The techniques were: a. Seldinger b. Trochar c. Cannula with jet ventilation and d. Scalpel with Endotracheal Tube. Participants received standardized training. Each participant performed each technique on 5 occasions. The first 4 attempts were performed in the same session and the 5th one month later in order to examine skill retention. Outcome measures were time to successful ventilation, technical complications, participant confidence and preference after the study.

Complications

Complication	Cannula N (%)	Scalpel N (%)	Seldinger N (%)	Trochar N (%)	P Value
Kinking	8 (12.0)	0 (0.0)	4 (6.0)	1 (1.5)	0.006
Retrograde Intubation	0 (0.0)	4 (6.0)	4 (6.0)	2 (3.0)	0.206
Wrong Jet Setting	1 (1.5)	n/a	n/a	n/a	n/a

n/a: not applicable



Results and Discussion: The time taken on the 1st attempt was slowest in the Seldinger technique. The rank order was Seldinger (154 ± 14 sec) > Trochar (85 ± 8 sec) > Needle (74 ± 13 sec) > Scalpel (68 ± 5.2 sec). The Seldinger technique took longer than all other techniques on all attempts. Time to ventilation improved in all techniques with practice. Significant improvements did not occur until the 3rd attempt in Seldinger, Scalpel and Cannula techniques. There were no differences between the Scalpel, Cannula and Trochar techniques at any time. The rank order of preference by participating anaesthetists after participation was Scalpel (38.1%), Trochar (33%) Cannula (14.3%) and Seldinger (14.3%). There was no change in outcomes at 1 month.
Conclusion(s): In a manikin study, performance and confidence of emergency oxygenation via the CTM improved with practice. The Seldinger technique consistently resulted in the longest time to successful ventilation.

19AP1-3

Adult airway dimensions in the 21st century

M. Erwteman, J. Hering, S. Loer, C. Boer

Anesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: Since the 19th century, the stated human trachea length has remained constant in leading anatomical textbooks (10–12 cm), while reported body length has increased over time. Particularly, the average length of the Dutch man has progressively increased over the last century from 169 to 183 cm. Earlier studies showed that body and trachea length are closely related, and it is therefore to be expected that the modern man has an increased trachea length as compared data from one century ago, which has consequences for the length of perioperatively applied endotracheal tubes. In this study we therefore sought to determine the length of the trachea in adults and hypothesized that the average trachea length has increased as compared to descriptions in leading textbooks.
Materials and Methods: In this study, trachea length (TL) and vocal cord to teeth distance (VCTD) were determined by tracheascopy in orally intubated patients under general anesthesia. The patient population was further divided in patients with a body length resembling the 'historical' average (169 cm ± 5 cm) and a 'modern' length (183 ± 5 cm) and performed further analysis. Values are represented as mean ± SD and analyzed by ANOVA.
Results and Discussion: Preliminary results in 36 patients (15 males/21 females) aged 47 ± 17 years showed mean values of body length, weight and body mass index (BMI) of 176 ± 9 cm, 80 ± 14 kg and 26 ± 4.0 m2/kg, respectively. The mean TL and VCTD were 13.1 ± 1.8 cm and 12.6 ± 1.4 cm. Interestingly, we only found a weak correlation between body length and TL ($r = 0.34$; $P = 0.044$) whereas the sum of TL and VCTD was moderately associated with body length (0.58; $P = 0.001$). Patients in the 'historical' body length category had a TL of 12.7 ± 1.5 cm, which is and 'modern' body length category (13.5 ± 2.2 cm). However, both groups differed with respect to vocal cord to teeth distance ($P = 0.02$).
Conclusion(s): Vocal cord to teeth distance showed a stronger relation with body length as compared to trachea length. The mean trachea length of patients with a comparable body mean body length as one century ago seemed to be increased.
Reference:
Cherng CH, Wong CS, Hsu CH, Ho ST: Airway Length in Adults: Estimation of the Optimal Endotracheal Tube Length for Orotracheal Intubation. J Clin Anest 2002;14: 271–274.

Chong DYC, Greenland KB, Tan ST, Irwin MG, Hung CT. The clinical implication of the vocal cords-carina distance in anaesthetized Chinese adults during orotracheal intubation. Br J Anaesth 2006;97:489–495.

19AP1-4

Airway management and preoperative assessment: Effect of the development and difusion of a new algorithm. A multicentric prospective study in Catalonia

R. Valero, A. López, V. Mayoral, S. Sabaté, QUAVA Group

Anesthesiology, Societat Catalana d'Anestesiologia, Reanimació i Terapèutica del Dolor, Barcelona, Spain

Background and Goal of Study: Difficult airway (DA) is the main cause of anaesthesia morbidity and mortality. Adequate airway assessment and management is one of the cornerstones of anaesthesia quality control. We evaluated the effect of the introduction of an algorithm for preoperative airway evaluation (PAE) and airway management (AM) in the anaesthesiologist community in Catalonia. This study is part of the QUAVA collaborative project to improve patient safety in anaesthesia AM.
Materials and Methods: A prospective multicentre cohort study was conducted in 21 hospitals in two phases. During 2 weeks all the adult patients requiring AM through general anaesthesia were included. A comprehensive preanaesthesia records review was performed based in Arné score (1). The AM procedure used, degree of difficult laryngoscopy and complications related to AM were recorded. Subsequently, a two-month period of education and diffusion of a new algorithm for PAE and AM was conducted. Finally, another 2-week study period was repeated to analyse the effect of the educational project.
Results and Discussion: 3753 patients were studied. PAE improved significantly in all the parameters analysed (overall increment of assessment of 24%). DA prediction increased from 10% to 13% after the educational project. Direct laryngoscopy and LMA were used in 81% and 13% of patients. Difficult laryngoscopy was registered in 7.7% and 8.6% of the patients in each phase. Non-predicted DA decreased from 4.1% to 3%. The algorithm was not followed in 12% of the non-predicted DA cases in the 1st phase but just in 2.5% of the 2nd phase. However, 55% and 59% of the anaesthesiologists in each phase did not follow the algorithm for predicted DA. Macintosh Laryngoscopy was the most used technique in both phases followed by fiberscope intubation (17%). In 7.4% and 8.5% of the predicted DA, a failure in the first chosen technique for AM was recorded in each phase. Complications appeared in 5.6% of patients and did not decrease between both phases: hypertension or arrhythmia in 3%, teeth or mucosa trauma in 2%, low SpO_2 in 0.9%. No major complications related to AM were recorded.
Conclusion(s): The development and diffusion of an algorithm for PAE and AM helps to improve the airway assessment and reduce the incidence of unexpected DA, although do not reduce the incidence of complications derived of AM. However, the adherence to algorithm in case of predicted DA remains poor and more efforts have to be done to change anaesthesiologists attitudes.
Reference:
1 Arné J. Br J Anaesth. 1998;80:140–6.

19AP1-5

Prediction of difficult laryngoscopy using 3 simple bedside tests. Preliminary results

N. Pentilas, A. Glinavou, A. Douma, I. Zogogiannis, B. Dimitriou

Anesthesiology, State General Hospital of Athens "G. Genimattas", Athens, Attica, Greece

Background and Goal of Study: Unanticipated difficult airway intubation can be challenging to anesthesiologist. Numerus investigators have attempt to predict difficult airway by using simlpe bedside tests. Most of the literature uses the Mallampati test, the Thyeomental distance and ratio, the newly appointed Upper lip bite test, mouth opening and motion of the cervival spine. The goal of this study is to enlight more on the predictive value of ULBT alone or with other tests.
Materials and Methods: After an informed consent was obtained 65 patients were enrolled in this prospective observational study. Patients charaterictists were ASA I–III. Exclusion criteria 1)unable to open the mouth 2)unable to sit 3)trauma 4)need for rapid sequence induction 5)edentulous 6)presence of oropharyngeal/laryngeal pathology 7)obvious malformations of the airway 8)recent surgery in the neck area. A single anesthesiologist with 3 yrs experience carried out the evaluation. The following predictive tests were performed on all patients. A)Modified Mallampati Test. B)Ratio of Height to THyromental Distance. C)Upper Lip Bite Test. The laryngoscopic view was classified with the modified cormacklehane 5 grade scale 1,2A,2B,3,4. Difficult airway prediction is with MMT class 3 and 4, ULBT class 3 or RHTMD > = 25cm. Induction of anaesthesia was performed with propofol, fentanyl. Cis-atracurium was administered iv to faciliate endotracheal intubation. When the patient was fully relaxed and in optimum sniffing position, another anesthesiologist with at least 5 yrs experience and more than 1500 intubations who was not informed of the preoperative values, carried out the laryngoscopy and assesed difficulty of laryngoscope at intubation.

Results and Discussion: Difficult intubation cormack-lehane grade 2b,3,4 ocurred in 6 patients (9,375%). For the MMT sensitivity = true positives/true positives + false negatives = 85,7% whilst spesificity = true negatives/true negatives + false positives = 74,1% and accuracy true positives + true negatives/all intubations. For the ULBT the values were 85,7%, 94,8%, 95,3% respectively, while for the RHTMD with a cut off for difficult airway pridiction of 25 the values were 85,7%, 74%, 76%.
Conclusion(s): The search for a predictive bedside test with sensitivity, spesicifity and accuracy continues. The ULBT seems not enough to ensure a comlete prediction but it is simlpe, fast and it contributes to other tests to raise the pridictive values. More studies have to be performed to clarify the predictive role of ULBT in the field of preoperative airway evaluation.

19AP1-6

Incidence of difficult facial mask ventilation in patients with lipodystrophy due to antiretroviral therapy

M. Torres, A. Fernández, F. Gilsanz

Anesthesiology, Hospital la Paz, Madrid, Spain

Background and Goal of Study: HIV- associated lipodistrophy is a frequent consequence of antiretroviral therapy and has been associated with lipohipertrophy (neck, trunk, breast) and lipoatrophy (facial, extremities) (1). Our aim was to analyse the difficulty in facial mask ventilation in patients with big deposits of fat around the neck and analyse if some specific variables for HIV treated patients could lead us to predict the difficulty.
Materials and Methods: After local ethical committee approval we performed a prospective observational study of 15 patients (ASA 1–3) undergoing ultrasonic-assisted liposuction of the neck due to antiretroviral therapy. Preoperative assessment included demographic data, body mass index, time with HIV infection, years under antiretroviral therapy, years with lipodystrophy, presence and graded of facial lipoatrophy, previous records of airway management problems, Mallampati classification, range of head and neck motion and measurement of the thickness of the neck with tape measure. After induction of anaesthesia the patients were ventilated by senior anaesthetists and difficulty with facial mask ventilation were graded in four categories. We described the reason of the difficulty. The total amount of fat aspirated were recorded.
Results and Discussion: 2 patients were lipoaspirated on the anterior side of the neck, 10 on the posterior side and 3 on both anterior and posterior side. Patient demographics were similar for both groups. The mean BMI was 26,57 kg/m^2, the mean years under antiretroviral therapy was 13 years, years with lipodystrophy 5,5 years. The thickness of the neck was bigger than 40 cm in 70% of the patient and facial mask ventilation was difficult in 46,7%. The reason of the difficulty was bad fitting of the mask in 90% of the patients.
Conclusion(s): Mask ventilation is more difficult in patients with lipodistrophy of the neck due to retroviral theraphy.
Reference:
1 Hultman CS, McPhail LE, Donaldson JH, Wohl DA. Surgical management of HIV-associated lipodystrophy: role of ultrasonic-assisted liposuction and suction-assisted lipectomy in the treatment of lipohypertrophy. Ann Plast Surg 2007; 58(3): 255–263

19AP1-7

Prediction and management of difficult airway in mentally handicapped patients in dentoalveolar surgery

L. Penide Villanueva, E. Terradillos Martín, C. Almaraz Santiago, J. Aguilar, A. Alonso

Anestesiología y Reanimación, Hospital General Universitario Gregorio Marañon, Madrid, Spain

Background and Goal of Study: Frequently, mentally disabled people need, even several times in their life, dentoalveolar surgery under general anesthesia for health dental care. The limited collaboration of disabled patients in the preoperative evaluation do not allow the exploration (Mallampati, Thyromental distance, Opening mouth, Mandibular protrusion and Neck mobility), the craniofacial abnormalities (macroglossia and cervical spine inestability, essentially) and malformations of the airway determined a possible difficult airway (DA) not expected. Our goal is to investigate if the indicence of difficult airway in disabled people is more than general population in dentoalveolar surgery and if score preoperative evaluation can to predict correctly DA in mentally disabled people.
Materials and Methods: This was a prospective clinical study with 60 patients divided in two groups. First group: 30 cases with intellectual disabilitis (ID) (17 Trisomy 21,5 Turner,3 Cri du Chat,2 Goldehar,3 other cromosome syndromes). Second group: 30 control cases. Both undergone dentoalveolar surgery with general intravenous anesthesia and endotracheal intubation (induction with volatile agents when intravenous cannulation was not possible). The characterists of pacients in both groups were similar in sex, age, height and ASA, an therefore, comparable. We used the same score preoperative (Ganzouri Risk). We investigated the incidence of DA in each group, and the accurancy of the score preoperative to predict DA with Cormack and Lehane scale.
Results and Discussion: The overwall incidence of DA on first group was 2%, and second group was 1.5%. Difficult ventilation was higher incidence in disabled people (mask ventilation inadequate, inestable, impossible) ($P < 0.05$). Difficult intubation (Cormack III–IV) was similar in both groups. The contol group had less postoperative complications (trismus). The results indicate with patients with ID need higher doses of propofol. We find a statistic association between the score test (Ganzouri) and difficult intubation (Cormack) in both groups. (12 ID cases was not possible collaboration in Mallampati test).
Conclusion(s): We concluded that pacients with ID are associated with a more difficult ventilation in connection with craniofacial deformities than the general population, difficult intubation is seen with similar frecuency in both groups. Test preoperative evaluation is acceptable to predict difficult airway in people with ID when they collaborate, but when the exploration is not possible we must anticipated a possible DA not expected.

19AP1-8

Preliminary data on anticipation of the difficult airway. The preoperative airway assessment form as an educational and quality improvement tool

D. Cattano, Y. Khalil, S. Sridhar, C. Smallwood, C. Hagberg

Department of Anesthesiology, The University of Texas Health Science Center at Houston, Houston, Texas, USA

Background and Goal of Study: An unanticipated difficult airway situation is a potentially disastrous one for a patient, so prediction of difficulties is critically important in preventing harm to patients. We have developed a new preoperative airway assessment form to help focus the airway assessment toward factors associated with airway difficulty[1]. This study is designed to compare the use of that form to a commonly used assessment.
Materials and Methods: We randomized resident anesthesiologists to use either the new airway assessment model (new form) or a standard preoperative evaluation (old form). Additionally, all patients underwent an evaluation using the new form by a skilled provider dedicated to airway assessment. We excluded patients less than 18 years of age and those with established airway access. Physical exam assessed body mass index, neck circumference, inter-incisor, thyromental, and sternomental distances, and standard Mallampati class. Additionally, cervical and jaw mobility and history relating to the airway were assessed. Data on the results of all airway interventions and the presence of any difficulties was collected.
Results and Discussion: Pre- and post-operative evaluations were performed on 880 patients, including 373 from residents who completed the old form. Residents using the new form predicted difficulty with a false negative prevalence of 7.2% and a false positive prevalence of 13.1%; those who used the old form who had a false negative prevalence of 12.8% and a false positive prevalence of 10.7%. The skilled provider had false negatives of 4.6% and false positives of 12.7%. The residents using the new form predicted difficulty with false negatives in mask ventilation of 7.9%, in laryngoscopy of 7.6%, and in intubation of 10%. This is compared to false negatives for the skilled provider of 3.9%, 2.9%, and 1.5% respectively.
Conclusion(s): Our results suggest that performing a more thorough airway evaluation using a systematic approach may increase the chance of successfully predicting a difficult airway. Given the relatively rare nature of airway difficulty, even a small decrease in false negative predictions by those using the new form may prove to increase preparedness and benefit patient safety. Additionally, the new form may be a useful tool in resident education, as those using the new form had less false negative predictions and missed less difficult airways.
Reference:
1 The American Society of Anesthesiologists. Practice Guidelines for Management of the Difficult Airway. Anesthesiology 2003; 98:1269–77.

19AP1-9

The Cormack-Lehane classification: Commonly used but sparsely known?

P. Schober, R. Krage, D. van Groeningen, S. Loer, L. Schwarte

Department of Anaesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: The Cormack-Lehane classification [1] is broadly used in anaesthesia to describe intubating conditions during direct

laryngoscopy. Therefore, anaesthesiologists should be well familiar with this classification, which distinguishes four grades based on the visibility of the glottis and epiglottis. In a pilot survey, the majority of anaesthesiologists claimed to know this classification, however detailed knowledge was actually only present infrequently. We therefore hypothesized that anaesthesiologists are insufficiently familiar with the Cormack-Lehane classification despite its widespread use.

Materials and Methods: 93 specialist anaesthesiologists (age 45 ± 9) from 38 nations were anonymously interviewed with a standardized questionnaire at an international anaesthesia congress. First, we tested whether any classifications were known at all to describe visibility during laryngoscopy. Subsequently, interviewees were specifically asked about the Cormack-Lehane classification and were requested to define all four grades.

Results and Discussion: 83 out of 93 anaesthesiologists (89%) claimed to know a classification to describe the visibility of laryngeal structures during laryngoscopy, however only 46 (49%) were able to name a correct classification. In all 46 cases the Cormack-Lehane classification was named, whereas other classifications were not mentioned. When specifically asked, 73% of the interviewed subjects stated to know the Cormack-Lehane-Classification. While 51% were able to define grade I correctly, only 39%, 27% and 29% of the anesthesiologists could correctly define grade II, III and IV respectively. Merely 22% of the medical specialists was able to define all four grades correctly.

Conclusion(s): Although documentation of intubating conditions is regularly performed in anaesthesiologic practice, less than one half of the interviewed anaesthesiologists could name a classification to describe the visibility of laryngeal structures during laryngoscopy. About two thirds of interviewees claimed to know the Cormack-Lehane classification, however only one fifth was able to define all grades correctly. These data show, that the Cormack-Lehane classification is known only to a minority of anaesthesiologists in detail despite its widespread use.

Reference:

1 Cormack RS, Lehane J. Anaesthesia 1984;39:1105–11.

19AP1-10

A preliminary survey of patients with difficult airway at a major urban hospital

D. Cattano, S. Sridhar, Y. Khalil, A. Chen, C. Hagberg

Department of Anesthesiology, The Unviersity of Texas Health Science Center at Houston, Houston, Texas, USA

Background and Goal of Study: The American Society of Anesthesiologists (ASA) has proposed several patient characteristics of potential concern in evaluating a patient with a difficult airway[1], many of which we have implemented into a new preoperative evaluation form.

Materials and Methods: After Institutional Review Board approval, we approached patients to perform a preoperative assessment. We excluded patients less than 18 years of age and those with established airway access. Physical exam assessed body mass index (BMI), neck circumference, inter-incisor, thyromental, and sternomental distances, and standard Mallampati class. Additionally, cervical and jaw mobility, and history relating to the airway were assessed. Resident anesthesiologists were randomized to perform either this new assessment or the standard preoperative airway assessment at our institution. Postoperative data was collected, including the results of all airway interventions and the presence of any difficulties.

Results and Discussion: We have screened 1832 patients with the new preoperative airway assessment model. Although 969 males and 863 females were screened, we collected postoperative information on 880 patients. Of the 1832 patients, the mean age was 47.72 ± 16.7 years and mean BMI was 29.33 ± 8.1 kg/m^2. 38 patients (2.1%) reported a history of difficult airway and were significantly different from those with no airway difficulty in BMI (28.07 ± 7.0 vs. 31.81 ± 8.7, $p = 0.01$), neck circumference (38.83 ± 4.4 vs. 43.13 ± 7.0, $p < 0.01$), and inter-incisor distance (4.44 ± 0.8 vs. 3.82 ± 1.0, $p < 0.01$). They also tended to have less cervical and jaw mobility, shorter neck, and a higher Mallampati class. When postoperative information was analyzed, difficult mask ventilation was encountered in 64 (7.3%), difficult laryngoscopy in 47 (5.3%), and difficult intubation in 57 (6.5%).

Conclusion(s): There has not been a unifying consensus on what qualities are most predictive of patients with a difficult airway. Our preliminary analysis suggests that age, BMI, Mallampati class, cervical mobility, jaw mobility, and neck size are all important qualities to consider in airway assessment, but the predictive value of each is unclear. In any case, a thorough history and physical should be performed as part of any preoperative airway assessment.

Reference:

1 The American Society of Anesthesiologists. Practice Guidelines for Management of the Difficult Airway. Anesthesiology 2003; 98:1269–77.

19AP2-1

The gastro laryngeal tube: Preliminary report

L. Gaitini, M. Somri, B. Yanovski, R. Tome, S. Vaida

Anesthesiology, Bnai Zion Medical Center, Haifa, Israel

Background and Goal of Study: Endoscopic retrograde cholangiopancreatography (ERCP) is performed under general anesthesia with endotracheal intubation, deep sedation or conscious sedation. General anesthesia with the airway protected by an endotracheal tube increases safety and prevents pulmonary aspiration but demands the use of muscle relaxants. The Gastro Laryngeal Tube (GTL) (VBM Medizintechnik GmbH, Sulz, Germany), is a new version of the Laryngeal Tube (LT) that allows ventilation and the use of a gastrointestinal endoscope while protecting against aspiration. It is an extraglottic device with two lumens for: a) protection of the airway and control of ventilation and b) insertion and advancement of a flexible fiberoscopic endoscope. The GLT has two cuffs: a distal esophageal and a proximal pharyngeal cuff. The endoscopic channel has an internal diameter of 16 mm and enables the insertion and the use of gastrointestinal endoscope with a maximum external diameter of 13 mm. This channel has an internal water lubricated film that minimizes friction caused by the insertion and movement of the endoscope. This study assesses the safety and efficacy of GTL as a ventilatory device and the possibility to perform ERCP through the endoscopic channel.

Materials and Methods: After obtaining informed consent GLT was inserted in 20 patients scheduled to undergo ERCP. The patients were anesthetized with Midazolam, Fentanyl, and Propofol. No muscle relaxants were used. Standard monitors were used. The GLT was inserted with a technique similar to the LT. After confirmation of proper positing of the GTL the patients were positioned in lateral left position and the anesthesia maintained with continuous infusion of propofol. The patients were allowed to breath spontaneously during the procedure.

Results and Discussion: GTL was inserted successfully in all patients. The ERCP procedure was performed successfully in all patients though the endoscopic channel of the GTL, with a mean duration of 33 ± 12 min. Oxygenation and ventilation were successful in all patients with a SpO_2 of 98 ± 0.5% and the mean $ETCO_2$ of 44 ± 8 mm Hg. One patient complained of sore throat that disappeared after 24 Hrs.

Conclusion(s): This preliminary study suggests that the GLT could be an efficient device to perform ERCP under general anesthesia without the use of muscle relaxants, preventing hypoventilation and desaturation caused frequently by the obstruction of the airway by the endoscope. The distal cuff that blocks the esophagus also reduces the risk of pulmonary aspiration.

19AP2-2

Airway morbidity with the Proseal-Laringeal Mask Airway® vs. endotracheal tube

J. Balaguer, M. Richart, M. Estruch, J. Soliveres, C. Solaz

Anaesthesia and Critical Care, University Hospital Dr Peset, Valencia, Spain

Background and Goal of Study: Classic laryngeal mask airway (LMA) is worlwide used for airway management (1). Proseal LMA (PLMA), may be safer than LMA. LMA produces lower sore throat incidence than endotracheal tube (ETT). The incidence of postoperative sore throat when using a PLMA compared with ETT is not well studied. The aim of this double-blinded study is to compare airway morbidity between those two devices.

Materials and Methods: After local ethics committee approval, 60 consecutive ASA I-II patients scheduled for less than three hours surgery under general anaesthesia were randomly allocated to airway management with ETT or PLMA by means of sealed envelopes. No patient was premedicated. Predicted difficult airway management, body mass index greater than 30 and ORL surgery patients were excluded. The anaesthesia was induced with propofol 2,5mg kg^{-1}, fentanyl 2 mcg kg^{-1} and cis-atracurium. Both devices were inserted according to manufacturer's instructions. Anaesthesia was maintained with sevoflurane 1,5–2% in oxygen and fentanyl on demand. After surgery, when the patients arrived to the recovery room, were asked by an anaesthesiologist blinded to the device used for sore throat, dysphagia and dysphonia (presence/absence). Chi square test or Fisher's exact test and Student's t test were used as appropiate. A $p < 0,05$ was considered significant.

Results and Discussion: Demograhic data are shown in table 1. Patients and surgery time were similar in both groups. One patient in the ETT was excluded because of unknow difficult airway management. Results are shown in table 2. Althrough the significance of sore thorat between the two devices is $p = 0,051$, we believe that sore throat incidence is lower in PLMA, but more cases could be required for confirmation.

Conclusion(s): PLMA produces less airway morbidity than ETT.

Reference:

1 Curr Opin Anaesthesiol 2002;15:627–33

Table 1.

	Age (yrS)	Sex (M/F)	Weight (kg)	Height (cm)
ETT	52 (20,1)	13/16	72,7 (9,1)	163,2 (12,7)
PLMA	49 (22,3)	12/18	66,3 (6,2)	158,1 (9,5)

Data show mean (SD) or number. p > 0,05.

19AP2-3

The use of a flexible laryngeal mask airway as an alternative to nasotracheal intubation in dentoalveolar surgery

K. Pelikán, L. Dadák, V. Šrámek, K. Kanovská, L. Pantucek

Faculty of Medicine, Universitas Masarykiana Brunensis, Brno, Czech Republic

Background and Goal of Study: Nasotracheal intubation (NTI), the traditional method of airway management in dentoalveolar surgery, has been connected with very high postanesthesiological morbidity.[1] The Flexible Laryngeal Mask Airway (FLMA) seems to be, for the patient, a safer, more comfortable alternative to NTI[2].

Materials and Methods: We studied prospectively 47 paediatric cases (December 2007–July 2008) undergoing dentoalveolar procedures in general anesthesia. Induction: volatile–sevorane (28%) or intravenous–midazolam, sufentanil, propofol (72%). FLMA was used in all cases, cuff pressure 40cm H_20, (checked routinely by manometer). PCV, O_2/air, isofluran, minimal flow, etCO_2 between 5,0–5,5. All surgeons were educated in how to change the position of the LMA flexible tube and mouth gag during the procedure. No technical problems arose. Removal of the FLMA after operation was carried out in fully awakened and cooperative children with recovered upper airway protective reflexes. All the FLMA were removed with inflated cuff–this being the simplest way of cleaning the upper airway of blood after the operation.

Results and Discussion: Data presented as median (min; max). We studied 47 children (M/F 22/25); age 10 (3;17); weight 36kg (14; 82); height 149cm (106; 182). FLMA No.2,5: 18x; No.3: 20x; No.4: 7x; No.5: 2x. were used. Ventilation time with FLMA 101 min (50; 176). Perioperative complications: 2 patients: Correctable obstruction of airway after manual depression of mandible made by surgeon in one case, difficult placement (3rd attempt)- wrong palatopharyngeal angle in cleidocranial dysplasia. All procedures were finished with FLMA in situ, there was perfect protection against aspiration of blood from above. Internal parts of all the FLMA were clean. There were no complaints from surgeons concerning perioperative comfort. The postoperative period went smoothly, epistaxis or vomiting of blood was not observed.

Conclusion(s): The FLMA has been a safe method of choice in mouth and throat surgery in children since 1990[2]. It allows surgical comfort and increases operation theatre turnover. The use of the FLMA is not connected with anesthesiological postoperative morbidity in contrast to the use of NTI[1].

Reference:

1 O'Connell JE, Stevenson DS, Stokes MA. Pathological changes associated with short term nasal intubation. Anaesthesia 1996,51,347–350.
2 Alexander CA. A modified Intavent laryngeal mask for ENT and dental anaesthesia. Anaesth4esia 1990,45,892–893.

19AP2-5

Difficult airway management in urgency/emergency situation with intubating laryngeal mask (ILMA)

J. Nieto, I. Vives, M. Paños, P. Martínez, J. Roigé

Anesthesiology, Vall d'Hebron University Hospital, Barcelona, Spain

Background and Goal of Study: Cannot intubate, cannot ventilate (CI,CV) it's urgency/emergency situation. ILMA™ (intubation laryngeal mask) was designed specifically to facilitate tracheal intubation while maintaining ventilation(1). If failure at intubation occurs owing to an unrecognized difficulty with conventional laryngoscopy, tracheal intubation with flexible fiberscope can be more easily achieved through a laryngeal mask airway (LMA) or an ILMA(2). Our goal is to shown that ILMA was considerate ideal technique by ventilation/intubation in different places of our hospital.

Materials and Methods: From January 2002 until November 2008, 467 call phone were done to anesthesia team. 58 were patients with difficult airway management (CI,CV): 10 bleeding upper airway postsurgery cervical arthrodesis, 8 morbid obesity post orthopedic urgery, 22 total Knee arthroplasty, 6 politraumatics (2 neck trauma), 4 burnt patients, 2 cerebral haemorrhage, 4 ankylosing spondylitis (2 tracheostomy cannula came out), 2 members of the patient's family. We placed ILMA without sedation, when ventilation was obtained sedation was administrated. If not obtained intubation to the first attempt, we realized alignment maneuver before to realize second attempt.

Results and Discussion: ILMA was placed all cases at first attempt. 52 patients were blind intubated to the first attempt; 6 cases at the second attempt after alignment maneuver. All cases were obtained ventilation/intubation with ILMA without needed fiberscope. Two patients with ankilosing spondylitis which tracheostomy cannula came out, wasn't possible facial mask ventilation nor intubation with fiberscope flexible but was possible ventilation/intubation to the first attempt with ILMA.

Conclusion(s): ILMA showed to be easy, quick and effective in the control in difficult airway without to need sedation in patients CI,CV in different scenarios and situations in our Hospital. Alignment maneuver showed to be useful to achieve intubation.

References:

1 Caponas G et al. Anaesthesia and Intensive Care 2002; 30: 551–69.
2 Guarino A et al. Minerva Anestesiol 2007Nov;73(11):555–7.

19AP2-6

Comparison between intubation through ILMA and Airtraq, in different non-conventional patient positions. A manikin study

E. Amaniti, V. Grosomanidis, K. Karakoulas, K. Mouratidis, D. Vasilakos

Anaesthesia and Intensive Care, AHEPA University Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece

Background and Goal of Study: Prehospital airway management emerges difficulties, especially in the trapped casualty, where patient position excludes certain techniques, as classic laryngoscopy. Goal of the present study was the comparison of two alternative intubation techniques, intubation through laryngeal mask airway (ILMA) and intubation using Airtraq laryngoscope, in different patient positions, using a manikin.

Materials and Methods: After a brief practice, ten anaesthetists, attempted intubations of the SimMan® Laerdal® Manikin, using ILMA or Airtraq laryngoscope. Each participant performed intubations in four different manikin positions, i.e. standing behind the manikin (sup), standing ahead and facing manikin's head (fac), facing manikin in the sitting position (sit) and in the lateral decubitus position (lat). The two different intubation techniques were compared, regarding time needed for successful intubation, number of attempts needed for intubation and dental trauma, estimated by audible teeth clicks. Statistical analysis was conducted using Kruskal Wallis, Mann Whitney U and Fisher's exact tests. Level of significance was set at p < 0.05.

Results and Discussion: Intubation through ILMA was significantly faster that Airtraq in the fac position, while Airtraq intubation was faster, compared to ILMA, in the lat position (Figure 1). Comparisons between ILMA and Airtraq in the sup and sit positions didn't show significant differences (p > 0.05). Regarding number of attempts, Airtraq intubation in the sit position was performed with significantly greater number of attempts, compared to ILMA (table 1). Comparison between ILMA and Airtraq techniques in the sup, fac and lat positions, didn't reveal any difference (p > 0.05). Moreover, Airtraq intubation lead to 2 audible clicks in fac position.

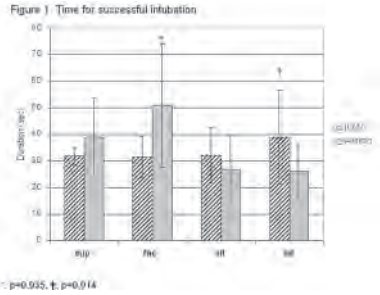


Table 1. Number of attempts

Attempts	sup	fac	sit	lat
1	10/7	10/6	10/3§	6/3
>1	0/3	0/4	0/7	4/7

§: p = 0.0031 Airtraq vs. ILMA

Conclusion(s): Using a simulation model, the present study demonstrated that both ILMA and Airtraq may be used as alternative techniques for the management of compromised airway, when patient position, especially in the trapped casualty, didn't allow direct laryngoscopy.

19AP2-7

Comparative study of the LMA Supreme with the LMA ProSeal in unparalysed anesthetized patients

A. Saint-Pol, B. Richez, A. Soulard, B. Julliac, A. Cros

Anesthesia-Reanimation 4, Universitary Hospital, Bordeaux, France

Background and Goal of Study: LMA-Supreme (SLMA) is a new, single-use, latex-free, laryngeal mask airway with gastric access. The LMA supreme and LMA ProSeal (PSLMA) were compared in 117 patients in a prospective randomized study.
Materials and Methods: After approval of our IRB and informed consent was obtained, patients (ASA 1–3), undergoing minor routine gynecologic surgery, standardised anesthesia was induced. Patients were allocated with the SLMA (n = 60) and PSLMA (n = 57). The devices were inserted by an experienced anesthesiologist; cuff inflation was performed to obtain a 60 cm H_2O pressure, as recommended by the manufacturers. Ventilatory parameters were set to obtain 8 ml/kg end tidal volume and $PetCO_2$ of 40 ± 5 cm H_2O. We have recorded ease of insertion and number of attempts, leak pressure, peak pressure, complications after insertion and removal, ventilatory parameters and ease of nasogastric tube insertion. Patients were asked about sore-throat, dysphonic and dysphasia.
Results and Discussion: There were no differences in demographic data between groups. First insertion success rate (89.4% and 92% in SLMA and PSLMA groups) and overall insertion success rate (100% in both groups). Average leak pressure (29 ± 7 cm H_2O with SLMA and 31 ± 5,5 cm H_2O with PSLMA) and peak pressure (12,5 ± 3,3 cm H_2O with SLMA and 12,6 ± 3,7 cm H_2O with PSLMA), ventilatory parameters were similar in the two groups. Gastric tube is easily inserted in 100% of cases in both groups. The number of patient with complications is similar in the two groups. Only the rate of sore-throat is superior in the LMA supreme group (8/61 with the supreme and 1/57 with the LMA ProSeal). 3 laryngospasm occured with the SLMA during this study.
Conclusion(s): SLMA and PSLMA are both easy to insert and allow safe positive pressure venilation. The rate of sore throat is superior with the SLMA.

19AP3-1

Simple and efficient technique to reduce the use of a Magill forceps in nasotracheal intubation

D. Nathalie, D. Vandeput, D. Thierry, E. Vandermeersch, F. Luc

Anaesthesiology and Intensive Care, O.L.V. Aalst, Aalst, Belgium

Background and Goal of Study: The use of a Magill forceps (MF) to facilitate nasotracheal intubation (NTI) is reported to vary between 60 and 66%. We hypothesise that laryngoscopy with a Cormack-Lehane grade 2 (posterior portion glottis, CL grade 2) exposure of the glottis can reduce the need for a MF, because it results in better alignment of a nasally introduced tube with the larynx.
Materials and Methods: After IRB approval, 150 patients presenting for dental or maxillofacial surgery were randomly allocated to one of two groups (n = 75 each). After induction of anaesthesia (propofol, sufentanil, mivacurium/rocuronium and a nasal vaso-constrictor), all patients were subjected to a full direct laryngoscopy (CL grade 1). Thereafter, NTI was attempted in group 1 with a"full" laryngoscopy (CL grade 1), and in group 2 with a "half" direct laryngoscopy (CL grade 2). In each patient 2 attempts for NTI without MF, followed by 2 attempts with were allowed. An unpaired T-test and a Fischer's exact test were used for statistical analysis. A P-value < 0.05 was considered significant.
Results and Discussion: Eleven patients could not be graded CL grade 1 at the start and were excluded from the study. Of the remaining 139 patients, 66 were assigned to Group 1 and 73 to Group 2. The groups were similar with respect to age, sex, weight, height, ASA status. NTI without a MF was possible in 70 of 73 patients (95%) in Group 2 vs 29 of 66 (44%) in Group 1 (P < 0.0001). In Group 1 only 19/66 (24%) of patients could be intubated without a MF at the first attempt vs 64/73 (87%) in Group 2 (P < 0.0001)(Table 1). Epistaxis with the need for suction to allow a clear laryngeal view, occurred in 5 patients (3.6%). CL grade 2 exposure of the glottis is a simple technique to improve alignment between larynx and nasal tube, and allows NTI without a MF more frequently than reported in the literature. Why should MF be avoided? Although this maneuvre is not routine use, it is often the learning method for trainees. There are several disadvantages of Magill forceps, such as risk of injury to the mucous membrane, the necessity of readjusting the forceps when placing the NTT and danger of cuff perforation.

Table 1.

	Without MF	1st attempt MF
Group 1 (%)	44	24
Group 2 (%)	95	87

Conclusion(s): Adjusting the laryngeal view from a full view of the glottis to a partly exposed glottis (CL grade 2), significantly reduces the need for a MF during NTI. Also, CL grade 2 exposure of the glottis allows NTI at the first attempt in significantly more patients compared to CL grade 1.

19AP3-2

I-gel supraglottic airway use for general anaesthesia in urological patients

J. Norkaitis, S. Vosylius

Clinic of Anaesthesiology and Intensive Care, Vilnius University, Vilnius, Lithuania

Background and Goal of Study: i-gel (Intersurgical UAB, Lithuania), is a single use, supraglottic airway management device with a no inflatable cuff and an oesophageal vent to allow ease of insertion. It has been designed to maintain airway patency for mechanical ventilation, to create a good anatomical seal of the pharyngeal, laryngeal and perilaryngeal structures whilst avoiding compression trauma. The goal of the study was to evaluate i-gel as alternative to tracheal intubation to conduct general anaesthesia during surgery for urological patients.
Materials and Methods: In this prospective, observational study, we evaluated i-gel in 206 consecutive patients undergoing urological surgery. On arrival in the operating room, continuous monitoring with ECG, non-invasive blood pressure and pulse oximetry was commenced and a suitable vein cannulated. All patients received a standardized general anaesthetic consisting of propofol 3–4 mg/kg or thiopental 5–6 mg/kg, fentanyl 0,1–0,2 mg, atropine 0,5–1,0 mg and maintenance of anaesthesia with oxygen 50% in nitrous oxide and isoflurane or sevoflurane in gas flow 3–4 l/min during induction. Then gas flow was reduced to 0,7 l/min and continued till the end of anaesthesia.
Results and Discussion: We studied the i-gel in 206 patients (male 149, female 57), mean age (±SD) 55,6 ± 16,6 years. Most common surgical interventions were lithotripsy in 91 patients, and transuretral prostata resection in 39. The risk of anaesthesia was assessed: ASA I in 83, II in 69, and III in 54 of patients. Mean duration of anaesthesia was 83 ± 36 min. 172 (84%) patients had a good hermetic seal of i-gel with anatomical structures. Size 3 i-gel was easily inserted in 16%, size 4 in 61%, and 5 in 23% of patients. Through i-gel airway all patients underwent adequate volume control mode ventilation with airway pressures no higher than 30 cm H_2O. 34 patients had not adequate hermetic seal, so underwent successful endotracheal intubation in 30 patients or insertion of laryngeal mask in 4 patients. These patients were older (63 vs 54 years, p < 0,01) than for the patients with i-gel airway. i-gel airway related complications and patient side-effects were not observed.
Conclusion(s): i-gel was easily inserted, providing an adequate hermetic seal and reliable airway devise in 84% of cases for supraglottic ventilation during general anaesthesia. The study will be continued to assess the reasons of non hermetic seal.

19AP3-3

Success rate of blind intubation through the new supraglottic airway device I-Gel™ compared with the ILMA™ in anaesthetized patients

L. Theiler, M. Kleine-Brueggeney, A. Vogt, N. Urwyler, R. Greif

University Department of Anaesthesiology and Pain Therapy, Bern University Hospital, Bern, Switzerland

Background and Goal of Study: The recently introduced single-use supraglottic airway device i-gel™ features the possibility of fibreoptic guided intubation. Prospective data about blind or fibreoptic guided intubation success rate are lacking. Therefore we performed this prospective RCT to evaluate the success rate of blind endotracheal intubation through the i-gel vs. the gold standard ILMA Fastrach™.
Materials and Methods: 40 patients were randomly assigned to either supraglottic airway device. After placement, we introduced an endotracheal tube without fibreoptic guidance, but under continuous visualization (the fibrescope was kept just at the tip of the tube). If blind intubation was not possible, the fibrescope was advanced and the intubation was accomplished by fibreoptic guidance. Primary outcome was blind first attempt success rate. Further measurements were time to intubate, fibreoptic view of the glottis, airway leak pressure and adverse events. Data are presented as mean ± SD or percentages.
Results and Discussion: Demographic data did not differ between groups (26 males, 14 females, aged 54 ± 16 years, BMI 28 ± 6 kg/m^2). Patients were treated at the ENT (60%), plastic (3%), and neurosurgical departments (37%). ASA status was I in 8%, II in 75% and III in 17%. First blind attempt success rate differed significantly (3 for i-gel, vs. 12 for ILMA, $p = 0.009$). No statistical differences were found for time to intubation, tidal volumes, airway leak pressure and incidence of sore throat. No other adverse events were found.
Conclusion(s): The i-gel can not be used for blind endotracheal intubation in clinical practice. A fibreoptic bronchoscope should be used at all times when endotracheal intubation through the i-gel is attempted.

Primary and Secondary outcomes

	i-gel	ILMA	p-value
Success rate of first attempt blind intubation	3 (15%)	12 (60%)	0.009
Time (sec.)	105 ± 63	76 ± 46	0.253
Tidal volumes (ml)	607 ± 156	574 ± 127	0.269
Airway leak pressure (cm H20, mean ± SD)	26 ± 8	30 ± 6	0.057
Fibreoptic laryngeal view* n (%)	13/2/2/3 (65/10/10/15)	13/4/2/1 (65/20/10/5)	1.0
Epiglottic downfolding n	3	1	0.598
Sore throat	6	3	0.449

* only vocal cords seen/cords and, or arytenoids seen/only epiglottis seen/other (e.g. LMA cuff, pharynx) seen

19AP3-4

Supraglottic airway I-Gel in anaesthesia and sedation for bronchoscopy

V. Mizikov, M. Mustafaeva, Z. Kochneva, N. Levitskaya

Department of Anaesthesiology, Russian Research Center of Surgery, I.M. Sechenov Moscow Medical Academy, Moscow, Russian Federation

Background and Goal of Study: Earlier we used the LMA ProSeal (PLMA) to minimize the reflexogenous effects of the rigid bronchoscope (RB), especially in the final stages of surgical manipulations after RB removal to awareness [1, 2]. In this study we have decided to replace PLMA with I-Gel, a new non-inflatable supraglottic airway device used in general anaesthesia with IPPV and MAC with spontaneous breathing for bronchoscopy with FOB in adult patients, and to evaluate the safety and efficacy of I-Gel in this application.

Materials and Methods: After local ethics committee approval 50 pts (M-28, F-22; ASA I–III) aged 21–74 were divided into two groups depending on TIVA (Prop + Fent + MR) with IPPV (group I, n = 28) or MAC ("Ketofol" – Ket: Prop = 1:4) with spontaneous ventilation (group II, n = 22). In group I I-Gel was inserted after RB removal to awareness; and in group II it was used as a conduit for FOB insertion and examination. Time and number of I-Gel insertion attempts were measured. Haemodynamics, EEG, SpO2 and BIS were monitored. Gas leakage during IPPV was evaluated volumetrically and by auscultation. Right position of the device was controlled visually by FOB.

Results and Discussion: In both groups I-Gel was successfully inserted on the 1-st attempt; mean time required was 7 ± 3 sec. No significant changes in haemodynamics were recorded after I-Gel insertion in all pts. Slight gas leakage noises were auscultated in 30% of the cases right after I-Gel insertion. The noises disappeared 60–120 sec later. We attribute this to the thermoplasticity of the I-Gel seal. Under MAC the pts did not exhibit any undesirable reflexive reaction to the presence of the I-Gel.

Conclusion(s): I-Gel is an effective and safe airway management device in anaesthesia with IPPV and MAC with spontaneous ventilation during bronchoscopic surgery.

References:

1 Mizikov V.,Variushina T., Kirimov U. The laryngeal mask for fiberoptic bronchoscopy in children. British Journal of Anaesthesia 1997; V. 78; Suppl. 2; 37.

2 Mizikov V., Vasilkovskaja N., Rusakov M. et al. Laryngeal mask ProSeal in anaesthesia for bronchoscopy. Abstracts of IX Moscow International Congress of Endoscopic Surgery 2005; 70–72.

19AP3-5

A comparison of two endotracheal tubes for intubation via new I-Gel laryngeal mask

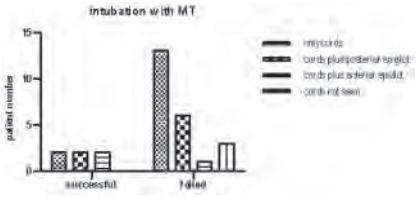
H. Francksen, J. Renner, J. Scholz, B. Bein

Anaesthesiology and Intensive Care Medicine, University Hospital S.-H., Kiel, Schleswig-Holstein, Germany

Background and Goal of Study: The i-gel is a new single-use, noninflatable supraglottic airway (1). Its wider and shorter stem suggest that it may be an ideal conduit for intubation using a fibrescope or blindly. A size 4 i-gel has a channel length of 192 mm and an internal diameter of 12,3 mm and will accept a 6,5–7,0-mm cuffed tracheal tube.

Materials and Methods: After approval of our IRB and written informed consent was obtained, in 49 patients (ASA 1–3), standardised anaesthesia was induced (remifentanil and propofol). A size 4 i-gel was inserted in all patients. The position of the device was controlled using a fiberoptic bronchoscope (FOS) (4 = only vocal cords visible; 3 = vocal cords plus posterior epiglottis; 2 = vocal cords plus anterior epiglottis; 1 = vocal cords not visible but function adequately; 0 = vocal cords not visible and function inadequately). All patients were randomly allocated to an intubation attempt via the i-gel device using either an ID 6.5 mm silicon Portex (PT) or an 6.5 mm Mallinckrodt ETT (MT) made of conventional clear polyvinylchloride (PVC). Both ETTs were inserted blindly by a single experienced anaesthesiologist. In 20 patients. the Portex ETT in the other 29 patients, the Malinckrodt ETT was inserted. Failure rate and time to successful intubation were recoded.

Results and Discussion: Fiberoptic control of the position of the devices was comparable in both groups. In the PT-group, intubation was successful in 15 patients (FOS 4-in 7 patients, FOS 3-in 8) and failed in 6 cases (FOS4-in 2, FOS3-in 1, FOS2-in 1 and FOS1-in 1). In MT-group successful intubation was performed in 6 patients (FOS 4-in 2, FOS 3- in 2, FOS 2- in1, FOS 1-in 3) Figure 1 and intubation failed in 23 patients (FOS4-in 13, FOS3-in 3, FOS2-in 1, FOS1-in 3). Successful intubation was significant higher in PT group (P < 0,001). Time to intubation with Portex ETT and with Mallinckrodt ETT was (mean ± standard deviation) 11 ± 9 seconds and 14 ± 8 seconds, respectively.



Conclusion(s): A successful intubation with ETT via i-gel does not depend from fibreoptic score. Significantly higher failed rate suggest, that the i-gel is not suitable for Blind intubation with conventional PVC ETTs.

Reference:

1 Levitan et al.: Anaesthesia 2005; 60:1022–6.

19AP3-6

The supraglottic airway I-gel™ in comparison with LMA-ProSeal™, LMA-Classic™ in clinical practice

Y. Cheong, W. Shin, H. Yang, T. Nishiyama

Department of Anaesthesiology and Pain Medicine, University of Ulsan College of Medicine, Asan Medical Center, Seoul, Republic of Korea

Background and Goal of Study: I-gel is a new supraglottic device without an inflatable cuff, made of thermoplastic elastomer. I-gel is very easy to use, associated with minimal complications, and suitable for difficult airway management. This study was designed to investigate the usefulness of I-gel in comparison with Classic Laryngeal Mask Airway (cLMA) and ProSeal Laryngeal Mask Airway (pLMA) in clinical practice.

Materials and Methods: In this prospective study of multi-center, 131 ASA physical status I–II patients scheduled for orthopedic surgery were included. The patients were randomly assigned to I-gel, pLMA, cLMA groups. Properly sized I-gel (No. 4–5) or LMA (No. 3–4) was selected. We assessed hemodynamic data, maximal leak pressure, tidal volume, success rates and postoperative complications.

Results and Discussion: There was no difference between the three groups with respect to demographic data. Hemodynamic data (mean blood pressure and heart rate) immediately after insertion of devices were similar between three groups. Maximal leak pressure of cLMA group was significantly lower than I-gel and pLMA groups. The success rates at first attempt of insertion were similar among the three devices. There was no difference with respect to the incidence of adverse events, sore throat and bleeding among the three devices.

Patient characteristics and hemodynamics

	I-gel (n = 64)	pLMA (n = 53)	cLMA (n = 14)
Gender (M/F)	29/35	34/19	5/9
Age (year)	42.2 ± 16.3	43.7 ± 15.3	42.9 ± 14.2
Weight (kg)	64.3 ± 16.5	66.3 ± 12.3	60.3 ± 9.5
Height (cm)	167.0 ± 40.0	165.8 ± 9.6	162.9 ± 9.0
MBP0min (mm Hg)	76.5 ± 15.9	78.3 ± 14.8	78.4 ± 10.5
HR0min (beat/min)	62.9 ± 11.4	67.5 ± 14.3	66.6 ± 11.1

Values are mean ± SD. MBP0min, mean blood pressure immediately after insertion of devices, HR0min, heart rate immediately after insertion of devices

Comparison among the three groups

	I-gel (n = 64)	pLMA (n = 53)	cLMA (n = 14)	P value
Attempt (1)	50	47	12	
Attempts (2 or 3)	14	6	2	0.304
Maximal leak pressure (cm H_2O)	27.1 ± 6.4	29.8 ± 5.7	20.7 ± 5.4*	< 0.05
Blood tinged (n)	0	3	1	0.134
Sore throat (n)	5	5	3	0.300

Values are mean ± SD. * P < 0.05 versus I-gel and pLMA groups

Conclusion(s): During anesthesia with controlled ventilation, these three supraglottic airway devices can be used effectively without any adverse events. I-gel has excellent esophageal sealing effect as pLMA. We suggest that the I-Gel could be used an alternative supraglottic device for airway management.

19AP3-7

Intubation time and use of laryngoscope blades in a difficult intubation manikin

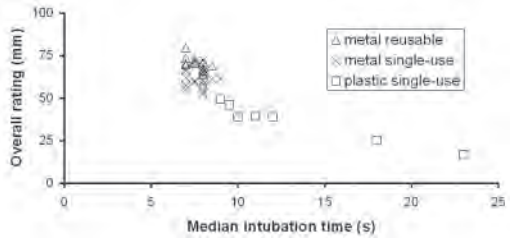
E. Flavell, R. Day, A. Wilkes, N. Goodwin, J. Hall

Department of Anaesthesia, University Hospital of Wales, Cardiff, United Kingdom

Background and Goal of Study: Tracheal intubation is a key skill for all anaesthetists. Recent concerns regarding variant CJD have led to an increase in the use of disposable laryngoscope blades. In difficult intubations, there is a need for equipment of a consistent standard. The evidence for plastic and metal blades has been conflicting. This study tested 40 currently available MAC 3 laryngoscope blades to see whether there was a difference in intubation time and ease of use between blades.

Materials and Methods: Forty blades were tested comprising both metal, plastic and mixed composition. A Laerdal airway management trainer manikin was set at a Cormack and Lehane grade 2b laryngoscopy using triple immobilisation. Thirty anaesthetists with five or more years experience were asked to intubate the manikin. The time taken to intubate was recorded and participants were then asked to rate the overall use of the blade on a 100mm visual analogue score. Blades were presented in a random order and were analysed using SPSS version 14.

Results and Discussion: The results are shown in figure 1. There was a moderate correlation between the time taken for intubation and the overall performance of the blades for the plastic blades. However, there was a poor correlation between the two variables for metal blades. There were 11 blades which at least one participant could not intubate within one minute. Two of the plastic blades cracked during use.



Conclusion(s): Plastic blades were associated with worse performance and longer intubation times in a difficult intubation manikin. There was a range in the shapes of the blades despite all blades being labelled as MAC3 blades. This may have contributed to difficulties. Single use metal blades performed well and may be a better option for disposable blades. However, the problems associated with their disposal and cost of production are concerns that need to be addressed.

Acknowledgements: Produced as part of a larger project done for the Centre for Evidence Based Purchasing.

References:

1 Asai T, Uchiyama Y, Yamamoto K, Johmura S, Shingu K. *Anaesthesia* 2001;56:342–345.
2 Evans A, Vaughan RS, Hall JE, Mecklenburgh J, Wilkes AR. *Anaesthesia* 2003;58: 869–873.
3 Rassam S, Wilkes AR, Hall JE, Mecklenburgh JS.*Anaesthesia* 2005;60:384–394.

19AP4-1

Assessing efficacy of a training program for awake fiber-optic intubation

M. Guglielmi, L. Urbaz, C. Tedesco, A. Sogni, G. Ronzoni

Anesthesia and Critical Care, Ospedale Civile di Desio, Desio, Milan, Italy

Background and Goal of Study: Although awake fiber-optic intubation (FOI) has been acknowledged as gold standard for predicted difficult intubation, many anesthetists are not familiar with the procedure yet. We set up a training program for FOI under conscious sedation with remifentanil and local anesthesia. Program efficacy was evaluated comparing performances, patients' parameters stability and satisfaction between trainees and experts.

Materials and Methods: Training was organized in 2 parts: 1) Theoretic session on difficult airway guidelines, use of fiber-optic bronchoscope (FOB), pharmacology of remifentanil and topic anesthesia and procedure steps. At the end trainees attended 5 FOIs performed by an expert (>50 FOI). 2) 20 FOI simulations on a manikin. We enrolled patients requiring oro-tracheal intubation for elective surgery. EKG, blood pressure (MAP), heart rate (HR), peripheral O_2 saturation (SpO_2), respiratory rate (RR) and sedation score (OASS modified) were acquired. After baseline acquisition (T1), remifentanil infusion was started at 0.05–0.1g/Kg/min and upper airway anesthetized with lidocaine. Remifentanil was titrated to obtain an OASS of 9–12. FOB was then inserted (T2) and sovra and sub-glottic anesthesia achieved with spray as you go technique. The instrument was then passed through the vocal cords and the tube secured (T3). Laryngeal reflexes, assessed as number of coughing, procedure length and patients satisfaction were recorded.

Results and Discussion: 3 experts and 4 trainees joined the study with 29 and 25 FOIs respectively. Patients in both groups had similar anthropometric features and ASA status. To reach the aimed OASS, remifentanil was raised on average to 0.15 ± 0.05 with not difference between experts and trainees. MAP, SpO_2 were stable through the procedure, HR increased from 77 ± 16 to 90 ± 23, ($p=0.02$) and RR decreased from 16 ± 3 to 12 ± 4 ($p < 0.05$), (T1 vs T3). No difference between experts and trainees was noted. Blunting of laryngeal reflexes was satisfactory, with 4 ± 3 coughing in both groups. Time to T3 was 3 ± 2 for experts and 4 ± 2min for trainees, ($p < 0.05$). Procedures were successful in both groups and patients were equally satisfied; only one patient in the trainees group had an unpleasant recall.

Conclusion(s): Conscious sedation with topic anesthesia yields optimal conditions for awake FOI. Collaborating patients facilitate execution of the procedure even in not experienced hands. This study highlights the importance of a standardized training program to spread awake FOI among anesthetists.

19AP4-2

Effect of patient trolley height on tracheal introducer placement in simulated difficult intubation. A manikin study

A. Jayakumar, A. Wilkes, I. Hodzovic

Department of Anaesthetics and Intensive Care Medicine, University of Wales College of Medicine, Cardiff, United Kingdom

Background and Goal of Study: During tracheal intubation, the patient's face should be at a height between the xiphisternum and umbilicus of the anaesthetist[1]. However, there is little evidence to support this recommendation and wide variation in clinical practice. We decided to investigate whether height of the patient's trolley influences speed and success of tracheal introducer placement in a difficult airway.

Materials and Methods: Forty-eight anaesthetists took part in this randomised cross-over study. A Laerdal Airway Management Training Manikin was set to simulate grade III laryngeal view; an adjustable height patient trolley and Eschmann tracheal tube introducer were used. We tested four trolley heights: Position 1–anaesthetist's preferred position; Position 2–one inch above xiphisternum; Position 3–midpoint between umbilicus and xiphisternum and Position 4–level of the anterior superior iliac spines. For each trolley position, we recorded time taken for tracheal placement, failure of placement and visual analogue score (VAS) (0 cm–very easy, 10 cm–extremely difficult) of perception of difficulty in placing tracheal tube introducer for each patient trolley position.

Results and Discussion: Values in the table are mean (standard deviation), proportion and mean (95% confidence interval). P1 – Position 1; P2 – Position 2; P3 – Position 3; P4 – Position 4;

	Height of patient trolley				
	P1	P2	P3	P4	p value
Time (s)	22 (11)	22 (11)	21 (8)	24 (13)	= 0.46
Failure rate	10%	10%	12%	23%	= 0.14
VAS score	4.4 (3.7–5.0)	4.4 (3.7–4.9)	5.3 (4.4–6.0)	5.9 (5.2–6.6)	= 0.01

Conclusion(s): Time taken for tracheal introducer placement was not influenced by height of the trolley. Failure rate in the P4 (23%) was twice the failure rate in P1 and P2 (10%), which even though not statistically significant, could be clinically important. Anaesthetists attending cardiac arrests frequently encounter patients positioned at or lower than the lowest trolley position tested in this study. The low patient trolley position (patient face at the level of anaesthetist's anterior superior iliac spine) is associated with increased failure rate and increased perception of intubation difficulty and should be avoided.

Reference:

1 Otto CW. Ln: Nunn JF, Utting JE, Brown BR, eds. *General Anaesthesia*. London: Butterworths, 1989; 512–39.

19AP4-3

Improvement of laryngoscopic view via shoulder and head elevation during tracheal intubation

P. Lebowitz, H. Shay, T. Straker, D. Rubin, S. Bodner

Anesthesiology, Montefiore Medical Center, Bronx, New York, USA

Background and Goal of Study: The sniff position, which provides lower cervical flexion and atlanto-occipital extension, promotes laryngeal view by aligning the oral, pharyngeal, and laryngeal anatomical axes. Raising the patient's shoulders and increasing lower neck flexion beyond the sniff position so that the patient's ear lies higher than the sternum improves laryngoscopic grade in obese patients.(1) We evaluated combined shoulder-head elevation in patients presenting for general endotracheal anesthesia to determine whether non-obese patients might also benefit.

Materials and Methods: We evaluated study patient's body mass index (BMI), dentition, Mallampati classification, thyromental distance, and atlanto-occipital extension ability. We positioned each patient on a Troop Elevation Pillow® (ramp) as well as on a firm 7-cm-high head cushion. After the patient had been anesthetized and paralyzed, the anesthetist, using a Macintosh 3 or 4 blade, assessed the laryngoscopic grade according to the Cormack and Lehane scale. We then removed the ramp, following which the anesthetist used the same laryngoscope, re-assessed the laryngoscopic grade, then intubated the patient's trachea. We compared laryngoscopic grade, lifting force needed, and external laryngeal pressure during each of the two laryngoscopies with each patient serving as his or her own control. We performed chi-squared Fisher's exact test analyses to compare high-BMI patients with low-BMI patients with regard to laryngoscopic view during ramp use. We also performed regression analyses of the data to establish correlations that related to improvement or worsening of laryngoscopic view. P values < 0.05 were considered statistically significant.

Results and Discussion: The mean BMI of our 189 patients was 30 ± 7. When those patients with BMI < 25 were compared with patients with BMI > 30, the difference between those improved by the ramp and those worsened by the ramp had a P value of 0.02. Multivariate regression analysis showed no meaningful correlations among laryngoscopic grade change and Mallampati classification, thyromental distance, ability to extend neck, and dentition.

Conclusion(s): This study indicates that adding an intubating ramp to the sniff position improves laryngoscopic view significantly more often than it hinders it. Further, use of the ramp leads to improved or unchanged laryngoscopic grading in 88% in patients with BMI < 25, 91% in patients with BMI > 30, and 100% of patients with BMI > 45.

Reference:

1 Collins JS et al Obesity Surgery 14:1171–1175, 2004.

19AP4-4

Achievement of an adequate minute volume through a 2 mm transtracheal catheter by expiratory ventilation assistance (EVA) in a simulated upper airway obstruction

A. Hamaekers, T. Goetz, P. Borg, D. Enk

Anesthesiology, Maastricht University Medical Centre, Maastricht, Netherlands

Background and Goal of Study: In case of complete upper airway obstruction conventional jet ventilation is ineffective and dangerous. Properly applied suction has been suggested to support expiration [1]. A modified ejector pump, normally used to handle parts during manufacturing processes, can provide minute volumes above 6 L/min through a 2 mm catheter in a simulated obstruction of the upper airway [2]. Venturi-based ejector pumps for industrial purposes are usually designed to create maximum negative pressure. However, for expiratory assistance the capability of a device to effectively exhaust gas from the lungs is more important. Therefore, we designed a novel ejector pump employing an optimized entrainment effect for expiratory ventilation assistance (EVA).

Materials and Methods: This newly developed ejector was compared with the previously described, modified Venturi-based ejector pump (SEG 07, J. Schmalz GmbH, Glatten, Germany) [3]. Both devices were tested in an LS800 long simulator (Draeger Medical AG, Luebeck, Germany) with an obstructed outlet at different compliances and resistances using an oxygen flow of 15 L/min. The insufflation time of 1000 mL of oxygen and the time needed for passive backflow of this volume through a transtracheal catheter (2 mm ID; Cook Inc., Bloomington, IN, USA) as well as for assisted expiration using both ejector pumps were measured. Achievable minute volumes (MV) and inspiration/expiration-ratios (I/E-ratio) were calculated.

Results and Discussion: Although an adequate minute volume could be achieved with both ejector pumps, the novel proved to be superior in all simulated conditions (see table).

Compliance (mL/mbar)	100	50	30	10
Resistance (mbar/L/s)	2	2	2	32
MV (L/min, passive backflow)	3.45	4.27	4.95	5.45
I/E-ratio (passive backflow)	1/3.33	1/2.38	1/1.77	1/1.04
MV (L/min, SEG 07)	6.66	6.50	6.30	5.24
I/E-ratio (SEG 07)	1/1.26	1/1.23	1/1.19	1/1.08
MV (L/min, novel ejector)	7.48	7.30	7.09	6.10
I/E-ratio (novel ejector)	1/1.0	1/0.98	1/0.93	1/0.82

Conclusion(s): The altered design of the ejector pump provided improved minute ventilation through a 2 mm catheter in an obstructed upper airway even in extreme pulmonary settings. Although the principle of EVA seems promising, further evaluation of this technique regarding applicability and safety is required.

References:

1 Schapera A. et al. Crit Care Med 1994;22:326–33.
2 Hamaekers A. et al. presented at the DAS meeting, 2008.
3 Hamaekers A. et al. presented at the NVA meeting, 2009.

19AP4-5

A comparison of three cuffed emergency percutaneous cricothyroidotomy devices with surgical cricothyroidotomy performed by experienced anaesthesiologists

C. Murphy, S. Rooney, C. Maharaj, J. Laffey, B. Harte

Department of Anaesthesia and Intensive Care Medicine, University College Hospital Galway, Galway, Ireland

Background and Goal of Study: In the cannot-intubate cannot-ventilate scenario, emergency cricothyroidotomy is a life-saving procedure[1,2]. We compared three cuffed percutaneous devices to the surgical cricothyroidotomy using a pig-larynx and lung simulator model with regard to success, speed and ease of insertion

Materials and Methods: Following formal training, 20 experienced Anesthesiologists performed cricothyroidotomies in randomized order, using each of the three cuffed devices (cuffed Melker, Portex Cricothyroidotomy Kit, Quicktrach 2) and standard surgical cricothyroidotomy. Participant demographics, successful insertion rates, procedure time, ventilation, complications and user preference were recorded. Each device was compared to the surgical cricothroidotomy which remains the gold standard.

Results and Discussion: Eight participants failed to successfully insert the PCK device ($p < 0.01$). One failed insertion occured in the Quicktrach 2 group and in the surgical cricothyroidotomy group. All placements in the cuffed Melker group were successful. The time required to complete the procedure was significantly longer in the PCK group (median 181.5 sec, $p < 0.05$) compared to the surgical approach (median 59 sec). Median time for insertion of the cuffed Melker was 94 sec, while the Quicktrach 2 had the shortest insertion time (median 52 sec). A high incidence of posterior laryngeal wall trauma was observed with the PCK (70%), cuffed Melker (40%) and surgical cricothyroidotomy technique (45%). The severity of posterior laryngeal wall trauma was significantly reduced with the Quicktrach 2 (15%). As all devices were cuffed, similar expired tidal volumes were measured on the lung simulator and ventilator. The pressure required to ventilate was significantly higher in all three percutaneous devices compared to the surgical airway ($p < 0.01$). Participants ranked the cuffed Melker device first preference and easiest to insert (VAS difficulty score mean rating 2.8). The PCK device was the least preferred and rated more difficult to insert (mean rating 5.7)

Conclusion(s): In a pig-larynx model, the Quicktrach 2 device demonstrated the shortest insertion time and lowest complication rate. The PCK device which is also based on a cannula-over-needle technique, was associated with a significantly longer insertion time, higher failure and complications rate. The cuffed Melker, inserted via the seldinger technique was the emergency airway of preference in our study population.

Reference:

1 ASA.Anesth 2003;98:1269–77. 2. Henderson JJ et al.Anaesthesia 2004;59:675–94.

19AP4-6

The impact of an elevation pillow on the intubation conditions in morbidly obese patients

M. Perdiou, A. Louizos, P. Zavrides, T. Kupreou

Anesthesiology Department, Ippokrateion General Hospital, Athens, Greece

Background and Goal of Study: It has been referred that the position of an elevating pillow under the shoulders of morbidly obese patients facilitates intubation and the work of breathing. In this study, our aim was to compare the intubation conditions with the use of the pillow and without it in this population of patients

Materials and Methods: We examined 40 morbidly obese patients with BMI value of >35, ASA I and II, randomly allocated into two groups. In group 1, 20 patients were positioned on the operating table having a specialized pillow under their shoulders and 20 patients of group 2 without it. For each patient several variables known as factors increasing the difficulty of intubation were recorded: Mallampati classification, neck circumference, mouth opening, thyromental distance, sternomental distance, neck mobility and history of sleep apnea syndrome. We also examined the duration of preoxygenation until ETO_2 reached 70%, 80% and 85%, the value of SpO_2 at the end of preoxygenation,

the easy of manual ventilation with face mask during induction of anesthesia and finally the IDS intubation score. We used t-test for statistical analysis

Results and Discussion: No statistically significant differences were found in the recorded parameters, which are shown in the table 1. The groups were comparable regarding anthropometric data and predisposing factors for difficult intubation.

Table 1.

VARIABLE	GROUP 1	GROUP 2
Age (yr)	37,1 ± 9,6 (22–53)	37,36 ± 12,3 (22–55)
Sex (m/f)	8/12	7/13
Height (cm)	170,5 ± 12,44	166,18 ± 10,82
Weight (kg)	135 ± 20,71	132,63 ± 25,81
BMI (kg/m2)	46,23 ± 3,5	47,58 ± 4,99
Sleep apnea syndrome (n)	8/20	7/20
Mallampati class I/II/III/IV	7/7/3/3	7/8/3/2
Neck circumference (cm)	44,11 ± 3,60	45,5 ± 3,69
Mouth opening (cm)	5,31 ± 0,43	5,08 ± 0,52
Thyromental distance (cm)	8,8+/1,47	9,13 ± 1,68
Sternomental distance (cm)	16,4 ± 1,90	15,95 ± 1,74
Duration of preoxygenation (min),70%	1,91 ± 1,71	2,62+/2,01
80%	3,05 ± 2,29	4,43 ± 2,51
85%	5,75 ± 2,43	6,98 ± 3,66
manual ventilation without orofaryngeal airway (n)	16	13
SpO2 after preoxygenation	100%	100%
IDS score < 5/> 5	18/2	17/3

mean values ± SD

Conclusion(s): The use of an elevating pillow for better positioning of the morbidly obese patients on operating table does not seem to improve the intubation conditions, although the time of effective preoxygenation is reduced and the ventilation with face mask is easier.

19AP4-7

A comparison of direct laryngoscopic view depending on the headrest height

E. Goo, C. Kim, S. Kim, Y. No, Y. Jeon

Department of Anesthesiology and Pain Medicine, Seoul National University Bundang Hospital, Sung-nam si, Korea

Background and Goal of Study: The sniffing position has been advocated as a standard for direct laryngoscopy. However, a question has been raised regarding the advantage of the sniffing position. There is no study about the optimal headrest height for the best laryngoscopic view in the sniffing position. This study was performed to find the optimal headrest height for best laryngoscopic views.

Materials and Methods: Fifty patients scheduled for elective surgery under general anesthesia were enrolled. The following measurements including modified Mallampati classification, thyromental distance, inter-incisor gap, amplitude of the head and neck movement, neck length and occipital protrusion were recorded. After induction of anesthesia, the number 3 Macintosh curved blade was used for direct laryngoscopy. The laryngeal view was imaged continuously on a monitor of the integrated video system. The patients were placed in the intubating position without a headrest or with the headrest of 3 cm, 6 cm, or 9 cm high in randomized order. The best laryngoscopic view was recorded in each condition, and graded by one anesthesiologist.

Results and Discussion: The laryngoscopic view of the 9 cm- high headrest was significantly superior to those of other headrests and without a headrest ($P < 0.001$). The limitation of head and neck movement less than 90° was associated with poorer laryngoscopic view of the 9 cm-high headrest ($P = 0.012$).

Conclusion(s): The sniffing position provided a significant advantage over simple extension of the head without headrest for the best laryngoscopic view in tracheal intubation, and direct laryngoscopic view was the best while using the 9 cm high headrest.

Distribution of Laryngeal Views Depending on the Headrest Height

Laryngoscopic View Grade	0 cm	3 cm	6 cm	9 cm
1	0	0	1	9
2a	10	17	25*	26*
2b	24*	24*	18	12
2c	8	3	2	3
2d	0	2	2	0
3	8	4	2	0

The laryngoscopic views were classified depending on the degree of glottic visualization under direct laryngoscopy: Grade 1: 100% of the glottis; Grade 2a: 75–99%; Grade 2b: 50–74%; Grade 2c: 25–49%; Grade 2d: 1–24%; Grade 3: none of the glottis.* : data of the median.

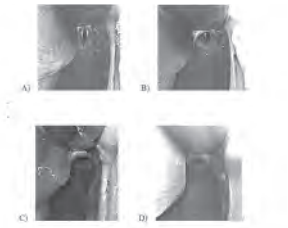


Figure 1. Examples of the laryngoscopic views in a patient.
The laryngoscopic views were improved with use of higher headrest. A) 9 cm headrest, B) 6 cm headrest, C) 3 cm headrest, D) without headrest.

19AP4-8

Tubeless superimposed high-frequency jet ventilation in microlaryngeal surgery

L. Karabiyik, G. Alp, E. Inal

Department of Anaesthesiology and ENT Surgery, Gazi University Faculty of Medicine, Ankara, Turkey

Background and Goal of Study: Superimposed high-frequency jet ventilation (SHFJV) was developed specifically for use in laryngotracheal surgery. This concept is based on the additive effect of normal and high frequency jets. Not only it is an alternative ventilatory approach in airway surgery, but also for facilitating gas exchange in critical patients with pulmonary insufficiency and stenosis. We presented our preliminary experiences of tubeless supralaryngeal SHFJV during microlaryngeal surgery.

Materials and Methods: ASA I–II six patients were premedicated with midazolam. SHFJV was applied supraglottically using a twinstream multi mode respirator by means of a special jet laryngoscope in patients undergoing elective microlaryngeal surgery. As SHFJV is an open system, total intravenous anaesthesia was administered in all cases. Ventilation was performed with an air/oxygen mixture. Anaesthesia was induced with propofol 1.5–2 mg kg^{-1} i.v. and maintained with propofol 6–10 mg kg^{-1} h^{-1} and remifentanil 0.05–0.2 µg kg^{-1} min^{-1} i.v. without muscle relaxant. Supraglottic airway pressures (mean and peak) and gases (FIO_2 and $ETCO_2$) were analysed.

Results and Discussion: The duration of the SHFJV was 25 to 45 minutes. The mean airway pressure and peak airway pressure were in the range of 7.3–11 and 10–15 mm Hg respectively, and PEEP was 6 to 9 mm Hg. Driving pressures of the high frequency and the the normal frequency jet streams were 0.7–0.8 bar and 0.9–1.0 bar, respectively. Inspiratory oxygen ratios were in the range of 0.4–0.7. HFJV resulted in SPO_2 and $ETCO_2$ values of > 95% and 34–47 mm Hg, respectively. Haemodynamic parameters were stable and within normal range. No complications during SHFJV were observed.

Conclusion(s): Tubeless SHFJV is particularly indicated in cases of severe stenosis and offers optimal conditions for laryngotracheal surgery, including laser surgery and stent implantation techniques. Since the ventilation is delivered above any possible stenosis the danger of barotrauma is minimized. Our findings show that this technique is simple, assuring adequate ventilation and oxygenation. Also, it provided good visibility of anatomical structures and offered space for surgical manipulation. This study demonstrates that SHFJV provides satisfactory pulmonary gas exchange and allows airway pressure monitoring. We also conclude that critical patients with laryngotracheal stenosis can be ventilated from above the stenosis; eliminating dangers of barotrauma, hipoxia and hipercapnia in case of emergency.

Reference:

1 Br J Anaesth. 2006;96:650.

19AP4-9

A comparison of machine delivered pressure controlled and hand delivered face mask ventilation

F. Brennan, I. Hodzovic, M. Stacey, G. Sudhir, A. Wilkes

Anaesthetics and Intensive Care, Cardiff University, Cardiff, South Glamorgan, United Kingdom

Background and Goal of Study: The ability to effectively ventilate by facemask is important during induction phase of general anaesthesia and in the management of difficult airway. This study compares the use of machine delivered pressure controlled ventilation via a face mask (machine ventilation) to hand delivered face mask ventilation (hand ventilation) in an airway training manikin

Materials and Methods: 62 anaesthetists took part in this randomised cross-over manikin study. Each participant was asked to ventilate the lungs of the Basic Airway Model (BAM) [1] for two minutes. The BAM was set at level 10 (difficult) [1]. We recorded delivered (DV) and expired tidal volumes (ExpTV),

the peak airway pressures, the leak volume (DV–ExpTV), participants glove size and participants preferred mode of mask ventilation. We used paired-samples T test[1] to analyse parametric data and Chi-Square test[2] to analyse nominal data.

Results and Discussion: Median [range] number of years of anaesthetic experience for participating anaesthetists was 7 [0.2 to 20] years. Findings are presented as mean (SD) and proportion (%). There was no correlation between the glove size and ExpTV (p = 0.1).

Table 1.

	Hand ventilation	Machine ventilation	P value
Leak volume (ml)	142 (111)	58 (42)	<0.0001[1]
Airway pressure (cm H_2O)	33 (8)	22 (5)	<0.0001[1]
Mean ExpTV (ml)	276 (70)	274 (59)	= 0.85[1]
Preference	43/62 (69%)	19/62 (31%)	= 0.002[2]

Conclusion(s): When compared to hand ventilation, machine delivered face mask ventilation had lower peak airway pressures and leak volumes while maintaining almost identical tidal volumes. High peak airway pressures (27 cm H_2O or more) may result in stomach inflation [2] and patient harm. Pressure controlled machine delivered face mask ventilation appears to have an additional patient safety effect during face mask ventilation in the hands of anaesthetists with wide ranging level of anaesthetic experience.

References:

1 Sudhir G et al. *Anaesthesia* 2007; 62:944–7.
2 Weiler et al. *Prehospital Disaster Medicine* 1995; 10: 101–5.

19AP4-10

Inverse intubation of entrapped trauma casualties – A comparison of direct laryngoscopy, indirect optical laryngoscopy and video laryngoscopy in a simulated scenario

P. Schober, R. Krage, D. van Groeningen, S. Loer, L. Schwarte

Department of Anaesthesiology, VU University Medical Center, Amsterdam, Netherlands

Background and Goal of Study: Securing a compromised airway can especially be challenging with entrapped casualties, as access to the head is frequently very limited. If tracheal intubation must urgently be performed and cannot be delayed until extrication of the victim, conventional laryngoscopy is often not possible. Such situations may force the emergency physician to attempt intubation from a ventral approach directly facing the victim. We aimed to compare three techniques for tracheal intubation under these special circumstances.

Materials and Methods: Inverse intubation was performed from a ventral position in a human patient simulator. To simulate an entrapped casualty in an automobile crash scenario, the dummy was in a sitting position and the cervical spine was immobilized. The head was only accessible from the left-ventrolateral side. Under this condition, 24 staff and resident anesthesiologists were asked to perform a "face-to-face" intubation using 3 techniques in random order: 1. direct laryngoscopy using a standard laryngoscope held in the right hand with the MacIntosh blade facing upward, 2. indirect optical laryngoscopy using the Airtraq system (Prodol, Bonita Springs, Fl, USA) and 3. video laryngoscopy (McGrath, Aircraft Medical, Edinburgh, UK). Participants only received standardized brief instructions over the different techniques. Success rate and tube insertion time were recorded.

Results and Discussion: Success rate did not differ significantly between the groups. Tracheal intubation was successfully performed in all attempts with the Airtraq technique and with the McGrath technique and in 21 out of 24 attempts with the MacIntosh technique. Tube insertion time was significantly slower with the videolaryngoscope (72 ± 58 sec) as compared to the Airtraq technique (22 ± 10 sec, $p < 0.01$) or the MacIntosh technique (32 ± 21 sec, $p < 0.01$). Airtraq tended to be the fastest technique, but failed to reach statistical significance vs. the MacIntosh technique ($p > 0.05$).

Conclusion(s): Inverse intubation can be performed with a high success rate with all three investigated techniques. While the Airtraq and MacIntosh approach had comparable tube insertion times, our data suggest that videolaryngoscopy might be less appropriate for inverse intubation when used by personnel only minimally trained in this technique.

19AP5-1

The Airway Scope® and the Macintosh laryngoscope produce similar haemodynamic responses to tracheal intubation in hypertensive patients

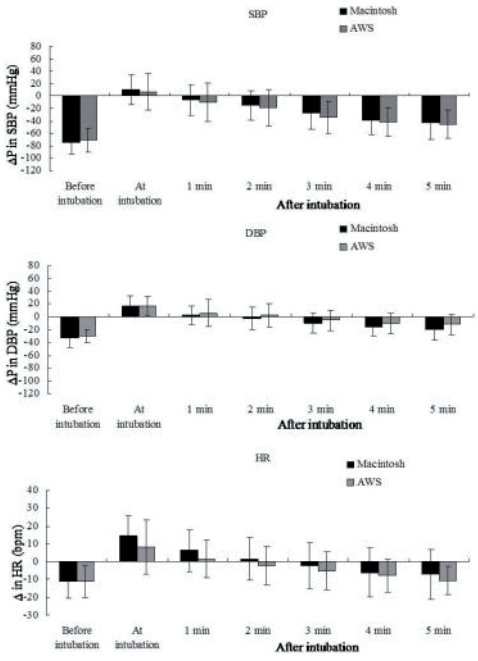
Y. Koyama, N. Sekino, G. Inagawa, Y. Kamiya, T. Goto

Department of Anesthesiology, Yokohama Minami Kyousai Hospital, Yokohama, Japan

Background and Goal of Study: We previously demonstrated that the Airway Scope®(AWS) caused less haemodynamic responses to tracheal intubation than did the Macintosh laryngoscope (ML) in normotensive patients (1). In this study, we sought to determine if this observation also holds true in hypertensive patients.

Materials and Methods: Forty-six hypertensive patients undergoing elective surgery were randomly assigned to receive tracheal intubation either with the AWS (n = 23) or the ML (n = 23). Anaesthesia was induced with fentanyl 2 mcg/kg, followed by propofol 1.5 mg/kg 2 min later. Vecuronium 0.15 mg/kg was given after loss of consciousness. Mask ventilation was continued until the train-of-four response completely disappeared. Then, tracheal intubation was performed. The blood pressure and heart rate (HR) were recorded at the following times: a) before administration of anaesthetics (baseline), b) immediately before intubation, c) at intubation, and d) 1,2,3,4, and 5 min after intubation. Statistical comparisons were performed by ANOVA, followed by Student's *t* test.

Results and Discussion: The ML produced no significantly greater changes in the systolic blood pressure (SBP) (ΔP) and the diastolic pressure (DBP) (ΔΔP) from the baseline from the time point of "At intubation" to "5 min after intubation" than did the AWS. There were also no significantly greater HR changes in the ML group than in the AWS group.



Conclusion(s): In hypertensive patients, the AWS technique failed to attenuate haemodynamic responses to tracheal intubation. We speculate that even the lower stimulation produced by the AWS compared with the ML might be sufficiently strong because hypertensive patients are more sensitive than normotensive patients (2). Therefore, the AWS may not be valuable in hypertensive patients in attenuating haemodynamic responses.

References:

1 Y Koyama, M Nishihama, G Inagawa, et al: Attenuation of haemodynamic responses to tracheal intubation by the Airway Scope®. Euroanaesthesia 2008, Copenhagen, Denmark.
2 Stone JG, Foex P, Sear JW, et al. Risk of myocardial ischemia during anaesthesia in treated and untreated hypertensive patients. *British Journal of Anaesthesia* 1988; 61; 675–9.

19AP5-2

Evaluation of the GlideScope® for tracheal intubation in patients with cervical spine immobilization by a semi-rigid collar

I. Bathory, P. Schoettker, C. Kern

Anesthesiology, University Hospital Vaud CHUV, Lausanne, Switzerland

Background and Goal of Study: Intubation for patients with potential cervical spine injury may be necessary to provide general anesthesia. The presence of a semi-rigid cervical collar may prevent cervical spine movement but renders oro-tracheal intubation with a traditional laryngoscope very difficult if not impossible. We aimed at analyzing the feasibility of oro-tracheal intubation with the GlideScope® and its dedicated stylet for patients wearing a semi-rigid cervical collar.

Materials and Methods: After approval from the Hospital Ethics committee, patients' informed consent were obtained. 50 ASA 1-2 adult patients with a BMI ≤ ≤ 35 kg/m^2 scheduled for elective surgical procedures requiring tracheal intubation were included. Maximal mouth opening, neck circumference and thyromental distance were measured. After standardized induction for general anesthesia and neuromuscular blockade, the neck was immobilized with an appropriately sized semi-rigid Philadelphia Patriot® cervical collar, the head was taped to the trolley and the maximal mouth opening was recorded. Laryngoscopy was attempted using a Macintosh laryngoscope blade 3 and the modified Cormack and Lehane grade was noted. Laryngoscopy with the GlideScope® was then graded and followed by oro-tracheal intubation by the same anesthesiologist. The primary endpoint was the overall intubation success rate. Secondary endpoints included intubation time and number of optimization maneuvers required to aid tracheal intubation, the modified Cormack and Lehane grade at direct laryngoscopy and videolaryngoscopy (GlideScope®), oxygen saturation before and after intubation.

Results and Discussion: With the cervical collar applied, the maximal mouth opening was 2.0 cm [1.8;2.0] (4.5 cm [4.0;5.0] without collar), p < 0.0001. Videolaryngoscopy using the GlideScope® significantly decreased the modified Cormack Lehane grade, p < 0.0001. All patients were successfully intubated with the GlideScope® within a median of 50 sec [43;61].

Modified Cormack Lehane grade	MacIntosh	GlideScope®
1	–	4 (8%)
2a	–	43 (86%)
2b	–	3 (6%)
3	24 (48%)	–
4	26 (52%)	–

Conclusion(s): The GlideScope® allows oro-tracheal intubation in patients with cervical spine immobilization by a semi-rigid collar and decreases significantly the modified Cormack Lehane grade.

19AP5-4

Evaluation of the Airtraq in easy and difficult-to-intubate patients

J. Ariño, J. Velasco, G. Civantos, M. Gabaldón, F. López-Timoneda

Anesthesia, Hospital Clinico San Carlos, Madrid, Spain

Background and Goal of Study: The Airtraq (ATQ) is an anatomically shaped laryngoscope with two separate channels. The optical channel contains a high definition optical system and the guiding channel holds the endotracheal tube and guides it through the vocal cords. The aim of the study was to describe the use of the Airtraq in comparison with direct laryngoscopy using the standard Macintosh (MAC) in easy and difficult-to-intubate patients.

Materials and Methods: Following local institutional review board approval, 177 patients were approached for inclusion and informed consent was obtained. Information was collected preopertively: patient demographics (age, weight, and height) and airway measurements. All the patients received intravenous induction agents including midazolam 0.01–0.02 μg kg^{-1}, fentanyl 2–3 μg kg^{-1} and propofol 1–2 mg kg^{-1}. Neuromuscular blockade was achieved using succinylcholine 1 –1,5 mg kg^{-1} or rocuronium 0.6 mg kg^{-1}. The patients were placed in the 'sniffing' position with their head on a pillow. All patients underwent an initial direct laryngoscopy which was scored according to the Cormack and Lehane (C&L) grading system using the MAC blade. The trachea was intubated using the ATQ and given a second laryngoscopy score. Difficult-to-intubate patients were considered those scored 3 and 4 according C&L using MAC. The time to intubate (TTI) was measured from the time the ATQ entered the patient's mouth until end-tidal carbon dioxide was detected. Data are expresed as mean (SD). Statistical analysis was performed using a statistical software program SPSS 15.0 for windows (SPSS Inc.). A *P* value < 0.05 was considered statistically significant. (Table 1)

		C&L grade ATQ		
		I	II	Total
C&L grade MAC	I	75	0	75
	II	63	1	64
	III	27	7	34
	IV	1	3	4
	Total	166	11	177

Results and Discussion: Thirty eight patients were scored 3 and 4 according C&L using MAC. The Airtraq improved the laryngoscopic view (*P* < 0.001). In easy to intubate patients the mean TTI was 16.28 (6.59) s (97.8% required just one attempt to intubate). In difficult to intubate patients the mean TTI was 24.10 (11.70) s (31.6% required more than one attempt). In this group the mean TTI related with C&L grade I and II were 21.89 (7.28) and 30.30 (18.58) s respectively.

Conclusion(s): The Airtraq has potential advantages over standard direct laryngoscopy for difficult intubations.

19AP5-5

Comparison of stress response to laryngoscopy and endotracheal intubation with Glidescope videolaryngoscope and fiberoptic bronchoscope in predicted difficult airway

N. Jakushenko, U. Kopeika, D. Nagobade, A. Putnina, M. Mihelsons

Faculty of Medicine, University of Latvia, Riga, Latvia

Background and Goal of Study: Anaesthesia may be life threatening due to stress response produced by laryngoscopy and endotracheal intubation especially in difficult airway. We compared the stress response to endotracheal intubation between two fibreoptic techniques: GlideScope laryngoscope and fibreoptic bronhoscope in predicted difficult airways cases.

Materials and Methods: Following ethics committee approval, 50 patients with ASA 1–2, median age 52 ± 14 years, Mallampati 3–4 and mouth opening > 2 cm were scheduled for elective surgery and randomly assigned to be oral intubated with two different devices: Glidescope videolaryngoscopy (GS group) – 20 patients and fibreoptic bronchoscope (FB group) – 30 patients. Anaesthesia was induced with fentanyl 2 mkg/kg, propofol 2 mg/kg and mivacurium 0.2mg/kg and maintained with sevoflurane 2–3 vol% and fentanyl 1mkg/kg as needed. Blood pressure (BP) and heart rate (HR) were measured for10 min before and 10 min after endotracheal intubation with interval 1 min. Blood cortisol, norepinephrine (NE) and salivary alpha-amylase (AA) were recorded before and after endotracheal intubation the same time points. Intubation time (IT) also was recorded.

Results and Discussion: Mean IT was statistically significantly longer in FB group (145 ± 81 sec) versus Gs group (26 ± 8 sec) (p < 0.05). After endotracheal intubation: BP and HR maximally increase at second postintubation minute in both groups, but in FB group BP and HR were statistically significantly higher comparing to GS group (p < 0.05). Salivary AA level after endotracheal intubation increased higher in FB group (154Ku/ml) comparing to GS group (114.5Ku/ml). NE after endotracheal intubation increased significantly in FB group comparing to GS group. Blood cortisol decrease after endotracheal intubation in both groups, but in GS group blood cortisol level after EI was significantly lesser (426 ± 93nmol/l) comparing to FB group (530 ± 79)(p < 0.05).

Conclusion(s): Stress response to oral endotracheal intubation during general anaesthesia was significantly higher with FB comparing to GS in predicted difficult airway with mouth opening > > 2cm cases.

References:

1 Xue FS, et all Comparison of hemodynamic responses to orotracheal intubation with the GlideScope videolaryngoscope and the Macintosh direct laryngoscope. J Clin Anesth. 2007 Jun;19(4):245–50.

2 Zhang GH, et all [Comparison of hemodynamic responses to orotracheal intubation between using GlideScope videolaryngoscope and fiberoptic bronchoscope] Zhongguo Yi Xue Ke Xue Yuan Xue Bao. 2006 Jun;28(3):406–9. Chinese.

19AP5-6

A comparison of laryngoscopic conditions: Truview vs. Macintosh

C. Tutuncu, G. Kaya, Y. Tunali, P. Kendigelen, F. Altindas

Department of Anesthesiology and Reanimation, Cerrahpasa Medical Faculty of Istanbul University, Istanbul, Turkey

Background and Goal of Study: New laryngoscopes are designed to decrease mortality and morbidity rates in cases of difficult intubation. One such device, Truview laryngoscope (Truphatec international Ltd Netanya, Israel), has an optical system and can provide a constant O_2 flow. In our study, we aimed to compare the effectiveness of the Truview blade to the "Macintosh" blade in adult patients undergoing elective surgery.

Materials and Methods: After obtaining informed approval from the faculty ethical committee, patients, ASA class I–II, between the ages 18–70, were included in the study. Patients that were expected to have difficult intubations were excluded from the study. After performing standard monitoring, all patients received standard general anesthesia. Following the administration of the neuromuscular block for three minutes, laryngoscopy was first performed with a Macintosh blade and after with a Truview blade and the Cormack-Lehane score for each was determined. The patient was subsequently intubated using a Truview blade. During the evaluation with the Truview blade and intubation, O2 (10L/min) was administered.

Results and Discussion: 128 patients (Age: 41 ± 16.3 years, Weight: 72.8 ± 13.2kg) were included in the study. The mean average of Mallampati scores were found to be 1.4 ± 0.6. The Cormach Lehane scores were found to be 1.9 ± 0.8 and 1.1 ± 0.5 ($p < 0.01$) when using a Macintosh blade and a Truview blade, respectively All patients, except 3, were intubated using the Truview blade. No patients showed any desaturation. The glottic view, evaluated by Cormack Lehane scores, was significantly better with Truview blade than the Macintosh blade. We experienced some difficulties during the study. The fogging of the optical system, drops left in the apparatus after washing may reduce view quality. It is important to identify these technical problems and take precautions to avoid them. The blade structure tightens the passage through which the tube is supposed to pass, which may make intubation more difficult, especially in inexperienced hands. In addition, stylet leans against the front wall of the trachea, making it difficult to insert the tube into the larynx. Nonetheless, these difficult can be easily overcome with experience in short time.
Conclusion(s): Truview laryngoscope displays a very clear view of the larynx, as indicated by Cormach Lehane scores. Intubation with the Truview laryngoscope requires experience. However, the learning curve is very steep. A significant advantage of using a Truview laryngoscope is that it enables a constant O_2 flow.

19AP5-7

Airtraq and Macintosh laringoscope in neurosurgery patients: Hemodynamics changes

E. Terradillos, C. Almaraz, L. Penide, A. Alonso, F. De la Gala

Anestesiologia y Reanimación, Hospital Universitario Gregorio Marañón, Madrid, Spain

Background and Goal of Study: The Airtraq is a disposable laringoscope that allows viewing of the vocal cords without a straight line of sight from outside of the patient to the vocal cords. The neck of the patient can be positioned in a neutral position. Airtraq laringocope (AL) was efficient in cases of difficult intubation and some anesthesiologists include the AL in their algorithm for the emergency difficult airway. AL involves less movement of the cervical spine compared to conventional procedures using a Macintosh laringoscope. Initial studies have shown little to no changes in hemodynamics during intubation with the Airtraq. Hypertension during intubation in neurosurgery patients can lead to elevated ICP, hemorrhage and cerebral edema. We want to study the difference among hemodynamics parameters after tracheal intubation with Al versus Macintosh laringoscope.
Materials and Methods: We used a prospective observational study to describe hemodynamics changes in two groups of patients. We chosed 30 patients, ASA I and II, without signs of diffificult airway (Mallampati, Thyromental distance, opening mouth, neck mobility were correct). We rejected patients with cardiovascular diseases and beta-blockers treatment. We randomized pantients to be intubated with AL or Macintosh Laringoscope. We measured blood pressure and heart rate previus intubation, post induction general anesthesia, postintubation and every minute during first five minutes.
Results and Discussion: 30 cases of different types of neurosurgery patients were recorded: 3 intracraneal aneurysms (10%), 5 arteriovenous malformations (16%), 3 pituitary tumors (10%) and 16 intracranial tumors (54%). 15 patients were intubated with AL and 15 patients with Macintosh. There was no difference among groups. All tracheal intubations were sucesfull at first time. The time of orotracheal intubation was not different between AL and Macintosh. Blood pressure and heart rate after intubation in Macintosh group were 10% more than the basal, however in Airtraq group was 4% more than the basal. There are significant differences in the first minute postintubation.
Conclusion(s): Airtraq Laringoscope can be usefull in patients that need hemodynamic stability.

19AP5-8

Tracheal intubation using the Airtraq laryngoscope. What about using straight reinforced tracheal tubes?

I. Zogogiannis, A. Douma, V. Dimitriou

Anaesthesia, "G. Gennimatas" General Hospital of Athens, Athens, Greece

Background and Goal of Study: The Airtraq® laryngoscope (AL) is a new disposable tracheal intubation device developed to facilitate tracheal intubation in patients with normal or difficult airways. Of interest all studies so far have been performed using the conventional Polyvinyl chloride (PVC) regular tracheal tubes. However there are cases where reinforced tracheal tubes (RFT) must be used. Aim of our study was to evaluate the success rate of tracheal intubation via the AL using straight reinforced tracheal tubes.
Materials and Methods: After IRB approval and informed written consent 280 patients (M/F: 120/160), ASA I-II, aged 22–78 yrs, scheduled to undergo general anaesthesia under standard monitoring were included. We tested both sizes of AL (AL-A, size A using tracheal tubes (TT) up to 8.5 internal diameter (ID) and AL-B, size B using TT up to 7.5 ID. Additionally we compared two different types of TT, the Portex, wire-reinforced tracheal tube (RFT) and the Intavent silicone wire-reinforced tube (RFST). Both are straight and soft tubes without a curvature. For statistical analysis the non-parametric correlation Spearman's rho (two-tailed) was performed between success rate and TT ID size.
Results and Discussion: Are shown in the table.

ID	RFT	RFT	RFST	RFST
	AL-A	AL-B	AL-A	AL-B
	n (%)	n (%)	n (%)	n (%)
7.0	22/34 (65)	30/36 (83)	12/24 (50)	22/26 (85)
7.5	24/36 (67)	36/44 (82)	16/28 (57)	26/28 (93)
8.0	24/32 (75)		20/22 (91)	
8.5	34/36 (94)			

%: success rate, Non-parametric correlation Spearman's rho (two-tailed): 0.126, $p < 0.05$

Conclusion(s): Straight reinforced tracheal tubes can be used successfully for tracheal intubation via the AL. There was a positive correlation between success rate and increasing ID in both AL sizes without statistically significant difference between RFT and RFST tracheal tubes.

19AP5-9

Airway management (AM) in acromegalic patients (AP) using the McGrath® Series 5 videolaryngoscope (VL).

I. Osborn, E. Behringer, P. Reinhard

Department of Anesthesiology, Mount Sinai School of Medicine, New York, New York, USA

Background and Goal of Study: Airway changes in AP include macroglossia, mandibular overgrowth and soft tissue thickening. Laryngeal exposure may be difficult with conventional direct laryngoscopy (DL) in these patients (1) VL is a new difficult airway management technology. We hypothesized that VL would improve laryngeal views when compared with DL in AP. We evaluated the Mcgrath® VL due to its unique design with adjustable blade length.
Materials and Methods: AP presenting for pituitary resection from February 2007 through December 2008 were enrolled. With IRB approval, their anesthetic records were reviewed. After preoxygenation and premedication, general anesthesia was induced. If facemask ventilation (FV) was adequate, a neuromuscular blocking agent was administered. The following laryngoscopy sequence was used: (1) Initial DL using either a MacIntosh Size 4 or Miller Size 3 blade (2) topical laryngeal spray with 4% lidocaine (3) Confirm FV (4)VL with the McGrath® VL in the fully extended position (5)Endotracheal intubation (EI) with a styletted endotracheal tube. The Cormack-Lehane (C/L) grade laryngeal view was recorded with each device. ASA standard monitoring and BiSpectral Index were employed. Complications were noted. AM in all AP was either performed or supervised by the first author.
Results and Discussion: Eleven patients, ages 19–46 years, ASA PS 2 (7 AP), ASA PS 3 (4 AP) were studied. The Mallampati Classification and C/L laryngeal views are compared. Using DL, 54% of AP had C/L laryngeal views associated with potentially difficult EI. Using VL, all AP had C/L laryngeal views associated with ease of EI. All AP were intubated easily on the first attempt using VL. There were no hemodynamic, respiratory nor traumatic complications.

Mallampati Class & Comparative Laryngeal Views of AP (n = 11)

MALLAMPATI CLASS	C/L VIEW (DL)	C/L VIEW (VL)
Class 1 (2)	Grade 1 (2)	Grade 1 (11)
Class 2 (3)	Grade 2 (3)	Grade 2 (0)
Class 3 (4)	Grade 3 (4)	Grade 3 (0)
Class 4 (2)	Grade 4 (2)	Grade 4 (0)

Conclusion(s): VL is a novel technology, markedly improving the laryngoscopist's field of view (2). The McGrath® VL is uniquely designed with an adjustable blade length and disarticulating camera stick (3). VL provided C/L Grade 1 laryngeal views and atraumatic intubation on first attempt in all study patients. Use of the McGrath®® VL provided an efficient, uncomplicated alternative method for advanced AM in this patient population.
References:
1 Anesthesiology 2000;93:110–4.
2 Can J Anaesth 2005;52:191–8.
3 Anesth Analg 2007;105:552–3.

19AP6-1

Jaw thrust maneuver can cause sympathetic responses during induction of anesthesia

D. Jee, S. Park, B. Kim

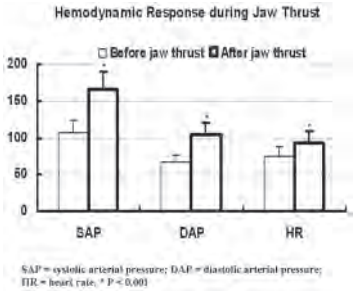
Anesthesiology and Pain Medicine, Yeungnam University Hospital, Daegu, Republic of Korea

Background and Goal of Study: Jaw thrust is frequently used for airway maintenance or as an aid to airway procedures such as fiberoptic bronchoscopic intubation or laryngeal mask airway insertion during induction of general anesthesia. However the adequate force applied by jaw thrust and its hemodynamic effects are not known. To assess the force and the hemodynamic response during application of jaw thrust, we designed a study.
Materials and Methods: Forty ASA PS 1–2 adult patients requiring general anesthesia received a standardized anesthetic protocol. After anesthesia induction the patients airway was maintained with jaw thrust and the lungs were ventilated through a Patil-Syracuse endoscopy mask to use a fiberoptic bronchoscope and to maintain inhalational anesthesia. The force applied by jaw thrust was assessed while the anesthesiologist stood on the floor scales (Champ Bench™, model CQ 100L31, Ohaus Corp, Pine Brook, NJ, USA) placed next to the operating table and measured the change in his weight.[1] The force was adjusted by direction of the endoscopist observing optimal airway patency, and the patients airway was maintained at that force for 4 minutes. Hemodynamic data were measured from 1 min before until 4 min during jaw thrust. Peak blood pressure and heart rate were recorded and compared with the baseline value.
Results and Discussion: The adequate force required during jaw thrust was shown in the table. Four minutes' application of jaw thrust increased arterial pressure and heart rate ($P < 0.001$) (Figure). There was no significant relationship between the hemodynamic data and the force (correlation coefficients 0.26 ~ 0.33, $P < 0.05$).

Table 1. Patient Characteristics

Age (years)	59.3 ± 8.6
Weight (kg)	61.5 ± 10.2
Height (cm)	160.5 ± 9.4
Sex	20/20
BIS at jaw thrust	54.0 ± 5.4
ET-Sevo at jaw thrust (vol%)	1.9 ± 0.3
Force (N) (range)	30.2 ± 9.0 (10.3 ~ 60.8)

Values are number or mean ± SD. BIS = bispectral index; ET-Sevo = end-tidal sevoflurane



Conclusion(s): This study suggests that jaw thrust maneuver with adequate force cause significant sympathetic responses during induction of general anesthesia.
Reference:
1 Clayton TJ, Vanner RG. Anaesthesia 2002; 57: 326–329.

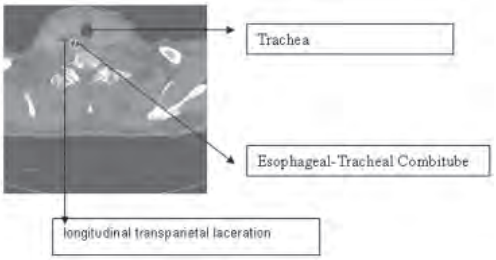
19AP6-2

Severe complication during prehospital placement of an esophageal-tracheal Combitube

H. Francksen, J. Renner, C. Stapelfeldt, J. Scholz, B. Bein

Anaesthesiology and Intensive Care Medicine, University Hospital Schleswig-Holstein, Kiel, Schleswig-Holstein, Germany

Background and Goal of Study: Complications related to airway management in the prehospital setting are frequent and potentially life threatening events. Difficult intubation can occur unexpectedly in clinical practice and emergencies. The "gold standard" of airway management is tracheal intubation with an endotracheal tube (ETT). Supraglottic airway devices, such as esophageal endotracheal combitube (ETC) serve as alternatives to endotracheal intubation. However, serious complication can occur.
Materials and Methods: We report on a 67 year old man with multiple midfacial fractures after severe motor vehicle accident. At the scene, first medical aid was provided by professional ambulant emergency service. Initially, patient was alert and breathing spontaneously. After three unsuccessful attempts to place an ETT, the emergency physician inserted an ETC as an alternative airway device. Cuff inflation was performed with 75 ml of air, as recommended by the manufacturer. The patient was ventilated with 100% Oxygen. SpO_2 was recorded continuously and showed efficient oxygenation. A computed tomography (CT) scan showed a longitudinal transparietal laceration of the anterior esophageal wall. The laceration was repaired immediately in the operating theatre. The patient was weaned from mechanical ventilation after 26 hours. At 72 hours, control CT scan was normal. The patient was discharged home after closure of tracheotomy a month later.



Results and Discussion: It has been shown previously, that esophageal perforation can occur with the ETC resulting in possible severe complications. Subcutaneous emphysema, pneumomediastinum, pneumoperitoneum, and mediastinitis, leading to sepsis, may result in death or serious morbidity. Esophageal perforation appears to be the mechanism by which these complications occur (1). Since the ETC is not suitable for routine use in daily clinical practice (2), most physicians are not familiar with this device, and improper use puts patients at risk of considerable complications.
Conclusion(s): In patients who require alternative airway devices, the ETC may not be the first choice as suggested by our case report.
References:
1 Vezina D, Can J Anesthesia 45:76–80, 1998.
2 Bein B, Eur J Anaesthesiol 22: 341–346, 2005.

19AP6-3

Difficult airway management in giant multinodular goitre in developing-country situations

F. García-Miguel, S. Vincinay, M. Mirón-Rodríguez, M. Aguilera, J. Mitchel

Anaesthesia and Reanimation, Hospital del Tajo, Aranjuez, Madrid, Spain

Background and Goal of Study: Practice guidelines for management of the difficult airway may need to be modified on the basis of clinical needs, the availability of technology and other constraints. Fiberoptic intubation is the first-choice non-invasive approach to anticipated awake difficult tracheal intubation (DTI) patients, but this equipment is not readily available in developing countries. Non-governmental organization "*DOA, Todo por la Salud*" participates each year in a humanitarian project in Trinidad (Bolivia) which includes operating patients diagnosed of giant multinodular goitre.
Materials and Methods: A prospective study was conducted of twenty-five patients at risk of DTI who underwent general anaesthesia for scheduled giant multinodular goitre intervention. An airway physical examination was conducted in all patients prior to initiation of anaesthetic care and airway management. Specialized equipment available for difficult airway management included rigid laryngoscope blades, narrow tracheal tubes, tracheal tube guides, classical laryngeal masks, and Fast-Trach™. Invasive airway access may be of limited value depending on the patient's pathology and anatomical abnormalities (Fig 1). After preoxygenation, inhalation induction commenced with sevoflurane 8% in 100% O2. After one minute, conventional laryngoscopy was performed to determine the Cormack and Lehane (CL) score. Where the CL score was <2, 1 mg/kg suzametonium was administered to facilitate intubation; for scores >3, sevoflurane was decreased to 5% or adapted in order to obtain an appropriate depth of anaesthesia, and oral intubation with spontaneous ventilation was performed. Reinforced tracheal tubes with guide were used in all cases. Hemodynamic and saturation were not altered during the procedure.
Results and Discussion: Intubation was performed easily in all patients, but assisted ventilation was required in 3 cases presenting prolonged apnea (> 30 seconds). Although DTI was anticipated in all cases, only one case had a CL score of 4.
Conclusion(s): Inhalational induction with sevoflurane in anticipated DTI adults proves to be an easy and feasible technique for successful intubation in the absence of fiberoptic or other non-invasive airway techniques.

19AP6-4

Anesthesia in rare poly-malformation syndromes with mandibular hypoplasia proposed for mandibular osteotomy

T. Garcia, M. Barbosa, H. Rebelo, J. Tavares

Department of Anesthesia and Intensive Care, Hospital de São João – Faculdade de Medicina, Universidade do Porto, Porto, Portugal

Background and Goal of Study: The airway approach in patients with craniofacial in the context of poly-malformation syndromes, like Pierre Robin Syndrome, Moebius Syndrome, and Cerebral Trunk Dysgenesia is an anesthetic challenge. Mandibular Hypoplasia is a craniofacial malformation with an elevated risk in general anesthesia due to the distinct changes in the airway (obstruction and death), due to a difficult orotrachial entubation, a difficult perioperative ventilation.
Materials and Methods: Anesthesia clinical cases in three bilateral mandibular osteotomy patients with Pierre Robin Syndrome, Moebius Syndrome, and Cerebral Trunk Dysgenesia.
Results and Discussion: A 2 year old child with Cerebral Trunk Dysgenesia (case 1) and a 3 year old with Pierre Robin Syndrome (case 2) with a history of tracheostomy at birth due to refractory respiratory insufficiency, recurrent respiratory infections, cleft palate corrective surgery (case 2); gastrostomy tube feeding and generalized hypotonia (case 1). Both underwent an inhalatory induction with sevoflorane via the tracheostomy canula and previously substituted for armored tubing according to weight and the tracheostomy. Manual assisted ventilation was required in both due to the extreme difficulty in ventilation and an adequate intra-operative gas exchange management. Balanced Anesthetic Management. A 3 year old child with Moebius Syndrome, aortic valvulopathy, obstructive sleep apnea (non-invasive ambulatory ventilation required) kyphoscoliosis, hypotonia, bilateral facial palsy. Due to an expected difficult airway, a pneumologist was requested for a flexible bronchofibroscopic entubation. Despite the expected difficulty, a no. 4.5 armored tubing was successfully placed, without a cuff after inhalatory sevoflorane induction. Balanced Anesthetic Management. There were no post-operative 24 hour ICU complications with extubation after 12 hours post-op.
Conclusion(s): Non absorbable distractors in mandibular osteotomies in children with severe retrognathia is a critical surgery in these patients to avoid complications and decrease mortality due to respiratory complications. These patients area challenge to the anesthesiologist because of the difficult airway and the challenging ventilation. This is a ground breaking surgery at this Hospital.

19AP6-5

Airway management in Apert syndrome: An anaesthetic challenging

R. Inácio, J. Cortesão, A. Bernardino, J. Gonçalves, T. Paiva

Department of Anaesthesiology and Intensive Care, Centro Hospitalar de Coimbra, Coimbra, Portugal

Background and Goal of Study: The Apert Syndrome is a craniosynostosis autossomal dominant, characterized by premature closure of the cranial sutures and syndactyly of the fingers and toes. The incidence of this syndrome is approximately 1: 50000 births. The authors present the anaesthetic approach to a patient with Apert Syndrome, proposed for urgent thoracic surgery.
Materials and Methods: Our patient was a 28 year-old woman, diagnosed with Apert Syndrome, proposed for an urgent drainage of empyema and descortication. The patient had a high forehead, with flattening of the face, maxillary hypoplasia, cleft palate, ectopic and supernumerary teeth and syndactyly of the feet and hands. She had an accentuated reduced cervical mobilization, with a short neck and a Mallampati IV. As difficult airway was anticipated we decided for an awake fibreoptic intubation, ensuring the immediate availability of the material for emergency tracheotomy that could be needed. After 4 failed attemps, the successful awake fibreoptic intubation was performed. The surgery proceeded without complications and after 3 days the patient was extubated in the Intensive Care Unit and recovered well.
Results and Discussion: Tracheal intubation in a patient with craniofacial deformities is an anaesthetic challenge. The main aspect in there management is the detailed knowledge of all problems that the anaesthesiologist must solve to avoid the risk of severe complications. In Apert Syndrome, the possibility of a distorted airway anatomy makes orotracheal intubation with rigid laryngoscopy difficult or even impossible. As induction of general anaesthesia may precipitate a complete airway closure, we decided for an awake fibreoptic intubation which can safely secure the airway.
Conclusion(s): Reports on airway management in adults with Apert Syndrome are few, mainly because the disease is rare and very few adult cases have been reported. Patients with Apert Syndrome have characteristic facial features that may lead to difficult intubation. Equipment for managing the difficult airway should be readily available. An awake fibreoptic intubation should be considered as an early option in airway management of these patients.

19AP6-6

Tracheal rupture after orotracheal intubation in a child

H. Rebelo, S. Favaios, A. Milheiro, D. Gomes, A. Bahia

Anestesiologia, Centro Hospitalar de Gaia Espinho EPE, Vila Nova de Gaia, Porto, Portugal

Background and Goal of Study: Tracheobronchial rupture after tracheal intubation is rare in clinical practice. Possible contributory factors are multiple vigorous attempts at intubation, overinflation of the cuff, anatomic alterations, and predisposing individual factors. These lesions can be detected by bronchoscopy, which is the most effective method to confirm the diagnosis and determine the exact location and extent of the tear.
Materials and Methods: We report a case of an ASA I, 12 years old child with membranous tracheal rupture after endotracheal intubation. Patient was scheduled for kneecap fracture correction under general anaesthesia with orotracheal tube nº 7 with cuff. It was used a standard monitoring. The procedure was made in the supine position and lasted 1 hour and 30 minutes without hemodynamic changes or ventilation problems. Extubation was soft without bronchospasm or larigospasm. After extubation patient has started cough and haemoptysis. Neck and face subcutaneous emphysema was noted about 10 minutes after extubation.
Results and Discussion: The diagnosis was confirmed by fiberoptic bronchoscopy and computed tomography scan, which showed subcutaneous emphysema, pneumomediastinum and trachea rupture. Treatment option was supportive with a medical approach without surgery. During the hospital stay the outcome was favourable, keeping parenteral nutrition for 11 days. The patient was discharged after 20 days of internment without sequelae. After a month, the bronchoscopy was repeated, and showed no changes, the healing process was completed.
Conclusion(s): Tracheobronchial rupture during intubation is often under diagnosed. In this case there were no risk factors that contribute to this event. Faced with the diagnosis of tracheobronchial rupture, treatment is often surgery, but for small lesions in asymptomatic patient, a conservative attitude and surveillance with subsequent examination by bronchoscopy may be used. If development of complications such as respiratory failure and/or mediastinitis occurs, there must be a more aggressive attitude.
References:

1 Can. J. Anesthesiology 2006/53:4/pp385–388, Postoperative tracheal rupture in a patient with difficult airway, Peter C. Dougall PhD MD.
2 Cir. Esp. 2006:80(1):46–8 Rotura traqueal yatrogénica por intubación orotraqueal, Ricard Ramos Izquierdo.
3 Chest 2006;130;412–418, Traqueobronchial Ruptures, Fourrier, Philippe Ramon et al

19AP6-7

Iatrogenic postintubation tracheobronchial rupture

J. Cortesão, R. Inácio, A. Bernardino, J. Gonçalves, T. Paiva

Department of Anaesthesiology and Intensive Care, Centro Hospitalar de Coimbra, Coimbra, Portugal

Background and Goal of Study: Iatrogenic tracheobronchial rupture (TBR) post intubation is a rare but severe and potentially fatal complication. Its incidence is unknown. Clinical manifestations and treatment are variable.
Materials and Methods: A 48 year-old female, ASA I was submitted to a diagnostic celioscopy. The intubation was performed at second attempt with a cuffed single-lumen tube without a stylet guide and no incidents noticed. During the post-operative period (10 hours after) the patient developed retrosternal pain, hemoptoic expectoration, cough, dyspnea, subcutaneous cervical, facial and upper limbs emphysema. CT scan also revealed pneumonediastinum. Bronchofiberoscopy showed tracheal rupture of 2-cm length above the emergence of main right bronchus. Urgent right toracotomy for surgical repair of tracheal rupture was performed under general anesthesia. As a difficult airway was anticipated, we tried with success an awake fiberoscopy intubation of the main left bronchus with left double lumen tube, No complications occurred, the patient was extubated smoothly and admitted to Intensive Care Unit.
Results and Discussion: The main risk factors associated with iatrogenic TBR are related with traumatic procedures, mechanical and patient related. Treatment may be conservative or surgical repair. The indication for each one is not consensual and depends on the local extent of TBR, the diagnosis timing, patient ventilation and clinical signs. This patient had a rupture of the lower third of the trachea, suspected by the symptoms and confirmed by bronchoscopy. The treatment of choice was surgical repair, a challenge for the anaesthesiologist since he had to deal with a potentially difficult airway and the need to ventilate only the left lung.

Conclusion(s): Anaesthesiologists when confronted with these post-intubation symptoms should always suspect and exclude the possibility of an iatrogenic TBR. This is a possible life-threatening complication with high morbimortality. The key for a better outcome lies in an early diagnosis and an immediate and adequate treatment.

19AP6-8

Management of the airway in Hunter Syndrome

P. Jubera, A. Ruiz de la Cuesta, J. Gil, A. Ortega, D. Martinez

Anaesthesiology, Hospital Miguel Servet, Zaragoza, Spain

Background and Goal of Study: Hunter Syndrome (mucopolysaccharidosis, Type II) is one of the mucopolysaccharidoses, a rare group of recessively inherited connective tissue diseases characterized by a defect in the degradation of mucopolysacharides normally present in connective tissues. Mucopolysaccharide accumulation involves multiple organs and tissues including bone, cartilage, brain, liver, spleen, blood vessels, skin, cornea, heart, and tracheobronchial airway structures. As a consequence of the anatomical and pathological changes in the upper airways of patients with Hunter syndrome, general anaesthesia–especially intubation–is a difficult and potentially high-risk procedure.
Materials and Methods: Patients suffering from Hunter Syndrome are associated with increased risks of difficult airway management. We reported a case of Hunter Syndrome for extraction of third molars under general anestheisa. The preoperative airway examination revealed a limited mouth opening, limited neck extension, abnormal dentition, short thyromental distance, large tongue. The patient was classified as a case of difficult intubation and we decided an awake fibreoptic intubation followed by general anaesthesia
Results and Discussion: We explained to the patient and it was suggested that awake fibreoptic intubation was the safest option. The patient gave his consent, so a nasal awake fibreoptic intubation was carried out under local anaesthesia and sedation with midazolam 1 mg and continuous administration of remifentanil. Atropine, 0.5 mg iv, was administered to diminish secretions. Remifentanil maintained the patient's spontaneous ventilation and increased their tolerance to the pain and discomfort.
Conclusion(s): When intubation is expected to be difficult at the pre-anaesthetic examination, the use of a fiberoptic bronchoscope is the technique of choice for intubating adults under local anaesthesia, and children under general anaesthesia.

19AP6-9

Anaesthetic management in patients with epidermolysis bullosa dystrophica

L. Karabiyik, G. Alp

Department of Anaesthesiology and Reanimation, Gazi University Faculty of Medicine, Ankara, Turkey

Background and Goal of Study: Epidermolysis bullosa distrophica (EBD) is a genetic disorder which causes blistering and shearing of the skin following even minor trauma, and leads to an array of medical problems. In anaesthetic caring for patients with EBD, taking precautions to protect the integrity of the skin and mucous membranes from trauma, friction injury and adhesive products are essential. This report describes nine anaesthetic management in four patients with EBD.
Materials and Methods: Surgical procedures for the patients with EBD were either superficial debridement or pseudosyndactyly repair. For pseudosyndactyly repair procedures; general anaesthesia was applied using Cobra perilaryngeal airway in two patients, whereas bilateral brachial and/or axillary nerve blocks were performed in two patients with an anticipated airway difficulty due to epidermolysis bullosa. Ketamin was administered for all wound debridement procedures. In one of these ketamin applications, supplemental anaesthesia was required with sevoflurane inhalation by means of face mask. ECG monitoring was made possible by placing three patches of wet cloth soaked in physiological serum on anterior thorax, in order to prevent bullae formation due to direct skin contact with adhesive tapes and electrodes. All devices were lubricated before airway or skin application.
Results and Discussion: Protection of skin integrity from trauma is essential in patients with EBD. This can be achieved by minimizing mechanical stimulation of the skin and mucous membranes. These patients may also have scarring, which results in microstomia, limited opening of the mouth and limited temporomandibular joint motion. Cobra perilaryngeal airway is a new airway device, intended for use as an alternative to a facemask for achieving and maintaining airway control. Because its anteroposterior width of the distal end is smaller than other devices, it requires less mouth opening for insertion. Ketamin is suitable for use in wound debridement, as it provides adequate analgesia.
Conclusion(s): We report the successful applications of intraoperative indirect electrocardiogram monitoring without electrodes, general anaesthesia using Cobra perilaryngeal airway and bilateral axillary and midhumeral nerve blocks in patients who had previously undergone repeated general anaesthesia. Regional anaesthesia is especially suitable in patients with DEB when a difficult airway is anticipated due to prior repeated airway managements during general anaesthesia.

19AP7-1

Anticlockwise rotation and laryngoscopic pressure improve gum elastic bougie-facilitated intubation success rates

L. Pazos Otero, M. Rial Munín, P. Aguirre Puig, J. Cortiñas Díaz, M. Amor Berdullas

Anesthesiology, Hospital Clínico Universitario de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

Background and Goal of Study: The main reason for difficulty in advancing the tube over the gum elastic bougie is probably an anatomical obstacule. The right arytenoid cartilage is suggested for several authors like the most frecuently place of obstruction. This could be explained by the direction of the bevel of the tracheal tube, when we advance the tube in neutral position, the bevel is usually facing the left and the tip is on the right. This prospective, and randomized study was designed to investigate which maneuvers could facilitate the intubation over a gum elastic bougie. We compare the tube orientation of 0º with the tube orientation of – 90º (anticlockwise) and with the presence of the laryngoscope in the mouth during the intubation.
Materials and Methods: 60 patients scheduled for elective surgery with Mallampati I or II. were included. The sizes of the Mallinkrodt standart tubes used were 8mm internal diameter for men and 7mm for women. After anesthesia was induced the bougie was passed through the larynx into the trachea. Patients were randomly assigned to one of the three groups. In group 1 and 2 the laryngoscope was removed from the mouth after the insertion of the bougie while in group 3 it was manteined. In group 1 the neutral orientation of the tube, with the bevel to the left was practised and in the group 2 the tube was turned to – 90º position. If unsuccessful, after the first attempt, in group 1 the tube was rotated to – 90º, in group 2 the laryngoscope was introduced in mouth again and in group 3 a LMA was used to manage the airway.
Results and Discussion: Only three patients could be intubated with neutral orientation. All the patients with the laryngoscope in the mouth were successfully intubated except one. The success rate at the first attempt in group 1 was 15%, in group 2 50% and 95% in group 3 ($p < 0.05$) The technique of rotating the tube to – 90º was more effective than the neutral orientation. The most successful method was to leave the laryngoscope in the mouth. There were not differences between the sizes of the tubes.
Conclusion(s): The study demonstrate that the placement of tracheal tube over the gum elastic bougie will be greatly increased by the presence of a laryngoscope in the mouth and rotating the tube to – 90º. The use of the gum elastic bougie with these maneuvers will increase its efficiency and will also decrease trauma and reduce the need for more techiques.
Reference:
1 S.Dogra (UK): Succesful difficult intubation. Tracheal tube placement over a gum-elastic bougie. Anaesthesia 1990, 45; 776–780.

19AP7-2

Bronchial blockers use by non-experienced anesthesiologists: A manikin study

O. Valencia, A. Callejo, S. Reca, R. Lopez-Vicente, F. Pérez-Cerdá

Anesthesiology, Hospital 12 de Octubre, Madrid, Spain

Background and Goal of Study: Lung isolation techniques are commoly used to facilitate surgical exposure and provide one-lung ventilation in patients undergoing a variety of intrathoracic surgical procedures. It can be achieved by the use of double lumen endotracheal tubes or modern bronchial blockers. Existing comparative studies are usually conducted by anesthesiologist expertise in thoracic anesthesia who peform lung isolation procedures on a routine basis. However nowadays lung isolation must be achieved by non experienced anesthesiologists who may benefit from using new types of bronchial blockers. With the increasing demand for one-lung ventilation, it is important to define which device and for which side can be used most effectively by occasional users.
Materials and Methods: A total of 22 non-experienced anesthesiologist in lung isolation techniques were recruited during a one month period. They were instructed in using three different types of bronchial blockers: the Arndt blocker (Cook critical care), the Cohen blocker (Cook critical care) and the Coopdech bronchial blocker (Daiken medical). After the instruction period, they were demanded to make an isolation of right and left main bronchus using the three types of bronchial blockers in a self-made sylicon model of a human

tracheobronchial tree. A number 8 endotracheal tube was left 2,5 centimeters above the carina, and with the aid of a 4,1 external diameter Olympus fiberscope (LF-2) the isolation was done. Age, sex, years of experience in anesthesiology, time to achive isolation in right and left bronchus with the three different methods, and best method participants subjective opinion were recorded. T-test was used to compare time between different bronchial blockers in both sides.
Results and Discussion: Sex: 27% males, 73% females. Age: X:27,45 years (SD 2,115), years of experience: X:2,73 years (1,95). Mean time to isolation of right main bronchus: arndt: 29,82 seconds (SD 12,64), cohen 23,91 (SD 7,62), coopdech 24,55 (SD 7,77). Significant difference between arndt-coopdech p0,038. Left main bronchus: arndt: 32,27 (SD 18,13), cohen 31,91 (SD 9,51), coopdech 27 (6,67). Significant difference between cohen-coopdech p 0,015. 18% of participants chose the arndt blocker as the best method and 82% the coopdech blocker.
Conclusion(s): The Coopdech blocker was chosen as the best method by most of participants (82%). It was the fastest method for achiving isolation of left main bronchus which wast the most difficult one.

19AP7-3

The innovative technique enables easy and faster insertion of the bronchial blocker tube, UNIBLOCKER™ into the left or right main bronchus

T. Iizuka, A. Notoya, Y. Yokokawa, T. Satake

Anesthesia, National Cancer Center Hospital, Tokyo, Japan

Background and Goal of Study: One-lung ventilation (OLV) is usually achieved by the use of a double-lumen tubes (DLTs). With increasing need for use of OLV for video-assisted thoracoscopic surgery (VATS) procedures, the limitations of traditional DLTs, including difficult insertion and positioning, have become evident. UNIBLOCKER™ (Fuji Systems Corporation, Tokyo, Japan) is intended to used for segmental lung ventilation in combination with a conventional endotracheal tube by blocking either the left or the right lung. However, problems are often encountered when inserting the UNIBLOCKER™ into the bronchus. In this study, we describe our original technique that enables the quick and easy insertion of the UNIBLOCKER™ into the left or the right bronchus and evaluated the quality of the lung deflation.
Materials and Methods: 33 patients undergoing a VATS approach with a bronchial blocker tube, UNIBLOCKER™ to establish OLV were studied. The time to place the UNIBLOCKER™ to the left or the right mainstem bronchus, the quality of lung deflation was rated by the surgeon under direct visualization as excellent, good, fair, or poor. Our original technique is attach the UNIBLOCKER™ into an endotracheal tube before intubation, and insert the UNIBLOCKER™ into the left or the right bronchus after intubation.
Results and Discussion: In all 38 patients, by means of this thechnique, quick insertion of the UNIBLOCKER™ and segmented lung ventilatin can be made after the bronchial blocker cuff was inflated at the targeted position of the bronchus. The quality of lung deflation was judged as being excellent or good in all patients, and the surgical field was excellent in all cases.

Results

	Right VATS	Left VATS
N	18	15
Time (sec)	37.28 ± 2.91	33.33 ± 3.27
Lung deflation	excellent 6/18 good 12/18	excellent 10/15 good 5/15

Conclusion(s): In this study, our technique to insert the UNIBLOCKER™ showed easy and quick placement to the left and the right main bronchus, however in patients who have a short mainstem bronchus, the positioning of a right-sided bronchial blocker cuff with the right upper lobe fenestration aligned with the right upper lobe bronchus may leave the bronchial blocker cuff positioned high in the carina with inadequate contact surface area to accomplish an adequate seal. For this reason, our data showed a better quality of lung collapse showed left > right.

19AP7-4

Bronchial blocker tube, UNIBLOCKER™ facilitate rapid and safety one-lung ventilation

T. Iizuka, A. Notoya, Y. Yokokawa, T. Satake

Anesthesia, National Cancer Center Hospital, Tokyo, Japan

Background and Goal of Study: In this study, we evaluated the efficacy of a wire-guided bronchial blocker, UNIBLOCKER™ (Fuji Systems Corporation, Tokyo, Japan) for achieving one-lung ventilation (OLV) during a video-assisted thoracoscopic surgery (VATS).
Materials and Methods: 38 patients undergoing a VATS approach with the new device, a bronchial blocker tube, UNIBLOCKER™ to establish OLV were studied. The time to place the UNIBLOCKER™ to the right or the left mainstem bronchus, the quality of lung deflation was rated by the surgeon under direct visualization as excellent, good, fair, or poor.
Results and Discussion: In all 38 patients, placement of the UNIBLOCKER™ was easily and safety with fiberoptic aided technique. One-lung ventilation was well tolerated in all cases. The quality of lung deflation was judged as being excellent or good in all patients, and the surgical field was excellent in all cases.

Results

	Right VATS	Left VATS
N	20	18
Time (sec)	37.50 ± 3.05	32.78 ± 3.30
Lung deflation	excellent 8/20 good 12/20	excellent 12/18 good 6/18

Conclusion(s): Lung isolation with the new device, UNIBLOCKER™, is both safe and very effective in VATS. In this study, UNIBLOCKER™showed ease in placement to the right and left main bronchus, however in patients who have a short mainstem bronchus, the positioning of a right-sided bronchial blocker cuff with the right upper lobe fenestration aligned with the right upper lobe bronchus may leave the bronchial blocker cuff positioned high in the carina with inadequate contact surface area to accomplish an adequate seal. For this reason, our data showed a better quality of lung collapse showed left > right. The development and clinical use of UNIBLOCKER™ is proven to be effective and easy to use for establishing OLV.

19AP7-5

Awake fiberoptic intubation: Remifentanil's role

C. Mascarenhas, V. Oliveira, D. Mascarenhas, J. Orfão

Anesthesiology, Intensive Care and Emergency, Centro Hospitalar do Porto – Hosp. Sto. António, Porto, Portugal

Background and Goal of Study: Awake fiberoptic intubation is commonly used for management of predicted difficult airway in head and neck surgery. Tracheal intubation is associated with sympathetic stimulation and patient's cooperation with full analgesia is a key factor for a successful fiberscopy. Remifentanil has properties to achieve this goal. Our aim is to evaluate hemodynamic stability and patient's cooperation in awaked fiberoptic intubation with continuous infusion of remifentanil.
Materials and Methods: Fifteen adult patients, ASA I–III, with predicted difficult airway scheduled for elective head and neck surgery were proposed to awake fiberoptic intubation (either nasal- or oral way). All patients were premedicated with midazolam IV (0,025 mg/kg) 15' before fiberscopy and instilled with nasal vasoconstrictor (phenylephrine) and 2% lidocaine spray in nasal and oral mucosa. Remifentanil infusion (0,02–0,1 µgr/kg/min) started 5' before fiberscopy. Heart rate (HR), mean arterial pressure (MAP) and peripheral oxygen saturation (SpO2) were recorded in five different times: T0 (arrival on OR), T1 (Start remifentanil infusion), T2 (Start fiberscopy), T3 (Fiberscope passage trough vocal cords), T4 (Intubation). Patient's cooperation was classified nominally (poor, insufficient, sufficient, good, excellent) and crossed with mean time for intubation. T0 results were compared with other times and analyzed with paired–samples T-Test, confidence interval 95%. P-value > 0.05 was consider significant.
Results and Discussion: There were no hemodynamic changes in awake fiberoptic intubation with remifentanil infusion between T0 and the other times. Patient cooperation was considered excellent in 73,3%, good in 20% and sufficient in 6,7%. Mild cough was present in 8 patients and 1 had violent cough. Mean time for intubation was between 3'–15'. Highest levels of cooperation were associated with shortest intubation mean time. Spontaneous ventilation was maintained in all patients without complications. Nasal intubation was achieved in 80% of the patients. Remifentanil, a short-acting, titratable opioid agonist, allows full analgesic control and counterbalances hemodynamic reaction to tracheal intubation. Patient's alertness and cooperation during fiberscopy contributes to a rapid and successful fiberscopy, despite airway abnormalities.
Conclusion(s): Continuous infusion of remifentanil in predicted difficult airway management provides hemodynamic stability and enhances patient cooperation with spontaneous ventilation during awaked fiberoptic intubation.

19AP7-6

Tracheal fluid leakage in benchtop trials. Comparison of static versus dynamic model with and without lubrication

M. Dave, N. Koepfer, C. Madjdpour, A. Frotzler, M. Weiss

Department of Anaesthesia, University Children's Hospital, Zurich, Switzerland

Background and Goal of Study: Benchtop studies are used to test the efficiency of tracheal tube cuffs in preventing fluid leakage in static and dynamic ventilated models. The aim of the study was to compare the potential of static and dynamic model and effect of lubrication, to test the tracheal sealing properties of a given tube cuff.
Materials and Methods: Internal diameter (ID) 7.5mm tracheal tube cuffs–*Tapered* Seal Guard (TSG) (Covidien), Standard Seal Guard (SG) (Covidien), Hi-Lo (Covidien), Ruesch SuperSafety (Ruesch), Portex Profile Soft Seal (Portex) were compared in the vertically placed PVC trachea of 18 mm ID. Tube cuffs were placed in the trachea without (group 1) and with (group 2) lubrication and were inflated to 25cm H_2O cuff pressure. At room temperature, 5ml of clear water was applied above the tube cuff and fluid leakage was measured at 60min in this static set-up. In a third trial, the tube cuffs were placed and inflated in the trachea without lubrication (group 3) and attached to a Testlung (Carbamed, Compliance 22ml/cm H_2O). Respirator settings were: fresh gas flow (air) 6 l/min; PEEP 5cm H_2O; respiratory rate 12/min; Peak inspiratory pressure 20cm H_2O. Clear water (5ml) was applied above the tube cuff and fluid leakage was measured after 60min and 5min after release of Intermittent Positive Pressure Ventilation (IPPV). Experiments were repeated 2 times with 4 new tubes for each run. Amount of fluid leakage in group 1 were compared to group 2 and 3 using Wilcoxon-test.
Results and Discussion: Table 1.

Table 1. Fluid leakage (ml over 60 min). Data in mean (SD).

Tube Brand	Static Unlubricated (group 1)	Static Lubricated (group 2)	Dynamic Unlubricated (group 3)	After release of IPPV (5min)
TSG	2.79 (1.32)	0 (0) *	0 (0) *	0.29 (0.32)
SG	2.74 (1.33)	0 (0) *	0 (0) *	1.35 (0.98)
Ruesch	4.74 (0.11)	0 (0) *	0 (0) *	4.73 (0.25)
Portex	4.76 (0.11)	0 (0) *	0 (0) *	4.71 (0.25)
Hi-Lo	4.76 (0.12)	0 (0) *	0 (0) *	4.61 (0.22)

*$p < 0.05$

Conclusion(s): Gel lubrication and IPPV has protective effect on fluid leakage past tracheal tube cuffs. Studies testing the efficiency of these cuffs designed in a static benchtop model rather than dynamic ventilated setup, and without lubrication of the cuff, might be more conclusive. Sudden withhold of IPPV facilitates fluid leakage past tracheal tube cuffs which was minimal to absent in presence of ventilation.
Acknowledgements: Study supported by departmental resources

19AP7-7

Tapered versus *cylindrical* tracheal tube cuffs – Comparison of fluid leakage

M. Dave, N. Koepfer, C. Madjdpour, A. Frotzler, M. Weiss

University Children's Hospital, Department of Anaesthesia, Zurich, Switzerland

Background and Goal of Study: It has been known that the longitudinal folds along the conventional PVC cuffs form a tunnel which allows drainage of secretions. The diameter of the HVLP cuff has to be greater than the diameter of the trachea to allow the intracuff pressure to be equal to the tracheal wall pressure and thus create sealing by occupying tracheal wall volume and not by pressure. When HVLP cuffs are inflated, the excess material folds over itself, developing channels and thus allowing leak. The aim of this study was to compare tracheal fluid leakage in the new *tapered* shaped tracheal tube cuff against the classic *cylindrical* tube cuffs when placed in different sized tracheas.
Materials and Methods: Internal diameter (ID) 7.5 mm tracheal tube cuffs–*Tapered* shaped Seal Guard Covidien (TSG), *Cylindrical* shaped Standard Seal Guard–Covidien (SG), Hi-Lo Covidien, Ruesch Super Safety Clear–Ruesch, Portex Profile Soft Seal–Portex were compared in an *in vitro* set up. Vertically placed artificial PVC tracheas with ID of 16, 20 and 22 mm were intubated. The unlubricated tube cuffs were inflated to 25cm H_2O cuff pressure. At room temperature, 5ml of clear water was applied above the tube cuff and fluid leakage was measured at 60min using an electronic balance placed below the trachea. Experiments were repeated 2 times with 4 new tubes for each run. Data of non-tapered *cylindrical* tube cuffs are compared with that of the *tapered* tube cuff for each tracheal diameter using Mann-Whitney-U-test.
Results and Discussion: Tabel 1.
Conclusion(s): The ability of the new *tapered* shaped Seal Guard tracheal tube cuff to cope with different tracheal diameters for efficient tracheal sealing was superior to that of the standard *cylindrical* shaped tube cuffs. Cuffs made from PU prevented the fluid leakage better than those made from PVC.
Acknowledgements: Study is supported by departmental resources.

Table 1. Fluid Leakage (ml after 60 minutes). Data in mean (SD)

Tube Brand	Cuff Material	16 mm ID trachea	20 mm ID trachea	22 mm ID trachea
Tapered Seal Guard (TSG) (Covedian)	PU	3.12 (1.44)	1.51 (1.19)	0.12 (0.16)
Standard Seal Guard (SG) (Covedian)	PU	4.54 (0.40)	2.39 (1.76)	0.87 (1.76)
Ruesch	PVC	4.65 (0.14)	4.30 (1.24) **	4.81 (0.10) ***
Portex	PVC	4.69 (0.11)	4.28 (1.23) **	4.77 (0.13) ***
Hi-Lo (Covedian)	PVC	4.64 (0.16) *	4.27 (1.24) **	4.64 (0.27) ***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; PU = polyurethane; PVC = polyvinyl chloride

19AP7-8

ETview tube for percutaneous endoscopic tracheostomy: Preliminary report

F. Ferraro, S. Tchikou, N. Foderini, O. Sagliocco, M. Chiefari

Anesthesiological, Surgical and Emergency Sciences, II° University of Naples, Naples, Italy

Background and Goal of Study: Percutaneous dilational tracheostomy (PDT) is spreading as an alternative of conventional surgical tracheostomy in ICU. The use of endoscopic guidance during PDT is recommended to increase the safety of procedure. The aim of our study is to evaluate the use of the endotracheal view tube (ETview tube Ltd) instead of fiberoptic bronchoscopy (FBS) as an alternative endoscopic guide during PTD.
Materials and Methods: We studied 10 consecutive adult patients scheduled for PDT in our general ICU of the University Hospital. Timing was 10 days (mean 9 ± SD 6,7). After informed consent was obtained, five patients underwent Ciaglia Blue Rhino tecnique (CBR) and five Percu-Twist (TW). Each PDT was performed under total intravenous anaesthesia (TIVA), myoresolution and pressure control ventilation. The ETview tube is a disposable endotracheal tube 7 or 8 mm I.D. with video micro camera at the tip connected to a monitor (8 inch); it was placed by a tube exchange COOK n.11 O.D. 4.0 mm under continuous video-endoscopic control, before starting PDT. The tube exchange was left in trachea during the PDT to avoid dislodgment during the procedure. The meccanical ventilation support (PCV ≤ 30cm H_2O; PEEP ≤ 10 cm H_2O; Fr 15/m'; Ti ≤ 1.7"; $FIO_2$1) was continued using the ETview tube. Heart rate, oxygen saturation and arterial blood pressure were monitored.
Results and Discussion: In all ten cases there were not clinically relevant complications: bleeding (>5ml); posterior tracheal wall damage; tracheal ring fracture; pneumothorax; transitory hypoventilation; hypoxemia (SpO_2‹95; PaO_2: mean 126 ± SD 70,43 -min 67, max 226 mm Hg-); hypercarbia; and no significant change in ABG from the baseline (Δ Ph 0,065, Δ PaO_2 54mm Hg, Δ $PaCO_2$ 8mm Hg). The time required to perform PDT was: CBR 6.10 ± 2.10, TW 7.50 ± 3.05.
Conclusion(s): ETview use to perform PDT is a safe and effective alternative at FBS. The continous video endoscopic view via portable screen or monitor allows the sharing, the learning of the whole staff and offers simplicity of use for less higly trained personnel. The ETview placement by a tube exchange enhances the safety of the procedure about the risk of the loss of airway control. The continuous endoscopic monitoring by ETview does not interfere with ventilation as the bronchoscopy via the endotracheal tube. Finally the use of ETview is easier, faster and chiper than video FBS.

19AP7-9

Comparative study between Arndt and Coopdech bronchial blockers in right and left thoracic surgery

R. Garcia-Guasch, J. Busquets, A. Flo, J. Cordero, A. Martí

Anesthesiology, Hospital Germans Trias I Pujol, Universitat Autònoma Barcelona, Badalona, Barcelona, Spain

Background and Goal of Study: Endobronchial blockers are being used in thoracic surgery and offer some advantages over double lumen tubes: difficult airways, rapid sequence intubation, selectively collapsing lobes or in patients with an existing tracheotomy. The aim of the study was to compare the time required for the positioning and effectiveness of two bronchial blockers: Arndt and Coopdech in right and left thoracic surgery.
Materials and Methods: A prospective, randomized study was planned. Institutional and patient consent was obtained. All bronchial blockers were introduced in the side to be operated according to manufacturer recommendations. All devices were introduced by experienced staff. The variables recorded were: time to position the device (once the ETT was fixed), adequacy of lung collapse once the chest was opened, frequency of malpositions. Statistical analysis were

performed with two factors ANOVA test for quantitative data and X2 test for qualitative data ($p < 0.05$ was considered statistically significant).

Results and Discussion: All groups were similar regarding gender, age, weight, ASA. Positioning times in seconds are shown as mean ± SD. Quality of collapse and malpositions are shown as percentage. Left side bronchial blockers need significantly longer time than right ones to be placed. FBS must be introduced into the loop at the tip of the blocker in the Arndt blocker which takes some seconds to the placement and some more if it cannot be done at first time.

Positioning times, quality of collapse and malpositions for both blockers and both sides

	Right side n = 30	Left side n = 28	p	Arndt n = 27	Coopdech n = 32	p
Time (s)	142 ± 142	235 ± 192	0.048	230 ± 150	146 ± 18	0.058
Collapse quality	73.3%	75%	0.56	66.7%	81.3%	0.16
Malpositions	60%	3.6%	0.000	37%	28%	0.33

Conclusion(s): In hands of experienced anesthesiologists, in thoracic surgery, left side determines the longest time for initial positioning. Arndt take longer to place without clear significance. Right side devices presented significant frequency of malpositions. The quality of lung collapse was excellent for most of patients independently of the side of surgery and the blocker used.

Reference:

Aplicaciones de los bloqueadores bronquiales en cirugía torácica. R Garcia Guasch, JH Campos, M Granell, JJ Peña. Rev Esp Anestesiol Reanim 2007:54:547–555

19AP7-10

Comparison of air sealing quality in HVLP tracheal tube cuffs – *tapered* versus *cylindrical* shape

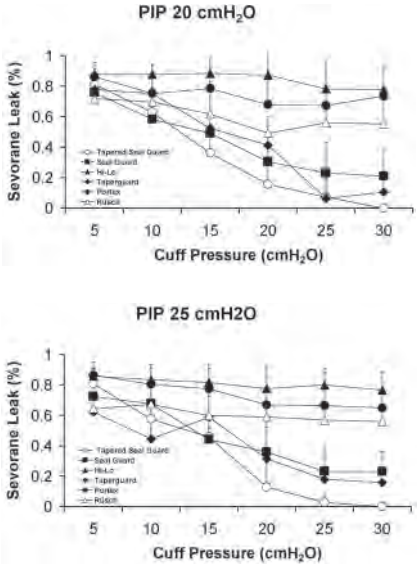
C. Madjdpour, J. Mauch, N. Koepfer, A. Frotzler, M. Weiss

Department of Anaesthesia, University Children's Hospital, Zurich, Switzerland

Background and Goal of Study: High endotracheal cuff pressures can cause tracheal morbidity by compromising mucosal blood flow. Optimal high-volume, low-pressure (HVLP) cuffs are characterized by proper tracheal sealing at low cuff pressures during mechanical ventilation. This study aimed to compare the air sealing characteristics of the new *taper*-shaped tracheal tube cuffs with those obtained from standard *cylindrical* cuffs.

Materials and Methods: *Taper*-shaped polyurethane (PU) and polyvinyl chloride (PVC) ID 7.5 mm tube cuffs (Seal Guard® and Taperguard–Mallinckrodt/Covidien) and standard *cylindrical*-shaped tracheal tube cuffs made from PU and PVC (PU Seal Guard®–Mallinckrodt/Covidien; PVC Hi-Lo®–Mallinckrodt/Covidien; PVC Portex® tracheal tube; PVC Rüsch® Super Safety Clear tracheal tube) were included. A PVC tracheal model (ID 20 mm) attached to a test lung (compliance 22 ml/H_2O) was intubated and the unlubricated tube cuffs were inflated to 5, 10, 15, 20, 25 and 30 cm H_2O. The test lung was ventilated with IPPV as followed: fresh gas flow of 4 lt/min air with 1% sevoflurane, PEEP of 5 cm H_2O, respiratory rate of 12/min, peak inspiratory pressures (PIP) of 20 and 25 cm H_2O. Sevoflurane concentration passing the tube cuff was assessed at the upper cuff border using an anaesthetic gas analyzer. Experiments were repeated 4 times with new tubes for each run. Data are presented as mean (SD) (figures 1 and 2).

Results and Discussion: Sevorane leak with PIP of 20 and 25 cm H_2O is shown below.



Conclusion(s): The *taper*-shaped tracheal tube cuffs made from PU and PVC demonstrated better sealing characteristics than the standard tracheal tube cuffs with a *cylindrical* shape. The usage of tracheal tubes exhibiting this new cuff design might therefore reduce the cuff pressure to seal the airway to allow sufficient ventilation.

Acknowledgements: This study was supported by departmental resources.

SUBJECT INDEX

AUTHOR INDEX

European Society of Anaesthesiology

ESA

Helsinki, Finland

Euroanaesthesia 2010

The European Anaesthesiology Congress

June 12-15

Symposia
Refresher Courses
Workshops
Industrial Symposia & Exhibition
Abstract Presentations

CME Accreditation
EACCME - UEMS

Deadline abstracts:
December 15th 2009
Online submission:
www.euroanesthesia.org

ESA Secretariat
Phone +32 (0)2 743 32 90
Fax +32 (0)2 743 32 98
E-mail: registration@euroanesthesia.org